Townsville

Planning Together... For *Townsville's* Future

TOWNSVILLE CITYPLAN

TOWNSVILLE CITY COUNCIL

Contents

Part 1 About the planning scheme **P1/1**
- 1.1 Introduction P1/1
- 1.2 Planning scheme components P1/2
- 1.3 Interpretation P1/5
- 1.4 Categories of development P1/6
- 1.5 Hierarchy of assessment criteria. P1/7
- 1.6 Building work regulated under the planning scheme P1/7
- 1.7 Local government administrative matters P1/8

Part 2 State planning provisions **P2/1**
- 2.1 State planning policy P2/1
- 2.2 Regional plan P2/1
- 2.3 Referral agency delegations P2/1
- 2.4 Standard planning scheme provision P2/1

Part 3 Strategic framework. **P3/1**
- 3.1 Preliminary P3/1
- 3.2 Strategic intent P3/1
- 3.3 Theme—Shaping Townsville P3/5
- 3.4 Theme—Strong and connected community P3/18
- 3.5 Theme—Environmentally sustainable future P3/20
- 3.6 Theme—Sustainable economic growth P3/24

Part 4 Local government infrastructure plan **P4/1**
- 4.1 Preliminary P4/1
- 4.2 Planning assumptions P4/2
- 4.3 Priority infrastructure area P4/21
- 4.4 Desired standards of service P4/22
- 4.5 Plans for trunk infrastructure P4/26
- 4.6 Definitions P4/28

Part 5 Tables of assessment **P5/1**
- 5.1 Preliminary P5/1
- 5.2 Reading the tables P5/1
- 5.3 Categories of development and assessment P5/2
- 5.4 Regulated categories of development and categories of assessment prescribed by the Regulation P5/4
- 5.5 Categories of development and assessment – Material change of use P5/4
- 5.6 Categories of development and assessment – Reconfiguring a lot P5/55
- 5.7 Categories of development and assessment – Building work P5/68
- 5.8 Categories of development and assessment – Operational work P5/70
- 5.9 Categories of development and assessment – Overlay P5/96

Part 6 Zones **P6/1**
- 6.1 Preliminary P6/1
- 6.2 Residential zones category P6/2
- 6.3 Centre zones category P6/131
- 6.4 Community facilities and open space zone category. P6/279
- 6.5 Industry zones category P6/307
- 6.6 Rural zones category P6/330
- 6.7 Other zones category P6/343

Part 7 Local plans **P7/1**

Part 8 Overlays **P8/1**
- 8.1 Preliminary P8/1
- 8.2 Overlay codes P8/3

Part 9 Development codes **P9/1**

P9/1

Part 10 Other plans **P10/1**
10.1 Oonoonba development scheme P10/1
10.2 Townsville City Waterfront Priority Development Area P10/1
Schedule 1 Definitions **SC1/1**
SC1.1 Use definitions. SC1/1
SC1.2 Administrative definitions SC1/25
Schedule 2 Mapping **SC2/1**
SC2.1 Map index SC2/1
SC2.2 Strategic framework maps SC2/5
SC2.3 Zone maps SC2/6
SC2.4 Local plan maps SC2/57
SC2.5 Overlay maps SC2/58
SC2.6 Other plan maps. SC2/69
Schedule 3 Local government infrastructure plan mapping and supporting material **SC3/1**
Schedule 4 Notations required under the Sustainable Planning Act 2009 **SC4/1**
SC4.1 Notation of decisions affecting the planning scheme under section 391 of the Act SC4/1
SC4.2 Notation of resolution(s) under Chapter 8, Part 2, Division 1 of the Act SC4/5
SC4.3 Notation of registration for urban encroachment provisions under section 680ZE of the Act SC4/6
Schedule 5 Land designated for community infrastructure **SC5/1**
Schedule 6 Planning scheme policies **SC6/1**
SC6.1 Planning scheme policy index SC6/1
SC6.2 Character residential planning scheme policy SC6/2
SC6.3 Cultural heritage planning scheme policy SC6/25
SC6.4 Development manual planning scheme policy SC6/57
SC6.4.1 Introduction SC6/58
SC6.4.2 Development application guidelines SC6/60
SC6.4.3 Standard drawings SC6/85
SC6.4.4 Active transport infrastructure SC6/92
SC6.4.5 Road network infrastructure SC6/98
SC6.4.6 Road works and traffic control SC6/155
SC6.4.7 Cleaning, grubbing and earthworks SC6/195
SC6.4.8 Stormwater management SC6/231
SC6.4.9 Stormwater quantity SC6/251
SC6.4.10 Stormwater quality SC6/308
SC6.4.11 Water and sewerage SC6/414
SC6.4.12 Landscaping and open space SC6/543
SC6.4.13 Irrigation SC6/634
SC6.4.14 Public utilities and building over/near services SC6/678
SC6.4.15 Steep land development SC6/692
SC6.4.16 Geotechnical investigations SC6/698
SC6.4.17 Structures SC6/708
SC6.4.18 Concrete works SC6/726
SC6.4.19 Noise and vibration SC6/752
SC6.4.20 Outdoor dining SC6/765
SC6.4.21 Rear lanes SC6/797
SC6.4.22 Waste management SC6/804
SC6.4.23 Construction management, quality management, inspection, and testing SC6/821
SC6.4.24 Acceptance of completed works SC6/916
SC6.5 Economic impact assessment planning scheme policy SC6/943
SC6.6 Emerging community planning scheme policy SC6/945

SC6.7 Flood hazard planning scheme policy SC6/947
SC6.8 Mitigating bushfire hazard planning scheme policy SC6/966
SC6.9 Natural assets planning scheme policy SC6/968
SC6.10 Parking rates planning scheme policy SC6/983
Schedule 7 Places of cultural heritage value SC7/1
Appendix 1 Index and glossary of abbreviations and acronyms. A1/1
Appendix 2 Table of amendments A2/1

Citation and commencement

This planning scheme may be cited as the Townsville City Plan.

A notice was published in the Government Gazette No. 37 on 17 October, 2014 for the planning scheme for the City of Townsville.

The commencement date for the planning scheme was 27 October, 2014.

The Townsville City Plan was amended for alignment with the *Planning Act 2016* (the Act) by the Minister's rules under section 293 of the Act on 27 June 2017.

Amendments to the planning scheme are included at Appendix 2.

Strategic vision

In 2021, our community will be defined by the statement:

Townsville is the northern gateway to Queensland. Our well-built city connects people to their community, via an active lifestyle that is enjoyed by all who live and visit. We are leaders of positive environmental action. We are acclaimed for our business entrepreneurship, government enterprise, innovation, technology and cultural stewardship.

Four Community Plan themes expand on this vision statement:

Strong, connected community
A community that draws on the diversity, skills and expertise of residents to build a community that has pride in its culture and lifestyle.

Environmentally sustainable future
Our community recognises and values the natural environment. We acknowledge the need for a more sustainable future and seek to achieve this through solutions that minimise our impact on the environment.

Sustaining economic growth
The community recognise that it is fundamental to have a strong and balanced economic growth in order to enhance our city's way of life.

Shaping Townsville
Our city will meet the diverse and changing infrastructure and service needs of the community.

(Leading, creating, connecting: shaping a place to be proud of, Townsville Community Plan 2011-2021)

Editor's note—The Strategic vision is extrinsic material to the planning scheme.

Part 1 About the planning scheme

1.1 Introduction

(1) The Townsville City Plan (planning scheme) has been prepared in accordance with the *Sustainable Planning Act 2009* (the SP Act) as a framework for managing development in a way that advances the purpose of the SP Act.

(2) The planning scheme was amended for alignment with the *Planning Act 2016* (the Act) by the Minister's rules under section 293 of the SP Act on 27 June 2017.

(3) In seeking to achieve this purpose, the planning scheme sets out Townsville City Council's intention for the future development in the planning scheme area, over the next 25 years.

(4) The planning scheme seeks to advance state and regional strategies, including state planning policies, through more detailed local responses, taking into account the local context.

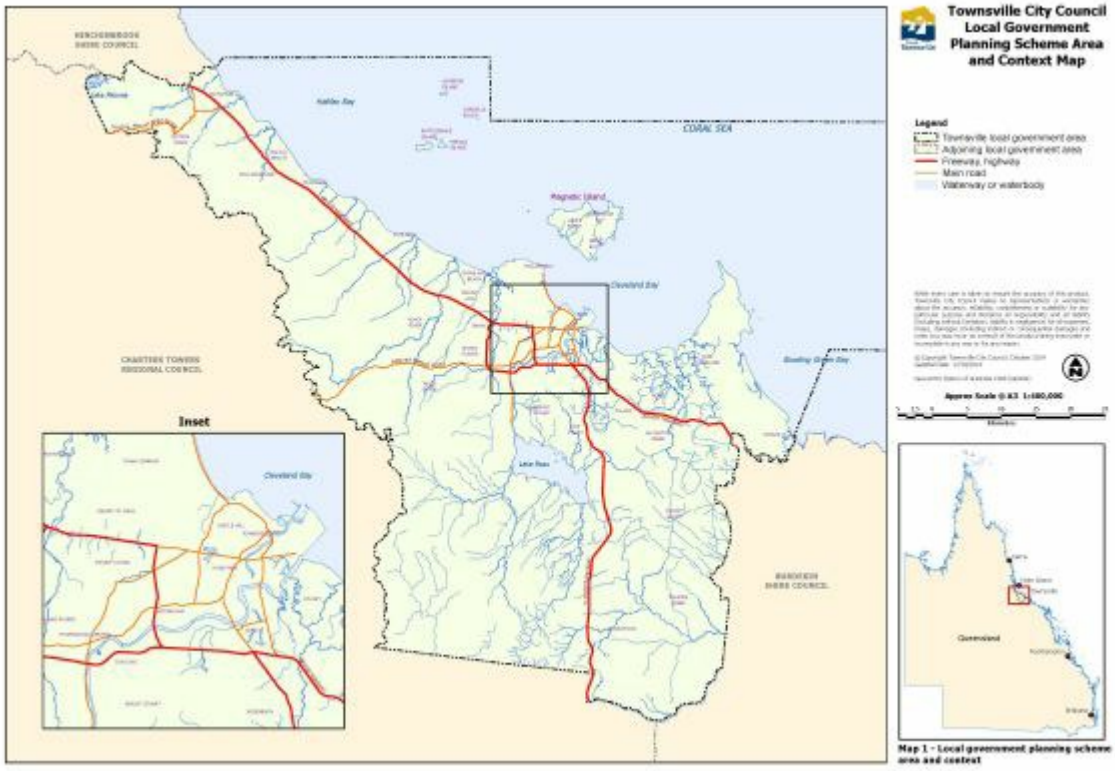
(5) While the planning scheme has been prepared with a 25-year planning horizon, it will be reviewed periodically in accordance with the Act to ensure that it responds appropriately to the changes of the community at a local, regional and state level.

(6) The planning scheme applies to the planning scheme area of Townsville City Council including all premises, roads, internal waterways and interrelates with the surrounding local government areas illustrated in Map 1.

Editor's note—In accordance with section 5(2)(a) of the Planning Regulation 2017, the regulated requirements apply to this planning scheme only where specifically identified as regulated requirements in the section containing the administrative definition for minor building work.

Editor's note—Areas which are not subject to the jurisdiction of the planning scheme are noted in the relevant zone codes in Part 6. They include the Department of Defence Estate, strategic port land and certain other major land holdings. In addition, land subject to a community infrastructure designation is listed in Schedule 5.

Editor's note—Under section 26 of the *Sustainable Ports Development Act 2015*, a master plan and port overlay may apply to Port of Townsville land outside designated areas of strategic port land. Where there is a port overlay, it prevails over the planning scheme, to the extent of any inconsistency.



Click here to view PDF high resolution map.

Map 1 - Local government planning scheme area and context

1.2 Planning scheme components

(1) The planning scheme comprises the following components:

- (a) about the planning scheme;
- (b) state planning provisions;
- (c) the Strategic framework;
- (d) the Local government infrastructure plan;
- (e) tables of assessment;
- (f) the following zones:
  - (i) Low density residential zone:
    - (A) Ross River Road corridor precinct;
    - (B) Stables precinct;
    - (C) Marlow Street precinct;
  - (ii) Medium density residential zone:
    - (A) Thuringowa South precinct;
    - (B) Thuringowa East precinct;
    - (C) Rossiter Park precinct;
    - (D) Aitkenvale medium density precinct;
    - (E) Aitkenvale village precinct;
    - (F) Hyde Park medium density precinct;
    - (G) Kings Road medium density precinct;
    - (H) The Strand precinct;
    - (I) North Ward gateway precinct;
    - (J) North Ward villages precinct;

(K) North Ward medium density precinct;

(L) Magnetic Island medium density precinct;

(M) Picnic Bay precinct;

(N) Nelly Bay tourist precinct;

(O) Wills Street precinct;

(iii) High density residential zone:

(A) Palmer Street precinct;

(B) Flinders Street West precinct;

(C) Railway Estate precinct;

(iv) Rural residential zone;

(v) Character residential zone:

(A) 1950s Post War Expansion precinct;

(B) 1960s Defence Housing and 1960s Housing Commission precinct;

(C) Worker's Cottages precinct;

(D) South Townsville precinct;

(E) Queenslanders precinct;

(F) Interwar Gables and Queensland Bungalows precinct;

(G) Interwar to 1950s Asymmetrical Gables precinct;

(H) Churchill Street precinct;

(I) Park Street precinct;

(J) Grand Queenslanders precinct;

(K) French Street precinct;

(L) Mixed 1950s precinct;

(vi) Neighbourhood centre zone;

(vii) Local centre zone:

(A) Rising Sun local centre precinct;

(B) North Ward local centre precinct;

(viii) District centre zone:

(A) Idalia district centre precinct;

(B) Annandale district centre precinct;

(C) Deeragun district centre precinct;

(D) Rasmussen district centre precinct;

(ix) Major centre zone:

(A) Aitkenvale major centre precinct:

Aitkenvale centre core sub-precinct;

Aitkenvale centre frame sub-precinct;

(B) Thuringowa Central major centre precinct:

Thuringowa town centre heart sub-precinct;

Willows sub-precinct;

Thuringowa Drive sub-precinct;

Thuringowa centre support sub-precinct;

(C) Hyde Park major centre precinct;

(x) Principal centre (CBD) zone:

(A) Civic and administration precinct;

(B) Flinders Street retail precinct;

(C) Flinders Street East precinct;

(xi) Specialised centre zone:

(A) Townsville Airport precinct;

(B) Port of Townsville precinct;

(C) Lavarack Barracks precinct;

(D) Domain Central precinct;

(E) Fulham Road medical precinct;

(F) Bayswater Road medical precinct;

(G) James Cook University-Townsville Hospital precinct:

Discovery Central sub-precinct;

Discovery Village sub-precinct;

(xii) Mixed use zone:

(A) Magnetic Island villages precinct:

Nelly Bay sub-precinct;

Picnic Bay sub-precinct;

Horseshoe Bay sub-precinct;

(B) Nelly Bay gateway precinct;

(C) Arcadia Central precinct;

(D) Kirwan Traders precinct;

(E) Charters Towers Road business precinct;

(F) CBD gateway precinct;

(G) South Townsville Railyards and Dean Park precinct;

(H) Wotton Street precinct;

(I) Breakwater precinct;

(J) King Street quarter precinct;

(K) King Road precinct;

(xiii) Sport and recreation zone:

(A) Balgal Beach golf course precinct;

(B) Cluden precinct;

(C) Lansdown motor sport facility precinct;

(xiv) Open space zone:

(A) Riverway precinct;

(xv) Community facilities zone:

(A) Picnic Bay community facilities precinct;

(xvi) Environmental management and conservation zone;

(xvii) Low impact industry zone:

(A) Nelly Bay low impact industry precinct;

(xviii) Medium impact industry zone:

(A) Roseneath medium impact industry precinct;

(xix) High impact industry zone:

(A) Lansdown high impact industry precinct;

(xx) Rural zone:

(A) Horticulture precinct;

(B) Mixed farming precinct;

(C) Grazing precinct;

(D) Cungulla precinct;

(E) Jensen precinct;

(xxi) Emerging community zone;

(A) Burdell precinct;

(xxii) Special purpose zone;

(g) the following overlays:

(i) Airport environs overlay;

(ii) Bushfire hazard overlay;

(iii) Coastal environment overlay;

(iv) Cultural heritage overlay;

(v) Extractive resources overlay;

(vi) Flood hazard overlay;

(vii) Landslide hazard overlay;

(viii) Natural assets overlay;

(ix) Water resource catchment overlay;

(h) the following development codes:

(i) Advertising devices code;

(ii) Healthy waters code;

(iii) Landscape code;

(iv) Reconfiguring a lot code;

(v) Telecommunications facilities and utilities code;

(vi) Transport impact, access and parking code;

(vii) Works code;

(i) the following other plans:

(i) Oonoonba development scheme; and

(ii) Townsville City Waterfront Priority Development Area;

(j) schedules and appendices.

(2) The following planning scheme policies support the planning scheme:

(a) SC6.1 Planning scheme policy index;

(b) SC6.2 Character residential planning scheme policy;

(c) SC6.3 Cultural heritage planning scheme policy;

(d) SC6.4 Development manual planning scheme policy;

(e) SC6.5 Economic impact assessment planning scheme policy;

(f) SC6.6 Emerging community planning scheme policy;

(g) SC6.7 Flood hazard planning scheme policy;

(h) SC6.8 Mitigating bushfire hazards planning scheme policy;

(i) SC6.9 Natural assets planning scheme policy;

(j) SC6.10 Parking rates planning scheme policy.

1.3 Interpretation

1.3.1 Definitions

(1) A term used in the planning scheme has the meaning assigned to that term by one of the following:

(a) the *Planning Act 2016* (the Act)

(b) the Planning Regulation 2017 (the Regulation)

(c) the definitions in Schedule 1 of the planning scheme

(d) the *Acts Interpretation Act 1954*

(e) the ordinary meaning where that term is not defined in any of the above.

(2) In the event a term has been assigned a meaning in more than one of the instruments listed in sub-section 1.3.1(1), the meaning contained in the instrument highest on the list will prevail.

(3) A reference in the planning scheme to any act includes any regulation or instrument made under it, and where amended or replaced, if the context permits, means the amended or replaced act.

(4) A reference in the planning scheme to a specific resource document or standard, means the latest version of the resource document or standard.

(5) A reference to a part, section, table or schedule is a reference to a part, section, table or schedule of the planning scheme.

Editor's note—In accordance with section 5(2)(a) of the Planning Regulation 2017, the regulated requirements apply to this planning scheme only where specifically identified as regulated requirements in the section containing the administrative definition for minor building work.

1.3.2 Standard drawings, maps, notes, editor's notes and footnotes

(1) Standard drawings contained in codes or schedules are part of the planning scheme.

(2) Maps provide information to support the outcomes and are part of the planning scheme.

(3) Notes are identified by the title 'note' and are part of the planning scheme.

(4) Editor's notes and footnotes are extrinsic material, as per the *Acts Interpretation Act 1954*, and are identified by the title 'editor's note' and 'footnote' and are provided to assist in the interpretation of the planning scheme; they do not have the force of law.

Note—This is an example of a note.

Editor's note—This is an example of an editor's note.

Footnote[1]—Footnote—This is an example of a footnote.

1.3.3 Punctuation

(1) A word followed by ';' or ', and' is considered to be 'and'

(2) A word followed by '; or' means either or both options can apply.

1.3.4 Zones for roads, closed roads, waterways and reclaimed land

(1) The following applies to a road, closed road, waterway or reclaimed land in the planning scheme area:

(a) if adjoined on both sides by land in the same zone—the road, waterway or reclaimed land is in the same zone as the adjoining land;

(b) if adjoined on one side by land in a zone and adjoined on the other side by land in another zone—the road, waterway or reclaimed land is in the same zone as the adjoining land when measured from a point equidistant from the adjoining boundaries;

(c) if the road, waterway or reclaimed land is adjoined on one side only by land in a zone—the entire waterway or reclaimed land is in the same zone as the adjoining land;

(d) if the road, waterway or reclaimed land is covered by a zone then that zone applies.

Editor's note—The boundaries of the local government area are described by the maps referred to within the *Local Government Regulation 2012*.

1.4 Categories of development

(1) The categories of development under the Act are:

(a) accepted development

Editor's note—A development approval is not required for development that is accepted development. Under section 44(6)(a) of the Act,

if a categorising instrument does not apply a category of development to a particular development, the development is accepted development. Schedule 7 of the Regulation also prescribes accepted development.

(b) assessable development

i. code assessment

ii. impact assessment

Editor's note—A development approval is required for assessable development. Schedules 9, 10 and 12 of the Regulation also prescribe assessable development..

(c) prohibited development

Editor's note—A development application may not be made for prohibited development. Schedule 10 of the Regulation prescribes prohibited development.

(2) The planning scheme also states the category of development for certain types of development, and specifies the category of assessment for assessable development in the planning scheme area in Part 5.

Editor's note—Section 43 of the Act identifies that a categorising instrument categorises development and specifies categories of assessment and may be a regulation or local categorising instrument. A local categorising instrument includes a planning scheme, a TLPI or a variation approval.

1.5 Hierarchy of assessment benchmarks

(1) Where there is inconsistency between provisions within the planning scheme, the following rules apply:

(a) relevant codes specified in schedules 6 and 10 of the Regulation prevail over all other components to the extent of the inconsistency;

(b) the strategic framework prevails over all other components to the extent of the inconsistency for impact assessment;

(c) overlays prevail over all other elements (other than the matters mentioned in (a) and (b)) to the extent of the inconsistency;

(d) zone codes prevail over use codes and other development codes to the extent of the inconsistency;

(e) provisions of Part 10 may override any of the above.

1.6 Building work regulated under the planning scheme

(1) Section 17(b) of the Regulation identifies that a local planning instrument must not be inconsistent with the effect of the building assessment provisions stated in the *Building Act 1975*.

(2) The building assessment provisions are listed in section 30 of the *Building Act 1975*.

Editor's note—The building assessment provisions are stated in section 30 of the *Building Act 1975* and are assessment benchmarks for the carrying out of building assessment work or building work that is accepted development subject to any requirements (see also section 31 of the *Building Act 1975*).

(3) This planning scheme, through Part 5, regulates building work in accordance with sections 32 and 33 of the *Building Act 1975.*

Editor's note—The *Building Act 1975* permits planning schemes to:

- regulate, for the *Building Code of Australia* (BCA) or the *Queensland Development Code (*QDC), matters prescribed under a regulation under the *Building Act 1975* (section 32). These include variations to provisions contained in parts MP1.1, MP1.2 and MP1.3 of the QDC such as heights of buildings related to obstruction and overshadowing, siting and design of buildings to provide visual privacy and adequate sight lines, on-site parking and outdoor living spaces. It may also regulate other matters, such as designating land liable to flooding, designating land as bushfire prone areas and transport noise corridors.
- deal with an aspect of, or matter related or incidental to building work prescribed under a regulation under section 32 of the *Building Act 1975*;
- specify alternative boundary clearances and site cover provisions for Class 1 and 10 structures under section 33 of the *Building Act 1975*.

Refer to Schedule 9 of the Regulation to determine assessable development, the type of assessment and any referrals applying to the building work.

(4) The building assessment provisions and designations in the planning scheme are contained in Table 1.6.1.

Table 1.6.1 Designations and Building assessment provisions in the planning scheme for the purpose for the *Building Act 1975*:

Description of designation and Building assessment provisions	Planning Scheme Part	*Building Act 1975* (BA), *Building Regulation* (BR) *2006* or *Queensland Development Code* (QDC) Reference
Bushfire Prone Areas		
Designated bushfire prone area	Schedule 2 – Development constraints overlay map OM-02 (Bushfire hazard)	Section 32(a) BA and section 12 BR; QDC MP 2.4 – Construction in Bushfire Prone Areas; and AS 3959-2009
Flood hazard **Note-** In accordance with section 13 (2) of the *Building Regulation 2006*, the following designation is made under section 13 of the *Building Regulation 2006* for the Flood hazard area in the Townsville City Plan (planning scheme).		
Flood hazard area **Note-** In accordance with section 13 (4) of the *Building Regulation 2006*, the Flood hazard area was designated on 27 October 2014.	Schedule 2 – Development constraints overlay map OM-06.1 and OM-06.2 (Flood hazard)	Section 32(a) BA and section 13(1)(a) BR; and QDC MP 3.5 – Construction of buildings in flood hazard areas
Defined flood level (DFL)	Schedule 1, Table SC1.2.2 Administrative Definitions "defined flood level' and Table 8.2.6.3(a) Flood overlay code, Editor's Note, PO1 and PO4	Section 32(a) BA and section 13(1)(b)(i) BR; and QDC MP 3.5 – Construction of buildings in flood hazard areas
The finished floor level of class 1 buildings built in all or part of the flood hazard area	Table 8.2.6.3(a) Flood hazard overlay code	Section 32(a) BA and section 13(1)(b)(v) BR; and QDC MP 3.5 – Construction of buildings in flood hazard areas
Transport Noise Corridors		
Designated Transport Noise Corridor (State Controlled Road and railway land) **Editor's note**-for the purposes of the *Building Act 1975* and application of the *Queensland Development Code* in relation to declaration of local government transport noise corridors, the planning scheme has not declared such transport noise corridors.	Schedule 2 – Infrastructure overlay map OM-10 (Noise corridors)	Section 246Z and s246ZA(3) BA; Section 32(b) BA; and QDC MP 4.4 – Buildings in a transport noise corridor
Character Residential Zone		
Building assessment provisions – regulated building work in accordance with sections 32 and 33 of the *Building Act 1975*	Character Residential Zone **Editor's note**—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the *Queensland Development Code* (MP 1.1, MP 1.2 and MP1.3) , for the purposes of section 33 of the *Building Act 1975* .	Sections 32 and 33 BA

Editor's note—A decision in relation to building work that is assessable development under the planning scheme can only be issued as a preliminary approval. See section 83(b) of the *Building Act 1975*.

Editor's note—In a development application, the applicant may request preliminary approval for building work. The decision on that development application can also be taken to be a referral agency's response under section 56 of the Act, for building work assessable against the *Building Act 1975*. The decision notice must state this.

1.7 Local government administrative matters

1.7.1 Declared Mall

(1) A Declared Mall, under section 80A of the *Local Government Act 2009*, exists in the Townsville Local Government Area. The Declared Mall was established by council resolution on 9 June 2011. The Declared

Mall is established on Stokes Street, between Flinders Street and Ogden Street.

1.7.2 Declared locality and building form for amenity and aesthetic referral agency assessment

For the purpose of Schedule 9, of the Planning Regulation, building work for a building or structure which is a single detached class 1(a)(i) building, class 1(a)(ii) building comprising not more than 2 attached dwellings or a class 10 building or structure in a locality identified in Table 1.7.2 that does not comply with the relevant QDC acceptable solutions or the acceptable outcomes in the codes identified in Table 1.7.2, is declared to:

(a) have an extremely adverse effect on the amenity or likely amenity of the locality; or

(b) be in extreme conflict with the character of the locality

1.7.2 Declared locality and building form for amenity and aesthetic referral agency assessment

Locality	Codes
Land in the Character residential zone	Character residential zone code
Land in the Flood hazard overlay	Flood hazard overlay code
Land in the Coastal protection overlay	Coastal hazard protection overlay code
Land in the Cultural heritage overlay	Cultural heritage overlay code

Part 2 State planning provisions

2.1 State planning policy

The Minister has identified that the state planning policy July 2014 is integrated in the planning scheme in the following ways:

State interests in the state planning policy appropriately integrated
All

State interests in the state planning policy not integrated
None

State interests in the state planning policy not relevant to Townsville City Council
None

Editor's note–In accordance with section 8(4)(a) of the Act the State Planning Policy applies to the extent of any inconsistency.

2.2 Regional plan

There was no regional plan relevant to the planning scheme area on commencement of the planning scheme.

Editor's note–Schedule 1 of the Regulation identifies the North Queensland region which was declared 8 July 2016.

2.3 Referral agency delegations

Schedule 10 of the Regulation identifies referral agencies for certain aspects of development. The following referral agencies have delegated the following referral agency jurisdictions to Townsville City Council:

Table 2.3.1 - Delegated referral agency jurisdictions

Column 1 **Application involving**	**Column 2** **Referral agency and type**	**Column 3** **Referral jurisdiction**
None	None	None

Editor's note—For the above listed referral agency delegations the applicant is not required to refer the application to the referral agency listed under Schedule 10 of the Regulation because the local government will undertake this assessment role.

2.4 Regulated requirements

The following regulated requirements prescribed in the Planning Regulation 2017 dated 3 July 2017 are appropriately reflected in the planning scheme.

- Administrative definition for Minor Building Work

Editor's note—Otherwise the planning scheme complies with QPPV 4 and does not apply any other aspects of the regulated requirements.

Part 3 Strategic framework

3.1 Preliminary

(1) The strategic framework sets the policy direction for the planning scheme and forms the basis for ensuring appropriate development occurs within the planning scheme area for the life of the planning scheme.

(2) Mapping for the strategic framework is included in Part 3 and Schedule 2.

(3) For the purpose of describing policy direction for the planning scheme, the strategic framework is structured in the following way:

- (a) the strategic intent;
- (b) the following four themes that collectively represent the policy intent of the scheme:
  - (i) Shaping Townsville;
  - (ii) Strong, connected community;
  - (iii) Environmentally sustainable future;
  - (iv) Sustaining economic growth;
- (c) the strategic outcomes proposed for development in the planning scheme area for each theme;
- (d) the elements that refine and further describe the strategic outcomes;
- (e) the specific outcomes sought for each, or a number of, elements;
- (f) the land use strategies for achieving these outcomes.

(4) Although each theme has its own section, the strategic framework in its entirety represents the policy intent for the planning scheme.

Editor's note—The planning scheme has adopted a 25-year planning horizon. However, the planning scheme itself (as a statutory document) is likely to have an operational life of up to 10 years before it is substantively reviewed.

3.2 Strategic intent

3.2.1 Townsville today

Townsville is on the cusp of significant growth and change. It is already the largest city in Queensland outside the south-east. Its population of around 190,000 in 2011 is set to grow to between 270,000 and 300,000 people by 2031.

Townsville is the major economic and service centre for North Queensland. It is the primary port and freight hub, particularly for the agricultural areas of the surrounding region and for the North West minerals province. It provides the highest order community and commercial services for the region, including health and education facilities which serve the whole of North and North West Queensland. As a consequence of its strategic regional position, Townsville enjoys a diverse economic base, with strong projected growth (Figure 3.1 – Regional context plan).

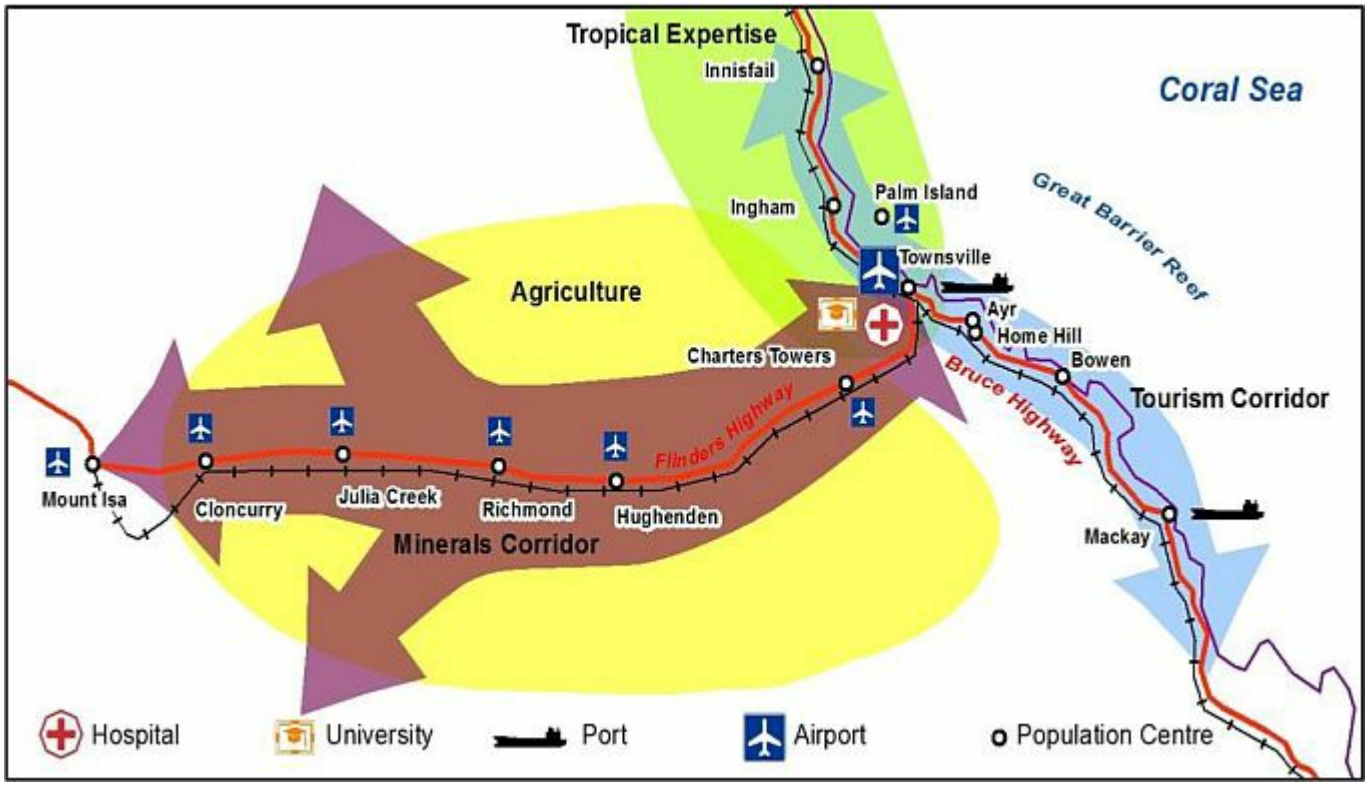


Figure 3.1 – Regional context plan

Townsville is a bioregional junction for the Wet Tropics, Brigalow Belt and Einsleigh Uplands bioregions. In addition, the region includes the UNESCO World Heritage-listed Great Barrier Reef and Wet Tropics as well as the Ramsar-listed Bowling Green Bay wetlands. Townsville's geographic location, tropical climate and unique environmental features are part of what makes Townsville a great place to live and underpins the region's economy.

3.2.2 A second capital for Queensland

Townsville will continue to evolve as the second capital of Queensland and the largest city in Northern Australia. Statewide growth, a focus on regional development and the potential for decentralisation policies will contribute to the city's increasing significance.

This enhanced role is reflected in significant growth in the city's economy, population and cultural status. Planning, new development and infrastructure investment are part of this evolution.

The increasing sustainability of the city and the protection of its natural assets will be key hallmarks of Townsville's growth and development.

3.2.3 Strong and connected community

As the Townsville Community Plan explains, a strong and connected community is cohesive even when people come from diverse backgrounds and abilities. It is a community that is safe and feels safe, enjoys sport and recreation activities, has a say in decision making including planning, and has pride in its culture and lifestyle.

Development, including buildings, streets and public spaces will be well-designed and contribute to the creation of exceptional places within the city. High-quality public spaces will be created to optimise community interaction. Good design also means places will feel safe.

Townsville's open space network will meet the community's needs and integrate with the natural landscape without compromising environmental and hydrological values. An emphasis on co-location and consolidation of sports and community activities will be followed, to best utilise resources.

Magnetic Island, Castle Hill, Mount Stuart, Mount Louisa, Mount Elliot, the Pinnacles, Cape Pallarenda, the Town Common and Cape Cleveland are some of the best known natural features of Townsville. The scenic amenity of such places is to be maintained.

The many small townships around Townsville, including Magnetic Island, Paluma and the beach communities north of

Black River, continue to be enjoyed and appreciated for their special attributes. Substantial changes to the function, scale and character of these communities are not anticipated.

3.2.4 Environmentally sustainable future

Townsville is a biodiverse city with unique tropical landscapes and interconnected areas of high environmental significance. Townsville has some internationally recognised iconic environmental features such as the Great Barrier Reef (including, significantly, Magnetic Island) and Wet Tropics UNESCO World Heritage-listed areas and the Bowling Green Bay Ramsar wetlands as well as national, state and regionally significant environmental features.

Natural areas also underpin Townsville's character and identity and provide the basis for its economic prosperity. Significant landscape values are associated with the coast, the islands, rural areas and elevated, vegetated mountains and ranges. The urban area is defined by prominent natural landscape features such as Castle Hill, Mount Louisa, Mount Stuart, the Town Common, the coastline and the Ross River and Bohle River corridors.

An environmentally sustainable future requires strong and connected biological communities and fully functioning ecological processes. This will provide for a more robust and resilient landscape capable of withstanding minor and even extreme natural disturbances.

New development, including the growth of the city broadly, will protect the integrity of these natural assets and environmental values. The shape of the city has been determined in part to avoid expansion into sensitive and vulnerable areas and corridors.

The significant ecological, landscape and recreation values of Magnetic Island will be protected, including:

- the bold and dramatic landscape of rocky headlands and vegetated ridges;
- the secluded and natural sandy beaches;
- the natural character of the settled bays created by unbroken tree canopies and prominent fringe of coastal vegetation;
- the environmental parks and reserves, including the nationally significant Magnetic Island National Park and foreshore reserves such as Picnic Bay, Nelly Bay, Alma Bay, Geoffrey Bay and Horseshoe Bay;
- the high-value habitats, sensitive marine environments, including the fringing reef and middle reef; and
- the World Heritage values of the Great Barrier Reef.

Fragmentation, loss of habitat and other impacts of development (for example on hydrological regimes, water quality and spread of pest species), will be avoided. In areas where development is intended to occur, impacts will be minimised and mitigated. The ecosystem services provided by these natural assets and their importance in building resilience to the impacts of climate change are recognised and are to be protected.

Exposure of communities to natural hazards, such as bushfire, landslide, flood and coastal risks such as storm surge and sea level rise, will be avoided wherever possible.

3.2.5 Shaping Townsville

To house Townsville's growing population, about 45,000 new homes will be needed over the next 25 years. New and expanded workplaces, shops and all the other activities associated with modern life will be needed in equal measure. This growth needs to be accommodated in a sustainable city form and through the creation of a series of great places within the city.

As the population grows so will its makeup change. Average ages are increasing and the typical household is reducing in size. By 2031, couple-only families are expected to be the dominant household type in Townsville. These changes mean that more housing options are needed in the future. There is also a need to facilitate affordable housing types in locations that support affordable living.

Whether traditional detached homes, inner city apartments or something in between, choice is needed to provide the lifestyle options that residents expect in a capital city, as well as options that everyone can afford. While detached houses will continue to be the most common housing option in Townsville's new and existing areas, about one third of new dwellings need to be smaller and in the form of townhouses or apartments, in order to meet these overall community needs, preferences and budgets.

A cornerstone of Townsville's evolution will be the revitalisation of the central business district (CBD) into a more vibrant and cosmopolitan place. The CBD will re-establish itself as the heart of the city, and attract the greatest investment in a diverse range of city uses, including residential. The CBD will be a great destination for the community and visitors.

The emphasis on the CBD as the city's principal centre is part of a broader strategy to make Townsville a more compact city, structured around a network of activity centres. Major centres at Aitkenvale, Thuringowa Central and Hyde Park, and new centres at Burdell and Julago, will be economic and community hubs. Over time, mixed use development within these centres will broaden their function beyond shopping to become great places to live, work, access services and recreate. New infill residential development will underpin these changes, comprising about a fifth of the city's residential growth to 2031. Similar changes at smaller scales – in keeping with an established activity centres hierarchy - will be promoted at other district, local and neighbourhood centres around the city.

All these changes will help sustain an enhanced public and active (walking and cycling) transport network over time. In particular, Ross River Road will become an initial focus for public transport linking the CBD, Aitkenvale and Thuringowa Central major centres and the James Cook University-Townsville Hospital precinct.

Inner urban lifestyles and sustainable built forms will be supported by green spaces and public places in the city's activity centres. Wherever possible, these spaces will connect with the wider open space network.

New communities at Burdell, Shaw, Cosgrove and Julago will emerge within the designated urban areas of Townsville. These places will be well-connected to the rest of the city and will boast ample local services and jobs, while protecting important natural assets.

A large majority of residential growth will continue to be implemented through greenfield development. Similar to infill areas, a mix of dwelling types will be provided in greenfield developments to meet existing and future community needs.

This planning scheme designates sufficient land supply for future greenfield development, well beyond the requirements of the next few decades. The city will not grow outwards beyond the areas designated in the foreseeable future. This will avoid further encroachment on natural assets and vulnerable coastal areas. The focus on infill development and major greenfield communities will also concentrate infrastructure investment, costing less than continued outwards growth in many directions. The Local Government infrastructure plan (Part 4) is based on this approach. Overall, this will help support a more sustainable Townsville.

Similarly, substantial lands have been allocated for rural residential development. Rural residential areas provide for semi-rural lifestyles, but no additional land for rural residential development beyond what is allocated in this planning scheme is intended.

Older suburbs will not experience substantial change. However, some new housing options in accessible locations are intended, allowing residents to continue to live in their neighbourhood as they age or their housing needs change.

The particular character of special neighbourhoods will remain identifiable and intact. Places of indigenous and non-indigenous cultural heritage are also protected.

The shape of the city will be such that an effective public transport system, focussed on the CBD and activity centres, can be achieved. Greater transport choice, beyond solely the car, is a goal of this planning scheme. Walking and cycling options will be enhanced through new development and new infrastructure investment. National, state and regional road, rail, sea and air freight networks are also identified, their prospects enhanced, and their future use protected from incompatible development.

3.2.6 Sustaining economic growth

Townsville has a diverse and healthy economy. This is driven by population growth, by the traditionally strong defence, port and transport sectors and by Townsville's regional position as the capital of North Queensland and transport hub for the North West minerals province and North Queensland agricultural sector.

Strategic transport links, a skilled workforce and an attractive lifestyle, the metals manufacturing cluster and the presence of major institutions creating capacity for a knowledge-based economy, all provide Townsville's primary

competitive strengths. Revitalisation of the CBD, and improving links between key economic precincts in the city, are also important opportunities to attract investment. The importance of the city's natural environment and attractive lifestyle in underpinning its attractiveness to business investment is also recognised.

Growth is anticipated in transport, storage and logistics industries, manufacturing (metals, food and beverage), defence, the knowledge economy (including education and research), the aviation industry, health, professional services, building and building supplies and tourism. Further economic growth in these and other sectors is required to maintain quality of life for the city's residents. About 50,000 new jobs are required by 2031.

Townsville's key productive precincts needed to accommodate much of this growth include:

- the CBD;
- Port of Townsville, Stuart industrial precinct and Townsville State Development Area;
- James Cook University-Townsville Hospital;
- Lavarack Barracks and other Department of Defence landholdings;
- Townsville Airport and RAAF Base Townsville; and
- Thuringowa Central, Aitkenvale and Hyde Park major centres.

In planning for industrial land, twin strategies are being pursued. Consolidation is promoted in existing industrial areas like Shaw Road and Garbutt, while new land is also made available for industrial development at the Townsville Airport, Roseneath, Lansdown and the Townsville State Development Area. The significance and potential of the Townsville State Development Area is recognised. Industrial land is a valuable resource and is to be used for industrial purposes.

Industrial land, including potential future land resources at the Bohle Plains, Department of Defence landholdings and key infrastructure corridors and facilities are to be protected from encroachment of sensitive activities.

Rural, extractive and other natural resources are also recognised as important contributors to Townsville's economy. Their continued viability is ensured and their orderly development managed.

Tourism is also a major part of the regional economy, including nature-based and eco-tourism in key tourism areas at Magnetic Island, and at a smaller scale in Paluma, Rollingstone, Balgal Beach, Toomulla, Toolakea and Saunders Beach. The CBD remains a major focus for tourism activities and infrastructure.

3.3 Theme - Shaping Townsville

Editor's note—What did the Townsville Community Plan 2011-2021 say about *Shaping Townsville*?
Our city will meet the diverse and changing infrastructure and service needs of the community.
Five guiding principles were also set out:

- *A vibrant, sustainable, connected urban form: creating places that provide for a great lifestyle.*
- *Preserve and enhance Townsville's heritage and character: the traditional character, identity and heritage of the city is retained, enhanced or complemented by development.*
- *A lively, diverse and connected city centre: Townsville's CBD will be recognised as Townsville's heart bustling with activity and creativity.*
- *Effective and adequate public infrastructure: the effective design and timely provision of adequate infrastructure will allow a growing population to enjoy a great lifestyle.*
- *Well-connected Townsville: the provision of infrastructure such as public transport, roads, walking and bike paths, communications and digital networks enables access for all in our community.*

3.3.1 Strategic outcome

(1) This planning scheme allocates land for housing, business and community uses, sufficient to meet Townsville's needs for at least 25 years.

(2) The shape of the city becomes more compact and efficient, led by intensified development in and around the principal centre (CBD) and the major activity centres at Aitkenvale, Thuringowa Central and Hyde Park. This makes public transport, walking and cycling more convenient and viable, and supports investment in community facilities and other infrastructure.

(3) A range of housing and lifestyle choices, including affordable and social housing choices, is provided in accessible and affordable locations.

(4) Limited areas for rural residential lifestyles provide residents with a semi-rural living option. These areas do not

create conflicts with other rural uses, extractive industry operations or natural assets and environmental values, and do not expand further.

(5) Townsville has areas of special residential character derived primarily from their architecture. Character residential areas are identified in which character is maintained by retaining character houses and ensuring sensitive redevelopment within these streetscapes.

(6) The special character and scenic and environmental values of Magnetic Island and the small townships of Paluma and the northern beaches (Rollingstone, Balgal Beach, Toomulla, Toolakea and Saunders Beach) are protected. These townships do not expand or accommodate any significant additional growth.

(7) The history of Townsville and its people make a major contribution to the identity of the city and its communities. The cultural heritage of Townsville is conserved for the present and future Townsville communities.

(8) The city is structured around a network of activity centres, ranging from the principal centre (CBD) to small neighbourhood centres. These activity centres are focal points for the city and its community. They accommodate the majority of future employment, community and commercial activities. Activity centres are also the focus for transport systems.

(9) A hierarchy of activity centres exists to ensure that the scale and form of development is appropriate to the location, and that the centre plays an appropriate role within the wider city. The hierarchy contributes to an efficient, well-functioning and accessible city. While the scale and form of activity centres varies, all activity centres are founded on a mix of land uses, and are supported by residential areas that enhance each centre's viability.

(10) Efficient, reliable and safe passenger and freight transport networks are provided to support the city's population and economic growth.

(11) Infrastructure and community services are provided in an efficient way and at a standard that best meets community and environmental requirements.

3.3.2 Element - City shape and housing

3.3.2.1 Specific outcomes

City shape and urban containment

(1) The growth of Townsville will occur within the city's existing urban and rural residential areas, and in areas identified for urban expansion through the Emerging community zone. Urban and rural residential development does not occur outside land identified for these purposes.

(2) On the edges of the urban area, urban uses are adequately buffered from nearby rural land and natural assets so that the productive use of rural land and ecological and biophysical processes and values are not compromised.

Infill development

Editor's note—The term "infill" refers to development within existing built up areas that generally involves higher density forms of housing.

(3) Locations for significant infill development include the principal centre (CBD) and surrounds, North Ward, and in and around the Aitkenvale, Thuringowa Central and Hyde Park major centres. This infill development will have a focus on "place making" and enhancement of the public realm. These areas will boast a wide range of housing choices, taking advantage of nearby amenities and existing or planned public transport, and creating more compact, walkable and vibrant urban neighbourhoods.

(4) Development in and around the principal centre (CBD) provides for a highly desirable inner city lifestyle. The highest and most intensive built form is focussed on the centre, framed by high-medium rise buildings. View corridors to Castle Hill along roads are maintained and access to and along Ross Creek and The Strand is maximised (Figure 3.2 – CBD and environs strategy plan).

Click here to view PDF high resolution map.

Figure 3.2 - CBD and environs strategy plan

(5) Development in North Ward facilitates medium density residential choices within a high amenity environment. Development is primarily focussed on walkable, mixed use village nodes, with a pedestrian-friendly, active frontage along The Strand. Built form reinforces gateway corridors along Gregory and Landsborough Streets, but does not intensify uses in areas subject to likely flooding or storm surge risk. Buildings exceeding 5 storeys in height do not occur in the Medium density residential zone fronting The Strand. Open space and strong visual connections are maintained between Castle Hill and The Strand (Figure 3.3 – North Ward strategy plan).

Click here to view PDF high resolution map.

Figure 3.3 - North Ward strategy plan

(6) Development in and around the Aitkenvale, Thuringowa Central and Hyde Park major centres assists in the evolution of vibrant urban neighbourhoods. A mix of uses is established within the centres and surrounding neighbourhoods are well-connected and integrated with the centres. A strong and positive sense of place is created by the establishment of active main street environments, more outward-oriented, street-focussed shopping centres and a boulevard-like streetscape along the major roads. Medium density residential uses increasingly occur within the centres and in the precincts surrounding them. Accessibility by walking, cycling and public transport is maximised (Figure 3.4 – Aitkenvale strategy plan, Figure 3.5 – Thuringowa Central strategy plan and Figure 3.6 – Hyde Park strategy plan).

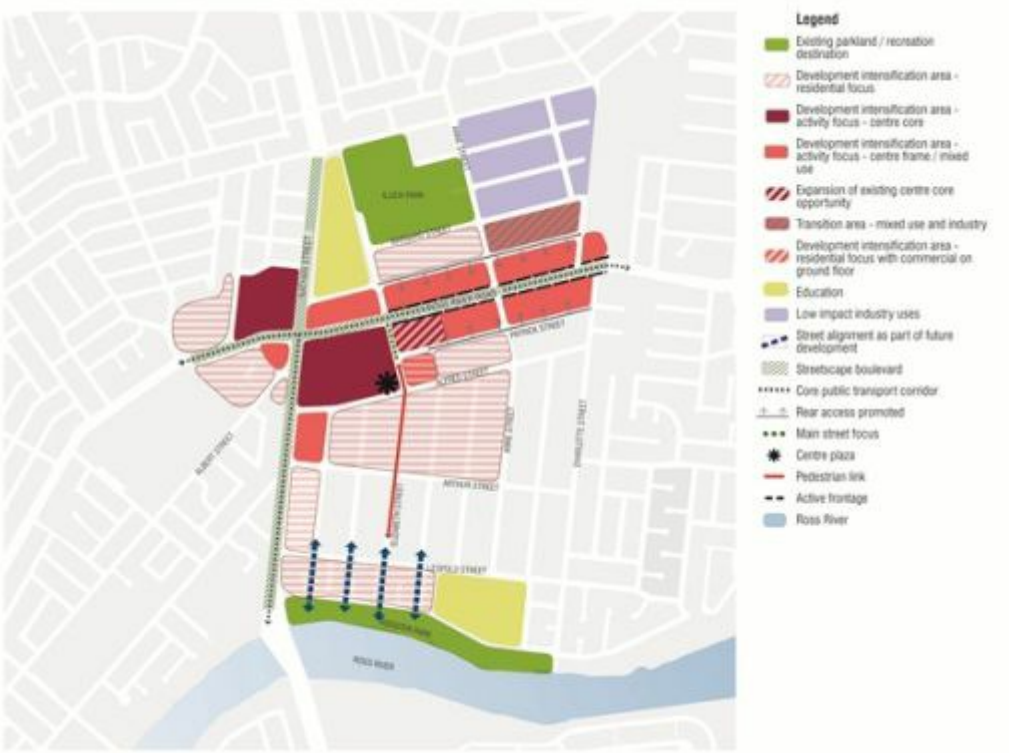


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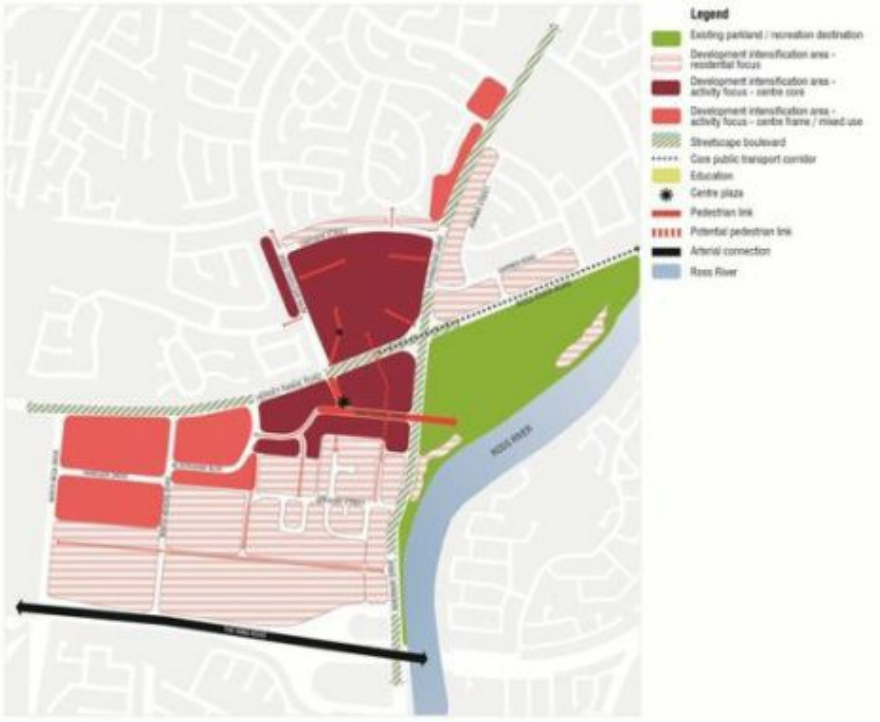
Figure 3.4 - Aitkenvale strategy plan



Click here to view PDF high resolution map.

Figure 3.5 - Thuringowa Central strategy plan

Click here to view PDF high resolution map.

Figure 3.6 - Hyde Park strategy plan

(7) Outside the identified focus areas for infill development, smaller scale opportunities for greater housing choice (such as housing on smaller lots, townhouses, housing for the aged) are generally limited to locations near shops, community facilities or major streets, and avoiding Character residential zoned areas.

(8) Design of neighbourhoods, streets and buildings is appropriate for Townsville's tropical climate and facilitates sustainable built forms. Infill development is well-integrated with existing communities, infrastructure and open space.

(9) The scale of buildings is well-matched to the size of lots, allowing for primary orientation of buildings to the street and provision of open space at ground level that is appropriate to the character of the neighbourhood.

Greenfield developments

Editor's note—The term "greenfield" refers to development areas that have not previously been used for urban purposes.

(10) Greenfield developments use land and infrastructure efficiently. They accommodate a net residential density of at least 15 dwellings per hectare of land, achieved through a mix of lot sizes and house types, such as detached houses and dual occupancies, units, apartments and townhouses in appropriate locations.

(11) Greenfield developments are designed to be well-connected and easy to get around, both within their boundaries and to the rest of the city. They are planned to support sustainable lifestyles, including pedestrian and cycle transport.

(12) Design of greenfield developments will also:

- (a) provide attractive streets;
- (b) be climate responsive and sustainable;
- (c) protect significant natural assets and ecological and biophysical processes;
- (d) protect significant landscape features and areas of high scenic value;
- (e) avoid natural hazards;
- (f) provide residents with convenient and functional parks, community facilities and activity centres; and
- (g) have their own recognisable character.

Island, Beach and mountain townships

(13) Townsville's northern beach and mountain townships (Paluma, Rollingstone, Balgal Beach, Toomulla, Toolakea and Saunders Beach) do not accommodate any significant additional growth and do not expand beyond current zoned land. Urban and rural residential development is subordinate to the natural character of the townships and respects and maintains the low-rise, village character and scale.

(14) While some short-term, low-density, eco-tourism style accommodation may occur, the special character and

scenic and environmental values of these areas is protected.

(15) No further growth is anticipated in the southern beach communities of Cungulla and Cleveland Palms, which are constrained by coastal processes, the impacts of nearby extractive resources and lack of services.

(16) The character of Townsville's small communities is reflected in the small-scale, tropical architectural design elements and landscaped setting.

(17) Residential and tourist accommodation is subordinate to the conservation values on Magnetic Island. Bayside settlements at Picnic, Nelly and Horseshoe Bays and Arcadia do not expand beyond their current extent. Within these areas, a variety of housing types is provided for residents and tourists, including detached housing, low-rise multiple dwellings and accommodation buildings.

(18) Each village on Magnetic Island retains its role and sense of identity:

(a) Nelly Bay – will continue to serve as the primary service centre and gateway to the island, with tourist accommodation and centre facilities;

(b) Arcadia – will continue to serve as a predominantly residential area, with access to its own local shops, a new community hub, and some small-scale tourism accommodation;

(c) Picnic Bay – will continue to serve as a predominantly residential area, with access to its own local shops, a new community hub, and some small-scale tourism accommodation; and

(d) Horseshoe Bay – will continue to be a predominantly residential community, with some small-scale tourism accommodation and activities.

3.3.2.2 Land use strategies

Zoning designations closely reflect the strategic intentions regarding the extent of urban growth. Development outside these areas will not be supported.

Major greenfield areas are included in the Emerging community zone to facilitate master planning and orderly development in accordance with best practice neighbourhood planning principles for accessibility, density, land use mix, street networks and lot configuration.

Council will monitor the supply of new land for residential development to ensure at least 10 years' land supply is available and to prevent land supply placing any pressure on housing affordability.

The residential and centre zones reflect intentions for development at a range of densities. The Medium density residential and High density residential zones accommodate the city's key areas for infill development. Within these areas development is desired to capitalise on the proximity to activity centres, public transport and amenity attractors.

The Rural residential zone is used to precisely designate these areas, and the appropriate nature and intensity of development within them.

Rural residential areas

(19) Rural residential areas provide for semi-rural lifestyles in which the primary use of properties is residential, but some, generally domestic scale, rural uses occur. Activities that would significantly disrupt the amenity of these areas are not intended to occur.

(20) New rural residential development does not occur beyond those areas zoned for rural residential purposes.

(21) Rural residential development maintains the character of the area and minimises any intensification of impacts on water quality or nearby natural assets, ecological and biophysical processes, or other natural resources. Minimum lot sizes reflect the capacity of the land to assimilate the wastes produced by residents.

(22) On the edges of rural residential areas, residential uses are buffered from nearby rural land and natural assets so that the productive use of rural land and ecological and biophysical processes and values are not compromised.

(23) Rural residential areas do not offer the full range of urban services. Except in locations where sewer and water are or can be connected, new development establishes adequate on-site servicing at a standard that will not detract from neighbours' amenity, water quality or the quality of the local environment.

3.3.3 Element - Character and heritage

3.3.3.1 Specific outcomes

Character residential areas

(1) Townsville city contains a collection of character residential areas with different elements of importance. Common to all of these areas are:

(a) consistency in building and architectural style within a particular street or precinct of character significance; or

(b) built forms that are reflective of a period of pre-war or post-war change in Townsville.

(2) Identified character areas are protected. In these areas, contributing character buildings are retained.

(3) New development or additions and renovations to contributing character buildings within character areas are consistent with the established character in these areas, complementing traditional building elements and the scale of existing development.

Cultural heritage

(4) Development on or near places of cultural heritage significance facilitates their active use but does not detract from their heritage significance and setting, including significant views to the place.

(5) Places that have cultural heritage significance to Aboriginal or Torres Strait Islander peoples are protected. Consistent with the provisions of the *Aboriginal Cultural Heritage Act 2003*, development will take all reasonable and practicable measures to ensure Aboriginal cultural heritage is not harmed.

3.3.3.2 Land use strategies

The planning scheme establishes a Character residential zone and Cultural heritage overlay which are devised to protect character areas and heritage places.

Places of indigenous cultural heritage are acknowledged and respected by this planning scheme, but are primarily protected by other legislation.

Council recognises that the city's natural assets are likely to contain places and attributes of cultural significance to Indigenous Australians.

3.3.4 Element - Activity centres

3.3.4.1 Specific outcomes

Nature of centres

(1) A broad range of uses are encouraged at activity centres, appropriate to the identified hierarchy, to support vibrancy, community life and health and economic development and competition. Day and night-time activity is expected in Townsville's larger, higher level activity centres: CBD, Aitkenvale, Thuringowa Central, Hyde Park and future centres at Julago and Burdell. Residential development is also promoted in activity centres, in a form and density appropriate to the scale of the centre.

Editor's note—The future major centre at Burdell is planned within the North Shore emerging community area.

(2) An activity centre contains a mix of uses and is multi-functional. While the dominant building in activity centres is often a shopping centre, a shopping centre alone does not make an activity centre.

(3) The planning scheme adopts a hierarchy for activity centres in Townsville, the purpose of which is to ensure optimum access to employment, services and facilities across the city, including public transport services, to support the efficient provision of infrastructure and to optimise public investment.

(4) The hierarchy is made up of:

(a) the principal centre (CBD);

(b) major centres;

(c) district centres;

(d) local centres;

(e) neighbourhood centres; and

(f) specialised centres.

Editor's note—Townsville's hierarchy of activity centres is indicated on Strategic Framework Map SFM-002. Local and neighbourhood activity centres are numerous and are not depicted on the map. They are identified through zoning.

(5) Centres in newly developing areas expand commensurate with population growth in their primary catchments. While over the 25-year planning horizon of this planning scheme they may be expected to grow to a particular level in the hierarchy, they are not to perform at this level prematurely.

(6) Development of retail and office activities occurs within the identified activity centres and mixed use areas. These activities do not locate in an out-of-centre location, except where specifically intended in a particular zone or precinct.

(7) Showrooms and retail-based hardware stores are also located within the identified activity centres or mixed use areas. Their design and layout facilitates integration with other centre activities.

Principal centre - Townsville CBD

(8) The principal centre is the Townsville CBD. This is the largest and most important activity centre in North Queensland. It accommodates the greatest extent of administrative, civic, cultural, commercial, retail, tourism and education facilities in Townsville, providing local, city and regional functions.

(9) The principal centre (CBD) provides the greatest diversity in employment and business opportunities, is a focus for public transport and offers the highest density housing choices in the city.

(10) The principal centre (CBD) strengthens its position as the heart of Townsville by expanding its retail functions, developing an identifiable and attractive community heart and major meeting place, and increasing its variety of cultural and entertainment activities. It is also strengthened by the establishment of a public realm that is unique and is an exemplar of successful placemaking.

(11) Uses in the principal centre (CBD) include:

(a) major office developments, including offices forming part of mixed use developments;

(b) the highest order retail functions, including a department store as a signature development;

(c) convenience and boutique retailing for the CBD's workforce, residents and visitors;

(d) dining and entertainment;

(e) additional higher education or training facilities;

(f) tourist accommodation, activities and services; and

(g) in-centre, high density residential accommodation.

(12) Any additional department store in Townsville is to be located in the principal centre (CBD) and not in any other centre.

(13) Major strategic facilities such as a sports stadium, entertainment or convention centre which may be needed during the 25-year planning horizon of the planning scheme are located adjacent to the city centre. The South Townsville Railyards and Dean Street precinct is a preferred location.

Major centres - Aitkenvale, Thuringowa Central, Hyde Park, Burdell (future) and Julago (future)

(14) Major centres in Townsville support but do not undermine the role of the principal centre (CBD), offering diverse business, employment and residential opportunities. These activity centres are accessible to broad catchment areas across the city, offering higher-order shopping and commerce, entertainment, health, education and community facilities, as well as higher density housing choices. They are well serviced by public and active transport networks and increasingly offer active, pedestrian-focussed street level environments.

(15) **Aitkenvale** and **Thuringowa Central** major centres have a broad range of uses and increased vibrancy as community hubs. Integration and connectivity within the centres is improved. The centres contain an array of higher order retailing, with a broad range of commercial, community, cultural and entertainment services. Medium density housing is encouraged as an integrated component of development within the centres. Housing includes student and visitor accommodation to reinforce links with James Cook University and Townsville Hospital.

(16) **Hyde Park** major centre evolves to become a unique and high amenity centre which takes advantage of the amenity potential of adjoining lakes and open space areas. Increased diversity of activity within the centre is encouraged, including integrated medium density residential components. Retail activities are consolidated.

(17) Future major centres at **Burdell** and **Julago** accommodate a broad range of uses in an integrated, street-based format. They provide the main focal point for their respective communities. Ultimately the Burdell and Julago centres will include a diverse range of commercial and community facilities together with community meeting places and recreational facilities. Uses in the centre promote local employment and higher density residential development.

(18) The centres are well-connected to the surrounding community, maximising accessibility by walking, cycling and public transport.

(19) A new department store is not to be located within any of the existing or future major centres.

District centres - Idalia, Deeragun, Rasmussen, Annandale and Shaw (future)

Editor's note—The future district centre at Shaw is planned within the Greater Ascot emerging community area.

(20) District centres provide a mix of activities and services that cater for the weekly and fortnightly needs of surrounding communities. Generally they do not attract people from beyond the district. They contain a diversity of commercial, community and entertainment-related uses, with supermarket-based retailing. They may also include medium density housing.

(21) The **Idalia** district centre services the south-eastern suburbs, the Stuart industrial area and highway traffic. Its primary focus is in bulky goods retailing and service industries, with minor growth in traditional retailing, including supermarket shopping. This centre will become the second major bulky goods showroom development within Townsville (in addition to Domain Central), and will serve the south-eastern suburbs of Townsville.

(22) **Deeragun** district centre becomes a more consolidated centre, with improved integration and connections. More non-retail uses including commercial and medical offices, tavern or casual dining uses are anticipated. Small retail showrooms may also be accommodated. Further outward expansion of the centre or the establishment of additional supermarkets does not occur.

(23) Further development in the **Rasmussen** district centre accentuates the district role of this centre, and includes a mix of local commercial premises and community services.

(24) **Annandale** district centre serves as the main activity centre for Lavarack Barracks and remains a predominantly retail centre, with a range of supporting commercial services. Only limited expansion of this centre occurs.

(25) A new district level centre is also to be established at **Shaw** during the next 25 years. However, within the next 10 years, the centre develops only to a local centre role.

Local and neighbourhood centres

(26) Local centres are convenience-oriented centres focused on a full-line supermarket and complementary and ancillary activities servicing the needs of surrounding communities. New local centres will be established commensurate with the growth of new communities at Julago, Cosgrove and Mount Low (the latter to be located on Mt Low Parkway, directly opposite North Shore Boulevard).

(27) Neighbourhood centres are small-scale centres that provide a limited array of basic, lower order needs including convenience retail, local professional and community services. Existing centres in established suburbs are not anticipated to require significant expansion, although some minor expansion of uses may be warranted. New neighbourhood centres are anticipated in Burdell, Julago and elsewhere in newly developing areas where need can be demonstrated.

Specialised centres

(28) Specialised centres incorporate major nodes of activity with a specific and limited function. These centres are intended to support and not to undermine other activity centres within the hierarchy.

(29) The special regional business roles of Townsville Airport, Lavarack Barracks, the Port of Townsville, Domain Central, Fulham Road medical precinct, Bayswater Road medical precinct and James Cook University-Townsville Hospital precinct, are recognised. These centres do not incorporate the breadth and depth of

activities of other activity centres, but instead provide specific higher order, regional and national functions catering for a specific market or technological role and provide significant employment.

(30) The long-term operation of the **Townsville Airport** is supported for both Department of Defence purposes and to satisfy the primary air transport needs of the Townsville and North Queensland regions. Townsville Airport precinct accommodates a range of businesses with a nexus with aeronautical activities, including offices and low impact industries and research and technology-related industries. Some complementary activities which cater to the needs of businesses and workers within the centres are appropriate. However, this centre does not accommodate office or retail activities to an extent that would undermine the principal centre (CBD) or other centres.

Editor's note—Townsville Airport does not fall within the regulatory jurisdiction of the Townsville City Plan. However, council recognises its important function through this zoning and acknowledges the intentions of Townsville Airport's master planning document.

(31) **Lavarack Barracks** is protected for ongoing Department of Defence-related purposes, including aviation, communications, logistics, administration, training, and accommodation and recreation facilities for Department of Defence personnel.

Editor's note—Lavarack Barracks does not fall within the regulatory jurisdiction of the Townsville City Plan. However, council recognises its important function through this zoning.

(32) The **Port of Townsville** is protected for the benefit of the local and regional economy, and development of the port is integrated with the CBD, Palmer Street and The Strand where possible, to maximise community access to and use of waterfront areas.

Editor's note—The Port of Townsville does not fall within the regulatory jurisdiction of the Townsville City Plan. However, council recognises its important function through this zoning and acknowledges the intentions of Port of Townsville's master planning documents.

(33) **Domain Central precinct** does not expand to include further retail uses, other than small facilities supporting the retail showroom function (such as food and drink outlets).

(34) **Fulham Road medical precinct** will continue to be the focus of private acute medical services in the Townsville region. It accommodates medical facilities, including the hospital and medical centres catering for allied and specialist medical services. It also contains residential uses providing short-term accommodation, particularly to meet demand generated by the primary medical uses in the precinct, and aged care and retirement living and respite care.

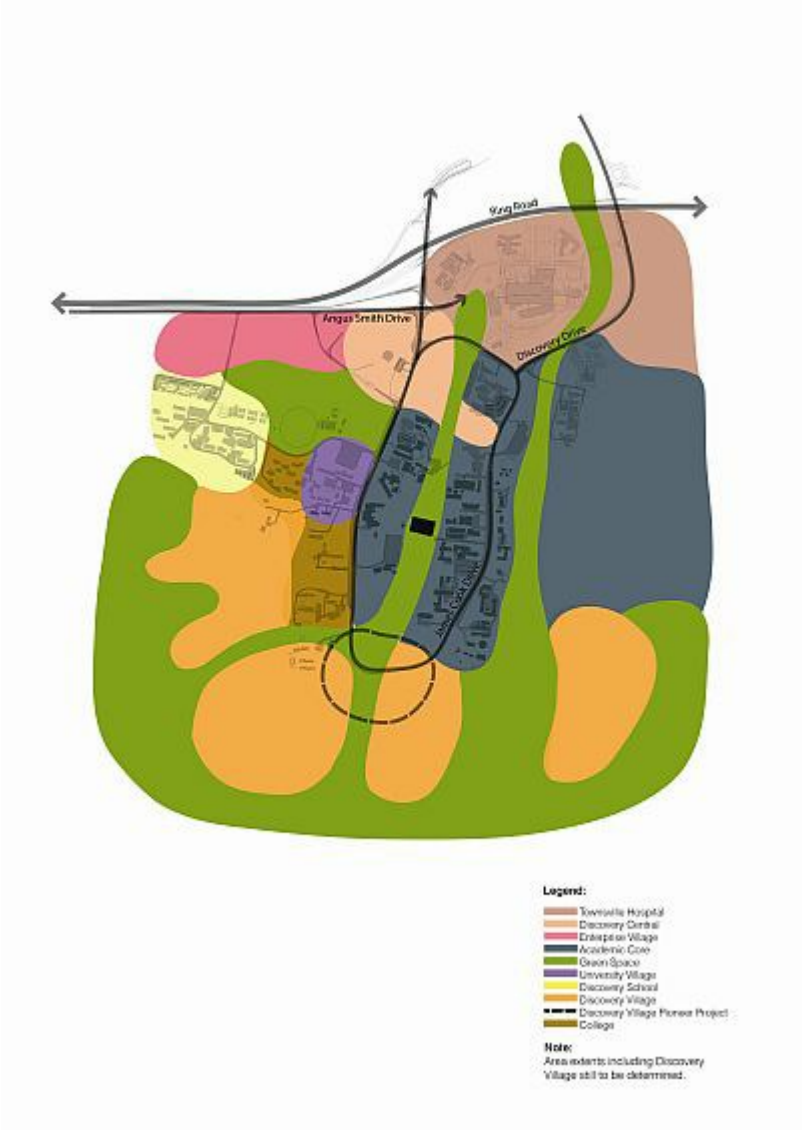
(35) **Bayswater Road medical precinct** accommodates a broad range of medical and associated services, and a mix of medical-oriented and low and medium density residential uses, in a vibrant, mixed use urban village with a strong sense of place and civic identity.

(36) The **James Cook University-Townsville Hospital precinct** evolves into a world-class knowledge community with a focus on the tropics and on sustainability. The centre becomes a mixed use environment, integrating the existing institutions and forming an integral part of Townsville, with strong links to the CBD. It becomes a leader in sustainability, minimising the use of finite resources like land, energy, water and wastewater. Development provides exemplar projects in aspects like public transport, housing, public spaces and community development, as well in its traditional academic, research and healthcare focus. It also exhibits increased self-containment with many people living and working within the centre, although its emerging resident community is well-connected to the wider city by active and public transport.

(37) The land use mix, and scale of development in the James Cook University-Townsville Hospital centre reflects the role of the centre in the city. Its focus is as a knowledge community based on the university, hospital and research and technology activities. Other land uses which benefit and enhance the knowledge community occur, including employment, residential and retail. These other uses are sufficient to facilitate high levels of self-containment on the site. They do not occur at a level that serves a wider role within the city or which may detract from the planned functions of other centres. The level of development will also need to be commensurate with the capacity of infrastructure to serve the area. Development not related to the focus of the centre, but instead designed to compete with other centres, does not occur.

Editor's note—Development of James Cook University (Douglas Campus), which is undertaken in terms of a Ministerial Designation, does not fall within the regulatory jurisdiction of the Townsville City Plan.

(38) The pattern of development is generally consistent with the strategy plan shown in Figure 3.7 – James Cook University-Townsville Hospital strategy plan.



Click here to view PDF high resolution map.

Figure 3.7 - James Cook University-Townsville Hospital centre strategy plan

Mixed use areas

(39) The city contains a number of mixed use areas and corridors, many of which arose from historic strip commercial development. These areas generally evolve to facilitate improved relationship between buildings and the street, a pedestrian-oriented streetscape and improved visual amenity along major roads.

(40) These areas contain a mix of uses including medium density housing (where compatible with the local amenity), convenience retail and small-scale offices and showrooms, community and service industry uses which do not compromise the intended role or successful functioning of centres.

Centre design

(41) The design of centres and mixed use areas in Townsville achieves:

(a) strong integration and consolidation through built form and layout;

(b) a high quality public realm, with attractive, safe and useable public spaces and streets;

(c) active uses that attract people on key pedestrian circulation streets and major frontages;

(d) buildings constructed at or close to the street on key frontages and parking areas and access ways that do not dominate major frontages and pedestrian routes;

(e) a high level of pedestrian and cyclist accessibility and accessibility by public transport;

(f) a human scale and pedestrian comfort (shelter and shade), at street level;

(g) climate responsive design, with the opportunity to adopt sustainable building designs beyond current best practice; and

(h) connectedness between green spaces and the wider network of natural assets, where practicable.

3.3.4.2 Land use strategies

The planning scheme establishes the hierarchy of centres through zoning provisions. These provisions place emphasis on ensuring centres are diverse, accessible and well-designed community hubs. Major development in the district and major centres should be supported by a centre design master plan.

Centre provisions are closely aligned with intentions for medium and higher density living options.

A detailed structure planning process will be undertaken collaboratively between council and James Cook University which may over time be integrated into the planning scheme. A 'strategic infrastructure plan' covering the whole of the centre will also be developed.

3.3.5 Element - Transport, accessibility and mobility

3.3.5.1 Specific outcomes

Transport choices

(1) The city provides choice in mode of transport. Transport systems are planned and built to conveniently and efficiently connect people with places of employment, services and leisure.

(2) The shape of the city and activity centres network establishes the basis for optimum transport outcomes for the city. The pattern supports consolidation around the principal centre (CBD) and major centres on the Ross River Road corridor, which is identified by council and the State Government as a core public transport corridor for the future.

(3) The activity centres network and designation of industrial land also support increased employment opportunities closer to where people live, reducing trip lengths and improving the efficiency and effectiveness of public transport and pedestrian and cyclist networks, and reinforcing the significance of inter-regional freight networks.

(4) The design of centres and residential areas incorporates a network of walking, cycling, public transport and vehicle routes that maximise connectivity and ease of mobility.

(5) The planning scheme places importance on the creation of attractive, climate responsive and safe streets and public spaces, and requires structure planning of centres and greenfield residential areas to ensure that the development pattern allows for high levels of accessibility.

Road and freight network

(6) National, state and regional road, rail, sea and air freight networks are protected from incompatible development and connections to the wider North and Western Queensland regions strengthened.

(7) Appropriate design and access standards are established for development on and near major transport corridors and key freight routes. Further encroachment on these corridors by sensitive land uses such as residential development is avoided and impacts are minimised where development already exists. Key routes include:

(a) the Bruce and Flinders Highways;

(b) the Ring Road;

(c) the Townsville Port Access Road;

(d) Woolcock Street;

(e) Duckworth Street-Nathan Street; and

(f) the rail lines.

(8) The planning scheme encourages co-location of freight and transport-related land uses in industrial areas with

convenient access to the principal road and rail freight network. The Townsville State Development Area will be the pre-eminent location in this regard.

(9) The defence and potential international roles for Townsville Airport will be protected from incompatible development.

3.3.5.2 Land use strategies

Better transport and accessibility outcomes for the city underpin the intentions for the development pattern and densities.

Key corridors and applicable standards for development on and near them are established by the planning scheme.

Council will work with the Queensland Government to develop high-quality public transport, cycling and walking networks, including dedicated bicycle facilities connecting major centres and catering for large volumes of cyclists. Council will also work with the Queensland Government to identify opportunities for park-and-ride facilities near designated public transport stops.

Council will support the relocation of the South Townsville rail yards to the Townsville State Development Area.

3.3.6 Element - Integrated infrastructure planning and provision

City shape

(1) Land use and development patterns support the efficient and cost-effective provision of infrastructure and community facilities.

(2) The city shape and activity centres hierarchy described in this strategic framework establish the basis for the most efficient provision of infrastructure to meet community needs over 25 years. In particular, it minimises the dilution of infrastructure investment across multiple development fronts. While upgrades will be required in the infill development areas, these costs will be less than those that would be involved in continued outward expansion of the urban area.

(3) The settlement pattern supports the co-location of community services and facilities, including in activity centres, where accessibility to communities can be maximised and multiple use of facilities can be coordinated.

(4) Major utilities and community facilities integrate sensitively with the surrounding environment through their built form and management of potential impacts.

Safety and efficiency

(5) The safe and efficient operation or use of infrastructure installations and corridors are protected.

(6) Encroachment of facilities by sensitive land uses is avoided and reasonable standards to manage impacts are established where development already exists. These facilities include:

- (a) energy-related infrastructure including electricity transmission lines, substations, gas lines and the like;
- (b) Lake Ross, Lake Paluma and other water supply areas;
- (c) water and waste water treatment plants and major distribution facilities;
- (d) solid waste treatment and disposal facilities;
- (e) transport and freight networks;
- (f) various Department of Defence landholdings and installations; and
- (g) community facilities and infrastructure.

(7) High standards of development infrastructure are established to effectively manage potential impacts on the community and the environment.

(8) Whole of lifecycle infrastructure costs are minimised.

3.3.6.2 Land use strategies

Council's Local Government infrastructure plan (Part 4 of the planning scheme) documents plans for trunk infrastructure to support the settlement pattern, and development charges are to be levied in accordance with the *Planning Act 2016*.

Council will consider strategies to encourage development within the areas identified as primary infill focus areas in recognition of the overall savings to the community that strategy will facilitate.

Council will negotiate infrastructure agreements as required with development proponents and state agencies as part of the master planning of major development areas.

3.4 Theme - Strong and connected community

Editor's note—What did the Townsville Community Plan 2011-2021 say about *Strong and connected community*?
A community that draws on the diversity, skills and expertise of our residents to build a community that has pride in its culture and lifestyle.
Seven guiding principles were also set out:

- *Strengthen community cohesion: Becoming a supportive and interconnected community that works together to make people feel comfortable and safe within their street, neighbourhood and the wider community.*
- *Value the richness of diversity: The diversity of cultures and community groups represented within Townsville are embraced so that we can all become champions of social inclusion.*
- *Develop a vibrant arts lifestyle: Embracing the richness and talent of the arts community.*
- *Nurture and value families: Providing opportunities to raise children within our unique lifestyle, and providing them with a great place to grow up.*
- *Develop a sense of safety: An environment in which the community feels safe to live, work and play.*
- *Provide active and passive sport and recreation opportunities: An environment where there is a choice of active and passive recreational activities contributes to the health and wellbeing of our city.*
- *Open, honest and accountable leadership: Inclusive engagement and communication encourages community participation in local decision-making.*

3.4.1 Strategic outcomes

(1) The character and identity of communities in urban and rural areas of Townsville evolves and strengthens through the city shape described in this strategic framework and through good urban design of places.

(2) The architectural, cultural, historic, scenic, natural, social or spiritual qualities that create places of local heritage are conserved and enhanced.

(3) Easy access is provided to community services and facilities, and to places to celebrate culture, history and identity. Public spaces and streetscapes are attractive, safe, accessible for all abilities and usable.

(4) A high-quality network of open space and recreation opportunities provides for the needs of the community, supports social interaction, enables connections to natural assets and landscape features, and reinforces the city's identity.

(5) Strong connections to the natural environment and the protection of natural assets contribute to the health and wellbeing of the community.

3.4.2 Element - Urban design

3.4.2.1 Specific outcomes

Design

(1) Design of the built environment (including buildings, streets and public spaces):

- (a) is consistent with the existing or desired character of the local area;
- (b) is oriented to the street and public places;
- (c) enhances the quality of the street;
- (d) is responsive to Townsville's climate;
- (e) creates a human scale at street level;
- (f) protects and celebrates important views, landscape features and natural assets, and places of cultural heritage significance; and

(g) makes it easy to get around, especially when walking or cycling: development is designed to integrate with its surroundings and has ample, not a minimum of, connections.

(2) Good design assists in the success of those areas that will be the focus for growth, change and economic activity.

Public realm

(3) High-quality public spaces are created that optimise opportunities for community interaction.

Prevention of crime and antisocial behaviour

(4) The design of development assists in preventing antisocial behaviour and supporting personal safety.

3.4.2.2 Land use strategies

Good urban design principles (including Crime Prevention Through Environmental Design Principles) form the basis of all planning scheme codes. At a citywide scale, they underpin the development pattern intentions.

3.4.3 Element - Open space network

3.4.3.1 Specific outcomes

Open space network

(1) Townsville has an open space network that:

(a) meets the community's recreation and sporting needs;

(b) offers a diverse range of recreation opportunities and landscape settings that encourage healthy lifestyles and physical activity;

(c) is safe and attractive;

(d) provides equitable and convenient access to sport and recreation facilities, particularly by walking and cycling;

(e) supports community groups and has the capacity to adapt to changing needs over time;

(f) is cost efficient, with a focus on co-locating sports in hubs;

(g) is designed and maintained to a high standard, and is fit for purpose;

(h) incorporates the natural landscape so that people may connect with nature in their recreation;

(i) links recreation spaces and community hubs wherever possible; and

(j) has minimal negative impacts on surrounding communities and land uses.

Types of open space

(2) The open space network provides for the following primary functions:

(a) local, district and regional recreation parks, and corridor or recreation linkages and amenity parks provide informal sport and recreation opportunities; and

(b) district, regional and specialised sports parks provide for formal sports and boast a range of training and competition infrastructure.

3.4.3.2 Land use strategies

The open space network will primarily be delivered through the Local Government infrastructure plan mechanisms. However, planning scheme requirements for reconfiguration and urban development of all types reflect the need for integrated open space and accessibility networks and a high-quality public realm.

3.4.4 Element - Strong and connected community

3.4.4.1 Specific outcomes

(1) Townsville maintains the scenic amenity values and iconic features that contribute to its character and sense of place. Development in areas of high scenic amenity is limited to minimise the potential for deterioration of the scenic values.

(2) Areas of high scenic amenity generally include elevated and vegetated areas which may also contain significant ecological and other environmental values. These include:

- (a) mountainous backdrops, including Mount Elliot, Mount Cleveland, the Pinnacles, Many Peaks Range and Hervey Range to Paluma;
- (b) significant hills and ridgelines within and framing urban areas, including Castle Hill, Mount Stuart and Mount Louisa; and
- (c) coastal headlands, foreshores and waters, including The Strand, Magnetic Island, Cape Pallarenda, Cape Cleveland, Cleveland Bay and Halifax Bay.

(3) Development is sited and designed to be sensitive to the landform, vegetation and other characteristics that contribute to scenic amenity values in all parts of the city.

(4) Non-urban land is protected to define the edges to the city, and to protect non-urban landscape values. Urban and rural residential development does not occur in rural areas.

3.4.4.2 Land use strategies

A primary strategy implemented through the planning scheme is the containment of urban growth within the designated area.

Otherwise, planning scheme requirements for reconfiguration and development of all types reflect the intention to protect areas and features of scenic importance.

3.4.5 Element - Managing the impacts of development

3.4.5.1 Specific outcomes

Protection of amenity

(1) Development mitigates the effects of new development on local character, noise and air quality, access to sunlight, breezes and privacy, and avoids commercial or through traffic in residential streets.

(2) The interface between land zoned for industry and sensitive land uses is managed to protect the health, wellbeing, amenity and safety of the community and protect industrial activities from incompatible development.

(3) The planning scheme does not protect private views, other than where proposed development is inconsistent with the described intent for a local area.

(4) Negative social impacts caused by development are avoided or minimised.

3.4.5.2 Land use strategies

Zone designations, and in some cases precincts, represent the type and scale of development intended for an area. This forms the basis for the community to establish realistic expectations about the type of amenity in an area.

3.5 Theme - Environmentally sustainable future

Editor's note—What did the Townsville Community Plan 2011-2021 say about *Environmentally sustainable future*?

Our community recognises and values our natural environment. We acknowledge the need for a more sustainable future and seek to achieve this through solutions that minimise our impact on the environment.

Three guiding principles were also set out:

- *Valuing our natural environment and urban green spaces: The Townsville community recognises, protects, retains and enhances the values and condition of our natural environment, urban green spaces, and scenic amenity.*

- *Taking responsibility for the health of our local waterways, wetlands and marine areas: The community takes appropriate actions to maintain the values and condition of our local waterways, wetlands and the marine environments.*
- *Adopting an environmentally sustainable lifestyle at home, work and at play: the community understands that our activities have an environmental impact. Individually and collectively we take responsibility for undertaking appropriate actions at home, work and play to minimise these impacts.*

3.5.1 Strategic outcomes

(1) Townsville's natural assets, including its biodiversity, habitat values and biophysical and ecological processes are protected, enhanced and restored to provide life supporting capacities for present and future generations.

(2) The maintenance of biodiversity is dependent on a variety of biophysical elements, functions and processes including an interconnected network of wildlife corridors and habitats. Habitat areas and connecting corridors are retained, and degraded links are restored to provide a continuous network of natural assets that supports the ecological and biophysical functions necessary for ensuring sustainable landscapes.

(3) The network of waterways and wetlands that contribute to terrestrial and aquatic biodiversity including fisheries, marine habitats and the Great Barrier Reef, is protected from the impacts of development to maintain high standards of water quality and aquatic ecosystem health.

(4) Water quality is protected, particularly within the city's drinking water catchments and waters identified as having high ecological value.

(5) The coastal zone is managed to protect, conserve and rehabilitate coastal resources, biological diversity and natural coastal processes.

(6) Risk to life, property and ecosystems as a result of natural hazards is minimised, and development is managed to respond to the likely impacts of climate change.

3.5.2 Element - Natural assets

3.5.2.1 Specific outcomes

(1) Areas of importance for the maintenance of habitat, biodiversity and biophysical and ecological functions are protected. Development avoids or minimises direct and indirect impacts on areas having or supporting significant environmental values, ecological functions and biophysical processes.

(2) As far as possible, natural areas are retained and integrated with the development to maintain and enhance the natural assets network.

(3) Fragmentation of native habitat is avoided to maintain biodiversity and increase ecological resilience, including resilience to climate change.

(4) Ecological corridors are maintained and where appropriate, rehabilitated and expanded, to support:

- (a) the natural movement and proliferation of native species;
- (b) ecological responses to climate change;
- (c) the maintenance of large scale migratory lifecycle processes; and
- (d) connectivity between significant habitat areas and patches of remnant vegetation.

(5) Development maintains suitable buffers to areas of significance, such as endangered and threatened ecological communities and remnant vegetation, wetlands and waterways and priority habitat to ensure the ongoing viability of the significant area and associated ecological functions and ecosystem services.

(6) Corridors and buffers are of a width which provides for:

- (a) movement of native fauna;
- (b) viable habitat areas;
- (c) minimisation of edge effects;
- (d) maintenance of the hydrological functions of the waterway or wetland;
- (e) appropriate recreational opportunities; and
- (f) any additional maintenance and bushfire setback functions to be located outside the areas required for ecological purposes.

(7) Appropriate public access to the city's natural assets is provided.

3.5.2.2 Land use strategies

The city shape and settlement pattern has been determined to avoid further expansion of urban or rural residential development beyond existing designated areas. This will avoid increasing pressures on environmentally important values.

Some areas (predominantly those in the protected estate) are included in the Environmental management and conservation zone. Other natural areas of national, state, regional and local significance are identified in overlay maps and are to be protected and managed through the Natural assets overlay code.

The Natural assets planning scheme policy no. SC6.9 assists in providing guidance to applicants regarding the range of values present across the mapped areas and how environmental assessments should be carried out.

3.5.3 Element - Integrated water cycle management and ecosystem health

3.5.3.1 Specific outcomes

Protection of waterways and wetlands

(1) Wetlands, waterways and associated riparian areas are protected from threatening processes and where practical, enhanced to ensure ecological processes and ecosystem services are fully functional.

(2) The proposed city shape and settlement pattern avoids further expansion of urban development into or nearer to important aquatic ecosystems.

(3) Development is located outside wetlands and avoids adverse effects on wetlands.

(4) Development is buffered from waterways and wetlands, with a buffer width sufficient to:

- (a) maintain ecological and habitat functions;
- (b) minimise potential edge effects; and
- (c) allow for natural hydrological (including flood-related) processes to function effectively and unimpeded.

(5) Where land is required for recreational, land management, bushfire hazard risk reduction and other appropriate purposes, these functions and land uses are located outside the areas required for ecological purposes and water quality improvement or are conducted in such a way that there are no adverse impacts on the environmental values.

Protection of water quality

(6) Intensification of development within the Lake Ross, Lake Paluma and Crystal Creek catchments is avoided.

(7) Water quality of both surface and ground waters, and the ecological and hydrological processes of catchments, are protected.

(8) New development incorporates drainage, stormwater and waste water management measures that protect ground and surface water quality and the environmental values of water.

(9) The release of acid and associated metal contaminants into the environment is avoided through appropriate standards for development involving filling or excavation, so that disturbance to acid sulfate soils is minimised and disturbed acid sulfate soils are appropriately treated.

(10) Best practice water sensitive urban design (adapted to the Dry Tropics environment) and integrated water cycle management responding to regionally specific climate and water quality characteristics, form the basis for engineering standards.

Water use efficiency

(11) Development, including landscaping, uses water efficiently as part of the total water cycle.

3.5.3.2 Land use strategies

Water resources are comprehensively protected through the Natural assets and Water resource catchment overlays, as well as through requirements under the Healthy waters and Works codes, as well as zone codes.

3.5.4 Element - Coastal protection

3.5.4.1 Specific outcomes

Conservation of coastal resources

(1) Coastal resources are conserved, and areas of high ecological significance or scenic amenity along the coast are protected.

Coastal risks

(2) Exposure of communities to coastal hazards, including erosion and storm tide inundation, is minimised, taking into account the projected effects of climate change.

(3) The settlement pattern avoids expansion of urban areas and smaller coastal settlements into environmentally significant coastal areas.

(4) In areas designated for urban development, increase in risk to people and property is avoided.

(5) Outside designated urban areas, only limited forms of development that are compatible with the risks occur within coastal hazard areas.

Public access

(6) Public access to the foreshore is maintained and managed for current and future generations.

3.5.4.2 Land use strategies

The Coastal protection overlay and underlying zoning provisions direct development so that it will be compatible with the hazard and protect coastal processes and areas of high ecological significance.

3.5.5 Element - Natural hazards (bushfire, landslide and flood)

3.5.5.1 Specific outcomes

Avoiding increase to risk

(1) New development in areas subject to bushfire, landslide or flooding hazard is compatible with the nature of the hazard.

(2) Development does not materially increase the extent or the severity of natural hazards, and the safety of people is maintained and damage to property is minimised.

(3) The settlement pattern avoids further expansion of urban and rural residential uses into hazard areas.

(4) Significant areas of Townsville are already established within the floodplains of the Ross and Bohle Rivers. Within these areas, the flood risk will be managed by avoiding intensification of development in high hazard areas and ensuring development is compatible with the hazard in other areas.

3.5.5.2 Land use strategies

Bushfire, Landslide and Flood hazard overlays and underlying zoning provisions direct development so that it will be compatible with the hazard and the desired character for the area.

3.5.6 Element - Sustainability

3.5.6.1 Specific outcomes

(1) Development is designed to sensitively respond to Townsville’s climate through its orientation, layout and design of the built environment.

(2) Development minimises demands for energy use and otherwise promotes efficient use of energy.

(3) Innovation in climate responsive and energy efficient design is encouraged.

(4) Development is located, designed and managed to avoid environmental harm or nuisance.

3.5.6.2 Land use strategies

The city shape and settlement pattern established under the planning scheme provisions underpins the growth of a more sustainable Townsville in which transportation and fossil fuel use will be better managed.

Development requirements also seek development that is climatically responsive and energy efficient at the site and built form scale. However, the planning scheme does not duplicate the jurisdiction of the *Building Act 1975* in this regard.

Planning scheme provisions also address the expected environmental performance of development generally.

3.6 Theme - Sustainable economic growth

Editor's note—What did the Townsville Community Plan 2011-2021 say about *Sustaining economic growth*?

The community recognise that it is fundamental to have a strong and balanced economic growth in order to enhance our city's way of life.

Four guiding principles were also set out:

- *Strong and diverse economy: the community recognises that sustaining a strong and diverse economy is vital for long-term prosperity.*
- *An innovative and highly skilled city: we will create new skills and business opportunities.*
- *A community that benefits from Townsville's economy: we will ensure that the benefits of economic growth are shared throughout the community.*
- *A city that sustains and prospers from its environment: the community will partner with business and industry to create a more resource efficient economy that generates new sustainable development businesses and jobs.*

3.6.1 Strategic outcomes

(1) Economic and employment growth is primarily located in Townsville's centres and industrial areas. The clustering of activities and employment in these areas facilitates improved transport networks (including public transport).

(2) Industrial land is used efficiently, a timely supply of land to meet industry needs is available, and efficient and cost-effective provision of infrastructure is facilitated.

(3) Sensitive uses are prevented from encroaching on the city's freight routes, special purpose areas, industrial areas and specialised centres, particularly Townsville Airport, Port of Townsville, the Townsville State Development Area, Lansdown and the Department of Defence landholdings, to ensure their ongoing efficient operation, minimise risks and avoid conflicts.

(4) Farming activities and the productive capacity of all rural land is protected.

(5) Within rural areas, new enterprises are encouraged that are associated with rural production or the natural environment, and which are not more appropriately located in urban areas.

(6) Development in and adjacent to quarries and other extractive and resource areas does not prejudice the continued and future use of the natural resources.

(7) Tourist accommodation and attractions are established in appropriate locations, and conflict between tourist activities and surrounding uses or values is minimised.

(8) Home based business is supported as an important incubator for new enterprises. However, activities are limited to ensure adverse impacts on neighbours' residential amenity do not occur.

3.6.2 Element - Industrial land

3.6.2.1 Specific outcomes

Sufficient land supply

(1) Land within designated industrial areas is used efficiently, and industries with a similar or compatible nature are co-located.

(2) The significance and potential of the Townsville State Development Area as a dry port, accommodating storage, transport and logistics activities, as well as port-related manufacturing is protected.

(3) The industrial investigation area at Bohle Plains will not be developed prior to the establishment of:

(a) a demonstrated need for the land;

(b) the inclusion of the area in council's Priority infrastructure area; and

(c) detailed structure planning which identifies, avoids and buffers significant environmental values, areas and corridors; avoids natural hazards on the site; identifies appropriate mix of industrial activity, identifies appropriate buffers, nominates site layout and circulation networks; and appropriately integrates the site with surrounding land.

(4) Interim uses in the industrial investigation area at Bohle Plains does not prejudice long-term suitability for industrial use.

(5) Industrial development does not expand beyond the areas zoned for industrial purposes or identified as industry investigation area on the strategic framework maps.

(6) In Roseneath, industrial uses with a transport and logistics focus are accommodated and are provided with adequate infrastructure, including roads, water, sewer and stormwater networks.

(7) In Lansdown, industrial uses with a medium and high impact industry focus are accommodated and are provided with adequate infrastructure, including roads, water, sewer and stormwater networks.

Protection of industry land for industry

(8) Industrial land is designed and remains available for intended industrial use and is protected from encroachment by uses that are sensitive to the impacts of industry.

(9) Industrial development is not intended to occur outside the zoned industrial areas, other than service industries and some low impact industries which may be located within activity centres or mixed use areas.

(10) Retail and commercial activities within industry zones are limited to those that directly support the industries intended for the zones, or are for outdoor sales uses. Bulky goods retailing (showrooms) and retail hardware stores are not accommodated within industry zoned land and are instead located within activity centres or mixed use areas.

(11) Subdivision requirements for industrial areas will be established to provide for a mix of lot sizes and, in particular, provision for larger lot sizes in Medium and High impact industry and Special purpose zoned areas.

Impacts of industry

(12) Industrial development is managed to protect environmental values, avoid risk to life and property and reasonably protect the amenity of surrounding areas.

(13) Alternative solutions to energy use and environmental performance are encouraged where impacts will be no worse than a conventionally designed development.

3.6.2.2 Land use strategies

Industrial areas are included in either the Low, Medium or High impact industry zone or Special purpose zone and the appropriate performance expectations for each are identified.

In addition, provisions are contained within residential zones, where relevant, to address potential reverse amenity issues from industrial areas and major infrastructure corridors. Council will work with the State Government to investigate the potential allocation of the Bohle Plains State land area to accommodate a range of industry types, including transport/freight-related activities. Industrial development of this area would desirably be contiguous with existing industry and appropriately integrate with the Townsville Ring Road.

Industrial land supply and demand will be monitored by council in order to determine when land in the Bohle Plains industrial investigation area may need to be made available.

Council will work with the relevant authorities to ensure the availability of gas and telecommunications infrastructure, as well as to investigate possible alternative freight routes which minimise existing conflicts within the urban area.

3.6.3 Element - Airport, seaport and Department of Defence land

3.6.3.1 Specific outcomes

Protecting special use areas

(1) Townsville Airport, Port of Townsville and Department of Defence landholdings are recognised for their particular strategic and economic value to the community.

(2) The safety and operational efficiency of these areas is maintained. They are protected from encroachment by sensitive uses.

(3) Development in the vicinity of these areas, and the transport/freight routes which serve them, is compatible with the physical and operational characteristics of the special use areas. New development will be located and designed to minimise any potential impacts.

3.6.3.2 Land use strategies

While the planning scheme has no jurisdiction over these areas, it regulates development in the areas surrounding them to avoid conflicts and reverse amenity issues arising.

3.6.4 Element - Natural economic resources (including rural and extractive industry)

3.6.4.1 Specific outcomes

Protecting productivity

(1) The productive capacity of all rural land is optimised within its environmental constraints.

(2) Significant non-rural activities and intensive animal industries do not occur in Townsville's primary horticultural areas.

Avoiding fragmentation

(3) Further fragmentation of rural land is avoided. A lack of viability for existing farms and small holdings does not justify their further subdivision or use for non-agricultural purposes.

(4) Development complies with the nominated minimum lot size for each precinct which will generally range from 10ha for rural lifestyle precincts, to 40ha for horticultural-based precincts to 400ha for grazing-based precincts.

Diversification

(5) Opportunities for diversification of activities within the rural areas is encouraged, provided that:

- (a) the productive capacity of the land is maintained;
- (b) conflicts with existing and intended rural activities in the surrounding area are avoided;
- (c) the existing landscape and natural resource values of the land are maintained; and
- (d) the development is not more appropriately located in another zone.

(6) Industry uses that are not directly related to farming or which do not require separation from urban or rural residential areas are not appropriate in the rural zone. These should be contained within zoned industrial land. In particular, transport depots and food or meat processing industries are to be located in an industrial zone.

(7) Intensive animal industries including feedlots and cattle handling facilities (for live export) are to be directed to the broader hectare lands of the predominantly grazing precincts where potential impacts can be better managed.

Protection of extractive resources

(8) Identified areas of extractive resources and their associated haulage routes are protected from encroachment of incompatible development. Buffers are provided to separate and mitigate the impacts of extractive operations and surrounding sensitive uses.

(9) While houses may be established on existing lots within identified buffer areas and haulage routes, any development which would increase the intensity of people living, visiting or working within these areas is avoided.

(10) Quarrying and extractive industry maintains the integrity of environmental and hydrological processes beyond site boundaries and minimises impacts on such values within the site.

3.6.4.2 Land use strategies

The rural land resources are primarily managed within the planning scheme through the Rural zone.

In addition, a number of overlays also assist in protecting the range of non-urban values, including Natural assets, Extractive resources, Bushfire hazard, Landslide hazard and Coastal environment.

3.6.5 Element - Tourism

3.6.5.1 Specific outcomes

Diversity

(1) A range of tourism opportunities and experiences, particularly nature-based tourism, are encouraged, with the principal centre (CBD) and its immediate environs a focus for larger tourist facilities.

(2) Tourism within the principal centre (CBD) and its immediate environs will be anchored by the Museum of Tropical Queensland and Reef HQ Aquarium, education and research uses and accommodation facilities, with improved links to the Breakwater, Anzac Park and The Strand.

(3) Tourist accommodation and dining will also continue to be encouraged in North Ward (with a focus on The Strand and Gregory Street), the Breakwater and Palmer Street, consistent with desirable built form and urban design outcomes for those areas.

(4) Magnetic Island is a major tourism destination for Townsville and will maintain accommodation and recreation activities at a scale and form that is relative to the overall character of the island. Supporting infrastructure encouraged on the island includes service and convenience of commercial facilities, walkways, foreshore promenades, and gateway treatments at significant junctions for each village.

(5) Small-scale, low-rise tourist accommodation and support facilities are to be facilitated at Paluma, Rollingstone, Balgal Beach, Toomulla, Toolakea and Saunders Beach. Tourism-oriented development in these northern townships focuses on protecting and emphasising the natural character attributes of the local area. The relationship between tourism, the environment and the availability and capacity of local infrastructure in these northern townships is managed so that it is sustainable.

Protecting values

(6) Tourism-related development maintains or enhances Townsville's image, environmental values, ecological processes and scenic quality both within and outside of urban areas.

(7) Outside the urban area, tourism-related development occurs where directly associated with rural activities or other natural resource values. However, such uses should not give rise to conflicts which would prejudice the existing economic activity in the area or adversely affect environmental values, ecological processes values or landscape character.

3.6.5.2 Land use strategies

The relevant zones and precincts identified in the planning scheme establish appropriate performance requirements for tourism-related development in appropriate locations.

Part 4 Local government infrastructure plan

4.1 Preliminary

(1) This local government infrastructure plan has been prepared in accordance with the requirements of the *Sustainable Planning Act 2009*.

(2) The purpose of the local government infrastructure plan is to:

(a) integrate infrastructure planning with the land use planning identified in the planning scheme;

(b) provide transparency regarding a local government's intentions for the provision of trunk infrastructure;

(c) enable a local government to estimate the cost of infrastructure provision to assist its long term financial planning;

(d) ensure that trunk infrastructure is planned and provided in an efficient and orderly manner; and

(e) provide a basis for the imposition of conditions about infrastructure on development approvals.

(3) The local government infrastructure plan:

(a) states in Section 4.2 (planning assumptions) the assumptions about future growth and urban development including the assumptions of demand for each trunk infrastructure network;

(b) identifies in Section 4.3 (priority infrastructure area) the prioritised area to accommodate urban growth up to 2026;

(c) states in Section 4.4 (desired standards of service) for each trunk infrastructure network the desired standard of performance;

(d) identifies in Section 4.5 (plans for trunk infrastructure) the existing and future trunk infrastructure for the following networks:

(i) water supply;

(ii) sewerage;

(iii) roads;

(iv) footpaths and cycleways; and

(v) parks and land for community facilities.

(e) provides a list of supporting documents that assist in the interpretation of the local government infrastructure plan in the Editor's note – Extrinsic material at the end of Section 4.5.2.

4.2 Planning assumptions

(1) The planning assumptions state the assumptions about:

(a) population and employment growth; and

(b) the type, scale, location and timing of development including the demand for each trunk infrastructure network.

(2) The planning assumptions together with the desired standards of service form a basis for the planning of the trunk infrastructure networks and the determination of the priority infrastructure area.

(3) The planning assumptions have been prepared for:

(a) the base date 2011 and the following projection years to accord with future Australian Bureau of Statistics census years:

(i) mid 2016;

(ii) mid 2021;

(iii) mid 2026;

(iv) mid 2031; and

(v) ultimate

(b) the LGIP development types in column 2 that include the uses in column 3 of Table 4.2.1.

(c) the projection areas identified on Growth Model Zone Maps 1 to 5 in the extrinsic material (Local Government Infrastructure Plan - planning assumptions & PIA). For reporting purposes, the projections are summarised by the reporting areas identified in Schedule 3 - Local government infrastructure plan mapping and tables, SC3.3.1 - Reporting areas map.

Table 4.2.1-Relationship between LGIP development categories, development types and uses

Column 1 **LGIP development category**	**Column 2** **LGIP development type**	**Column 3** **Uses**
Residential development	Single Dwelling (urban)	Dwelling house (urban)
	Single Dwelling (rural residential)	Dwelling house (rural residential)
	Single Dwelling (rural)	Dwelling house (rural)
	Multiple Dwelling	Dual occupancy Multiple dwelling
	Other Dwelling	Caretaker's accommodation Community residence Dwelling unit Relocatable home park Residential care facility Retirement facility
Non-residential development	Retail	Adult store Agricultural supplies store Bar Bulk landscape supplies Food and drink outlet Function facility Garden centre Hardware and trade supplies Market Outdoor sales Roadside stall Service station Shop Shopping centre Showroom Wholesale nursery

Column 1 LGIP development category	Column 2 LGIP development type	Column 3 Uses
	Services	Animal keeping Brothel Car wash Cemetery Childcare centre Club Community care centre Community use Crematorium Detention facility Educational establishment Environmental facility Funeral parlour Health care services Home based business Hospital Hotel Indoor sport and recreation Major sport, recreation and entertainment facility Motor sport facility Nature-based tourism Nightclub entertainment facility Non-resident workforce accommodation Outdoor sport and recreation Outstation Park Place of worship Resort complex Rooming accommodation Rural workers accommodation Service industry Short-term accommodation Theatre Tourist attraction Tourist park
	Professional	Emergency services Office Sales office Veterinary services
	Industry	Air services High impact industry Landing Low impact industry Marine industry Medium impact industry Parking station Port services Research and technology industry Rural industry Special industry Telecommunications facility Transport depot Warehouse Winery

Column 1 LGIP development category	Column 2 LGIP development type	Column 3 Uses
	Other	Animal husbandry Aquaculture Cropping Extractive industry Intensive animal husbandry Intensive horticulture Major electricity infrastructure Permanent plantation Renewable energy facility Substation Utility installation

(4) Details of the methodology used to prepare the planning assumptions are stated in the extrinsic material.

4.2.1 Population and employment growth

(1) A summary of the assumptions about population and employment growth for the planning scheme area is stated in Table 4.2.1.1-Population and employment assumptions summary.

Table 4.2.1.1-Population and employment assumptions summary

Column 1 Description	Column 2 Assumptions				
	2016	2021	2026	2031	Ultimate
Population	192,115	201,770	217,089	237,382	404,346
Employment	93,137	97,412	104,489	115,525	418,035

(2) Detailed assumptions about growth for each projection area and LGIP development type category are identified in the following tables in Schedule 3 Local government infrastructure plan mapping and tables:

(a) Table SC3.1.1 - Existing and projected population, and;

(b) Table SC3.1.2 - Existing and projected employment;

Editor's note—More detailed projections by growth model zone areas are available in the extrinsic material.

4.2.2 Development

(1) The developable area is identified in Schedule 3-Local government infrastructure plan mapping and tables, SC3.3.2 - Developable area map.

(2) The planned density for future development is stated in Table 4.2.2.1 to Table 4.2.2.5.

Editor's note—Locations where infill and broad-hectare densities apply are identified respectively as 'less than threshold' and 'greater than threshold' areas that are mapped in Appendix C and Appendix D of *Local government infrastructure plan - planning assumptions & PIA . Townsville City Council.* (extrinsic material). The densities and other key assumptions in this local government infrastructure plan include:

- Assumed population, housing and employment densities (infill) (Table 4.2.2.1);
- Assumed population, housing and employment densities (broad-hectare) (Table 4.2.2.2);
- Assumed population, housing and employment densities (heritage)(Table 4.2.2.3);
- Assumed population, housing and employment densities (special cases) as shown in Figure 4.2.2.1 (Table 4.2.2.4); and
- Delayed start dates for growth associated with preliminary approvals (Table 4.2.2.5).

(3) A summary of the assumptions about future residential and non-residential development for the planning scheme area is stated in Table 4.2.2.6 - Residential dwelling and non-residential floor space assumption summary.

(4) A summary of the assumptions about future educational enrolments for the planning scheme area is stated in Table 4.2.2.7 - Education assumptions summary.

Table 4.2.2.1-Assumed population, housing and employment densities (infill)

Zone	Precinct	Ultimate density (per net developable hectare)						
		Single dwelling (no.)	Multiple or other dwelling (no.)	Retail(m2)	Services (m2)	Profess. (m2)	Industry (m2)	Other (m2)
CF	All	-	-	-	-	-	-	-
CR	All	16.7	-	-	-	-	-	-
DC	All	-	-	2,970	765	765	-	-
EC	MCF2	-	-	2,310	595	595	-	-
EC	MCNS	-	-	5,280	1,360	1,360	-	-
EC	Other	16.6	4.9	20	80	-	-	-
HDR	PS	-	590.6	9,936	-	-	-	-
HDR	Other	-	80.0	656	83	459	-	-
HII	All	-	-	3	65	65	6,367	-
LC	All	-	-	2,970	765	765	-	-
LDR	MCF1*	-	-	2,310	595	595	-	-
LDR	MHF1*	-	-	-	3,180	2,120	-	-
LDR	RRRC*	18.8	2	10	40	-	-	-
LDR	ST*	10.0	-	-	-	-	-	-
LDR	Other	18.9	2.1	5	20	-	-	-
LII	All	-	-	1,120	319	286	3,646	230
MC	ACC	-	36.0	4,224	1,088	1,088	-	-
MC	ACF	-	-	3,300	850	850	-	-
MC	AMC	-	18.0	4,752	1,224	1,224	-	-
MC	HPMC(MCC)	-	-	5,280	1,360	1,360	-	-
MC	HPMC(Other)	-	-	5,280	1,360	1,360	-	-
MC	MCF3	-	-	2,310	595	595	-	-
MC	TCMC(TD)	-	21.9	3,373	869	869	-	-
MC	TCMC(TCS)	-	21.9	3,373	869	869	-	-
MC	Other	-	18.0	4,752	1,224	1,224	-	-
MDR	AV	-	137.9	3,901	1,005	1,005	-	-
MDR	AMD	0.1	221.2	5	21	-	-	-
MDR	HPMD	-	222.3	17	4	4	-	-
MDR	PB	18.9	2.1	5	20	-	-	-
MDR	NBT	-	42.0	2,100	1,050	1,050	-	-
MDR	NWV	11.0	64.4	7	28	-	-	-
MDR	S	10.6	61.8	35	140	-	-	-
MDR	Other	11.0	97.8	5	21	-	-	-
MII	All	-	-	601	223	124	5,121	130
MU	AC	-	42.0	2,100	1,050	1,050	-	-
MU	BRM	-	-	-	3,180	2,120	-	-
MU	CTR	-	24.3	2,435	2,435	-	-	-
MU	KT	-	-	1,300	1,950	1,950	1,300	-
MU	KR	11.0	97.8	5	21	-	-	-
MU	NBG	-	42.0	2,100	1,050	1,050	-	-
MU	CBDG	-	21.9	1,789	1,661	1,661	-	-
MU	STRD	-	341.0	9,900	-	-	-	-
MU	WS	11.0	64.5	5	21	-	-	-
MU	Other	-	21.9	1,789	1,661	1,661	-	-
NC	All	-	-	2,310	595	595	-	-
OS	R	-	-	1,300	1,950	1,950	1,300	-
OS	Other	-	-	-	-	-	-	-
PC	CA	-	-	3,900	30,550	30,550	-	-

Zone	Precinct	Ultimate density (per net developable hectare)						
		Single dwelling (no.)	Multiple or other dwelling (no.)	Retail(m2)	Services (m2)	Profess. (m2)	Industry (m2)	Other (m2)
PC	FSR	-	357.0	9,686	25,809	25,809	-	-
PC	Other	-	399.0	3,857	25,622	25,622	-	-
RR	RRRD	0.025	-	-	-	-	-	-
RR	Other	1.6	-	-	-	-	-	-
RUR	H	0.025	-	-	-	-	-	-
RUR	C	0.003	-	-	-	-	-	-
RUR	J	0.1	-	-	-	-	-	-
RUR	RRRD	0.003	-	-	-	-	-	-
RUR	Other	0.003	-	-	-	-	-	-
SC	Other	-	-	-	-	-	-	-
SC	BRM	-	-	-	3,180	2,120	-	-
SC	D	-	-	3,500	-	-	-	-
SC	FRM	-	34	670	2,680	-	-	-
SC	MH	-	-	-	7,200	4,800	-	-
SC	MHF2	-	-	-	3,180	2,120	-	-
SP	TSDA (B, EC, ECO)	-	-	-	-	-	-	-
SP	TSDA (HIIP)	-	-	340	126	84	2,877	74
SP	TSDA (LMI)	-	-	1,120	319	286	-	230
SP	TSDA (Other)	-	-	601	223	124	-	130
SR	BBGC	-	-	20	5	-	-	-
SR	Other	-	-	-	-	-	-	-

Table 4.2.2.2-Assumed population, housing and employment densities (broad-hectare)

Zone	Precinct	Ultimate density (per net developable hectare)						
		Single dwellings (no.)	Multiple or other dwelling (no.)	Retail (m2)	Services (m2)	Profess. (m2)	Industry (m2)	Other (m2)
CF	All	-	-	-	-	-	-	-
CR	All	11.3	-	-	-	-	-	-
DC	All	-	-	2,970	765	765	-	-
EC	MCF2	-	-	1,485	383	383	-	-
EC	MCNS	-	-	3,432	884	884	-	-
EC	Other	10.8	3.2	13	52	-	-	-
HDR	PS	-	590.6	9,936	-	-	-	-
HDR	Other	-	51.9	425	54	298	-	-
HII	All	-	-	1	16	16	1,592	-
LC	All	-	-	2,970	765	765	-	-
LDR	MCF1*	-	-	1,485	383	383	-	-
LDR	MHF1*	-	-	-	3,180	2,120	-	-
LDR	RRRC*	12.2	1.3	7	26	-	-	-
LDR	ST*	6.5	-	-	-	-	-	-
LDR	Other	12.3	1.3	3	13	-	-	-
LII	All	-	-	720	205	184	2,344	148
MC	ACC	-	23.4	2,746	707	707	-	-
MC	ACF	-	-	2,145	553	553	-	-
MC	AMC	-	11.7	3,089	796	796	-	-
MC	HPMC(1)	-	-	4,290	1,105	1,105	-	-
MC	HPMC(2)	-	-	3,432	884	884	-	-
MC	MCF3	-	-	1,485	383	383	-	-
MC	TCMC(TD)	-	14.2	2,192	565	565	-	-

Zone	Precinct	Ultimate density (per net developable hectare)						
		Single dwellings (no.)	Multiple or other dwelling (no.)	Retail (m2)	Services (m2)	Profess. (m2)	Industry (m2)	Other (m2)
MC	TCMC(TCS)	-	14.2	2,192	565	565	-	-
MC	Other	-	11.7	3,089	796	796	-	-
MDR	AV	-	89.6	2,535	653	653	-	-
MDR	AMD	0.1	144.2	3	14	-	-	-
MDR	HPMD	-	144.9	11	3	3	-	-
MDR	PB	12.3	1.3	3	13	-	-	-
MDR	NBT	-	27.3	1,365	683	683	-	-
MDR	NWV	7.2	41.8	5	18	-	-	-
MDR	S	6.9	40.1	23	91	-	-	-
MDR	Other	7.2	63.5	3	14	-	-	-
MII	All	-	-	388	144	80	3,304	84
MU	AC	-	27.5	1,375	688	688	-	-
MU	BRM	-	-	-	3,180	2,120	-	-
MU	CTR	-	15.8	1,584	1,584	-	-	-
MU	KT	-	-	846	1,269	1,269	846	-
MU	KR	7.2	63.5	3	14	-	-	-
MU	NBG	-	27.3	1,365	683	683	-	-
MU	CBDG	-	14.3	1,164	1,081	1,081	-	-
MU	STRD	-	341.0	9,900	-	-	-	-
MU	WS	7.2	41.9	3	14	-	-	-
MU	Other	-	14.3	1,164	1,081	1,081	-	-
NC	All	-	-	2,310	595	595	-	-
OS	R	-	-	845	1,268	1,268	845	-
OS	Other	-	-	-	-	-	-	-
PC	CA	-	-	3,900	30,550	30,550	-	-
PC	FSR	-	357.0	9,686	25,809	25,809	-	-
PC	Other	-	399.0	3,857	25,622	25,622	-	-
RR	RRRD	0.021	-	-	-	-	-	-
RR	Other	1.3	-	-	-	-	-	-
RUR	H	0.021	-	-	-	-	-	-
RUR	C	0.002	-	-	-	-	-	-
RUR	J	0.085	-	-	-	-	-	-
RUR	RRRD	0.002	-	-	-	-	-	-
RUR	Other	0.002	-	-	-	-	-	-
SC	Other	-	-	-	-	-	-	-
SC	BRM	-	-	-	3,180	2,120	-	-
SC	D	-	-	3,500	-	-	-	-
SC	FRM	-	21.8	435	1,740	-	-	-
SC	MH	-	-	-	7,200	4,800	-	-
SC	MHF2	-	-	-	3,180	2,120	-	-
SP	TSDA (B, EC, ECO)	-	-	-	-	-	-	-
SP	TSDA (HIIP)	-	-	186	69	46	1,578	40
SP	TSDA (LMI)	-	-	720	205	184	-	148
SP	TSDA (Other)	-	-	388	144	80	-	84
SR	BBGC	5.0	-	13	3	-	-	-
SR	Other	-	-	-	-	-	-	-

Table 4.2.2.3-Assumed population, housing and employment exceptions (heritage)

ID	Description	GMZ	Ultimate population by dwelling					Ultimate employment by category				Comment
			Single (Urban)	Multiple	Rural Residential	Rural	Other	Retail	Service	Professional	Industrial	
24	Lot 1 on RP706700	269	0	0	0	0	0	0	1	0	0	vacant
25	Lot 1 on RP732245	255	0	0	0	0	0	32	66	62	0	hall
26	Lot 7 on RP703414	280	2.8	0	0	0	0	0	0	0	0	estimated
27	Lot 6 on T118301	221	2.8	0	0	0	0	0	0	0	0	USH
28	Lot 50 on T118105	267	2.8	0	0	0	0	0	0	0	0	USH
29	Lot 169 on T118105	269	2.8	0	0	0	0	0	0	0	0	USH
30	Lot 19 on RP701558	256	0	0	0	0	0	24	49	47	0	USH
31	Lot 1 on RP701861	460	0	0	0	0	0	3	7	6	0	estimated
32	Lot 18 on RP701558	256	0	0	0	0	0	24	50	47	0	estimated
33	Lot 204 on T118101	258	0	0	0	0	0	0	1	0	0	estimated
34	Lot 47 on T118117	258	0	0	0	0	0	0	1	0	0	Church
35	Lot 446 on CP886001	472	0	0	0	0	0	0	10	0	0	Church
36	Lot 42 on RP703374	268	0	0	0	0	0	14	29	27	0	estimated
37	Lot 202 on T118101	258	0	0	0	0	0	0	1	0	0	estimated
38	Lot 2 on RP860274	272	0	0	0	0	0	54	111	105	0	Church
39	Lot 41 on RP703374	268	0	0	0	0	0	14	29	27	0	estimated
40	Lot 203 on T118101	258	0	0	0	0	0	0	1	0	0	estimated
41	Lot 19 on RP745707	257	2.8	0	0	0	0	0	0	0	0	Church
42	Lot 32 on RP729858	233	2.8	0	0	0	0	0	0	0	0	USH
43	Lot 2 on RP707346	224	0	0	0	0	0	20	41	38	0	USH
44	Lot 263 on T1181	224	0	0	0	0	0	20	42	39	0	estimated
45	Lot 1 on RP701770	224	0	0	0	0	0	9	18	17	0	estimated
46	Lot 258 on T1181	224	0	0	0	0	0	20	42	39	0	estimated
47	Lot 3 on SP148258	224	0	0	0	0	0	25	53	50	0	estimated
48	Lot 1 on SP148258	224	0	0	0	0	0	40	82	78	0	estimated
49	Lot 2 on RP709172	226	2.8	0	0	0	0	0	0	0	0	estimated
50	Lot 52 on T11884	226	2.8	0	0	0	0	0	0	0	0	USH
51	Lot 65 on T11884	226	2.8	0	0	0	0	0	0	0	0	vacant
52	Lot 160 on T11884	226	2.8	0	0	0	0	0	0	0	0	USH
53	Lot 68 on T11884	226	2.8	0	0	0	0	0	0	0	0	USH
54	Lot 2 on RP702016	224	0	0	0	0	0	29	60	57	0	USH
55	Lot 32 on T11884	226	0	7.2	0	0	0	0	0	0	0	estimated
56	Lot 2 on RP733821	224	2.8	0	0	0	0	0	0	0	0	4 units

ID	Description	GMZ	Ultimate population by dwelling					Ultimate employment by category				Comment
			Single (Urban)	Multiple	Rural Residential	Rural	Other	Retail	Service	Professional	Industrial	
57	Lot 1 on RP722451	216	2.8	0	0	0	0	0	0	0	0	USH
58	Lot 2 on RP701633	216	2.8	0	0	0	0	0	0	0	0	USH
59	Lot 1 on RP702042	216	2.8	0	0	0	0	0	0	0	0	USH
60	Lot 2 on RP840903	216	0	0	0	0	0	0	1	0	0	USH
61	Lot 262 on T1181	224	0	0	0	0	0	20	41	38	0	Church
62	Lot 83 on T11884	227	2.8	0	0	0	0	0	0	0	0	estimated
63	Lot 137 on T11884	226	2.8	0	0	0	0	0	0	0	0	Vacant
64	Lot 14 on T118194	225	2.8	0	0	0	0	0	0	0	0	vacant
65	Lot 51 on T11884	226	2.8	0	0	0	0	0	0	0	0	USH
66	Lot 70 on T11884	226	2.8	0	0	0	0	0	0	0	0	USH
67	Lot 153 on T11884	226	2.8	0	0	0	0	0	0	0	0	USH
68	Lot 48 on T1187	224	2.8	0	0	0	0	0	0	0	0	USH
69	Lot 117 on RP703355	272	2.8	0	0	0	0	0	0	0	0	USH
70	Lot 118 on RP703355	272	2.8	0	0	0	0	0	0	0	0	USH
71	Lot 23 on RP703389	268	2.8	0	0	0	0	0	0	0	0	USH
72	Lot 2 on RP703361	272	2.8	0	0	0	0	0	0	0	0	USH
73	Lot 52 on RP706831	209	0	7.2	0	0	0	0	0	0	0	USH
74	Lot 176 on T11884	226	2.8	0	0	0	0	0	0	0	0	4 units
75	Lot 1 on RP708992	216	2.8	7.2	0	0	0	0	0	0	0	USH
76	Lot 4 on RP701633	216	2.8	0	0	0	0	0	0	0	0	4 units
77	Lot 1 on RP702085	216	2.8	0	0	0	0	0	0	0	0	USH
78	Lot 3 on RP702042	216	2.8	0	0	0	0	0	0	0	0	vacant
79	Lot 74 on T11813	216	0	0	0	0	0	0	1	0	0	KSQ Exception
80	Lot 1 on RP714466	212	2.8	0	0	0	0	0	0	0	0	Church
81	Lot 29 on RP701601	255	2.8	0	0	0	0	0	0	0	0	USH
82	Lot 16 on RP706831	209	2.8	0	0	0	0	0	2.8	0	0	1 USH
83	Lot 1 on RP716224	228	2.8	0	0	0	0	0	0	0	0	Boarding House
84	Lot 105 on T1186	222	2.8	0	0	0	0	0	0	0	0	USH
85	Lot 276 on T11868	265	0	0	0	0	0	0	1	0	0	USH
86	Lot 275 on T11868	265	0	0	0	0	0	0	1	0	0	Church
87	Lot 112 on SP130012	270	0	0	0	0	0	54	0	0	0	Church
88	Lot 48 on RP701649	254	2.8	0	0	0	0	0	0	0	0	Auction house
89	Lot 1 on RP718874	460	0	0	0	0	0	0	1	0	0	USH
90	Lot 15 on RP701784	222	2.8	0	0	0	0	0	0	0	0	Hall

ID	Description	GMZ	Ultimate population by dwelling					Ultimate employment by category				Comment
			Single (Urban)	Multiple	Rural Residential	Rural	Other	Retail	Service	Professional	Industrial	
91	Lot 169 on EP2263	255	2.8	0	0	0	0	0	2.8	0	0	USH
92	Lot 51 on RP701649	254	2.8	0	0	0	0	0	0	0	0	vacant
93	Lot 52 on RP701649	254	2.8	0	0	0	0	0	0	0	0	USH
94	Lot 102 on T11887	265	0	0	0	0	0	20	41	39	0	vacant
95	Lot 1 on RP727464	330	2.8	0	0	0	0	0	0	0	0	estimated
96	Lot 25 on RP703382	274	2.8	0	0	0	0	0	0	0	0	USH
97	Lot 4 on RP716211	474	2.8	0	0	0	0	0	0	0	0	USH
98	Lot 291 on RP703355	275	0	0	0	0	0	0	1	0	0	USH
99	Lot 292 on RP703355	275	0	0	0	0	0	0	1	0	0	Church
100	Lot 42 on RP703389	268	2.8	0	0	0	0	0	0	0	0	Church
101	Lot 172 on RP703399	279	2.8	0	0	0	0	0	0	0	0	USH
102	Lot 143 on RP703359	278	2.8	0	0	0	0	0	0	0	0	USH
103	Lot 296 on RP703355	275	0	0	0	0	0	0	1	0	0	USH
104	Lot 289 on RP703355	275	0	0	0	0	0	0	1	0	0	Church
105	Lot 290 on RP703355	275	0	0	0	0	0	0	1	0	0	Church
106	Lot 30 on RP703409	287	2.8	0	0	0	0	0	0	0	0	Church
107	Lot 183 on RP703359	278	2.8	0	0	0	0	0	0	0	0	USH
108	Lot 72 on RP703359	278	2.8	0	0	0	0	0	0	0	0	USH
109	Lot 182 on RP703359	278	2.8	0	0	0	0	0	0	0	0	USH
110	Lot 149 on RP703359	278	2.8	0	0	0	0	0	0	0	0	USH
111	Lot 165 on SP116238	278	2.8	0	0	0	0	0	0	0	0	USH
112	Lot 31 on RP703409	287	2.8	0	0	0	0	0	0	0	0	USH
113	Lot 148 on RP703359	278	2.8	0	0	0	0	0	0	0	0	USH
114	Lot 150 on RP703359	278	2.8	0	0	0	0	0	0	0	0	USH
115	Lot 4 on SP119505	370	2.8	0	0	0	0	0	0	0	0	USH
116	Lot 18 on RP701633	216	2.8	0	0	0	0	0	0	0	0	USH
117	Lot 2 on RP701662	217	0	0	0	0	0	13	28	26	0	FSE Exception
118	Lot 2 on RP701648	217	0	0	0	0	0	0	53	50	0	estimated
119	Lot 3 on SP123456	213	0	0	0	0	0	0	1	0	0	FSE Exception
120	Lot 1 on RP701648	217	0	0	0	0	0	1	1	0	0	Council Office
121	Lot 1 on RP701696	218	0	0	0	0	0	0	417	0	0	vacant
122	Lot 12 on T11840	216	2.8	0	0	0	0	0	0	0	0	KSQ Exception
123	Lot 2 on RP707340	217	0	0	0	0	0	10	20	19	0	USH
124	Lot 16 on RP707412	217	0	0	0	0	0	20	41	39	0	estimated

ID	Description	GMZ	Ultimate population by dwelling					Ultimate employment by category				Comment
			Single (Urban)	Multiple	Rural Residential	Rural	Other	Retail	Service	Professional	Industrial	
125	Lot 3 on RP710800	287	0	0	0	0	0	0	1	0	0	vacant
126	Lot 1 on RP701816	216	0	7.2	0	0	0	0	0	0	0	Hall
127	Lot 709 on SP135285	263	0	0	0	0	0	0	0	2	0	FSE Exception
128	Lot 24 on RP701633	216	2.8	0	0	0	0	0	0	0	0	vacant
129	Lot 72 on T11813	216	0	0	0	0	0	0	1	0	0	USH
130	Lot 1 on RP710504	225	2.8	0	0	0	0	0	0	0	0	Church
131	Lot 71 on T11813	216	0	0	0	0	0	0	1	0	0	USH
132	Lot 1 on RP701912	225	2.8	0	0	0	0	0	0	0	0	vacant
133	Lot 2 on RP701817	216	2.8	0	0	0	0	0	0	0	0	KSQ Exception
134	Lot 43 on RP703476	285	0	0	0	0	0	0	1	0	0	USH
135	Lot 6 on RP719055	317	2.8	0	0	0	0	0	0	0	0	Church
136	Lot 171 on T1181	217	0	0	0	0	0	20	31	29	0	FSE exception
137	Lot 171 on RP703537	332	2.8	0	0	0	0	0	0	0	0	estimated
138	Lot 2 on RP701659	217	0	0	0	0	0	5	12	11	0	USH
139	Lot 5 on T118604	218	0	0	0	0	0	0	100	0	0	estimated
140	Lot 20 on RP707272	217	0	0	0	0	0	10	16	15	0	estimated
141	Lot 4 on RP701778	252	2.8	0	0	0	0	0	0	0	0	estimated
142	Lot 2 on RP707272	217	0	0	0	0	0	9	14	14	0	USH
143	Lot 5 on RP701603	255	2.8	0	0	0	0	0	0	0	0	estimated
144	Lot 2 on RP725278	252	2.8	0	0	0	0	0	0	0	0	USH
145	Lot 37 on T11868	270	0	0	0	0	0	17	36	34	0	USH
146	Lot 3 on RP701778	252	2.8	0	0	0	0	0	0	0	0	estimated
147	Lot 11 on RP903759	218	0	0	0	0	0	20	41	39	0	USH
148	Lot 163 on T1181	217	0	0	0	0	0	20	31	29	0	estimated
149	Lot 2 on RP709895	217	0	1.8	0	0	0	6	0	0	0	estimated
150	Lot 2 on RP701721	217	0	0	0	0	0	10	15	14	0	1 Unit 1 shop
151	Lot 1 on RP701930	270	0	0	0	0	0	15	0	0	0	estimated
152	Lot 31 on T11860	217	0	0	0	0	0	10	15	14	0	Vacant
153	Lot 49 on RP703409	287	2.8	0	0	0	0	0	0	0	0	estimated
154	Lot 52 on RP703409	287	2.8	0	0	0	0	0	2.8	0	0	boarding house
155	Lot 1 on RP701721	217	0	0	0	0	0	10	15	14	0	boarding house
156	Lot CP on SP141326	219	0	10.8	0	0	0	0	0	0	0	Vacant
157	Lot 48 on RP703409	287	2.8	0	0	0	0	0	0	0	0	6 units
158	Lot 1 on RP712215	219	0	0	0	0	0	10	20	19	0	USH

ID	Description	GMZ	Ultimate population by dwelling					Ultimate employment by category				Comment
			Single (Urban)	Multiple	Rural Residential	Rural	Other	Retail	Service	Professional	Industrial	
159	Lot 2 on RP743712	321	2.8	0	0	0	0	0	0	0	0	School
160	Lot 6 on RP703442	291	2.8	0	0	0	0	0	0	0	0	USH
161	Lot 1 on RP708141	219	0	0	0	0	0	14	29	27	0	School
162	Lot 706 on SP112195	258	0	0	0	0	0	80	123	116	0	School
163	Lot 2 on RP709750	254	0	0	0	0	0	0	1	0	0	estimated
164	Lot 1 on RP714572	317	2.8	0	0	0	0	0	0	0	0	Church
165	Lot 2 on RP701742	219	0	0	0	0	0	3	7	6	0	USH
166	Lot 3 on RP709750	254	0	0	0	0	0	0	1	0	0	School
167	Lot 3 on RP712293	232	2.8	0	0	0	0	0	0	0	0	Church
168	Lot 169 on RP703537	332	2.8	0	0	0	0	0	0	0	0	USH
169	Lot 133 on T11884	226	2.8	0	0	0	0	0	0	0	0	USH
170	Lot 66 on T11884	226	2.8	0	0	0	0	0	0	0	0	USH
171	Lot 3 on RP701633	216	2.8	0	0	0	0	0	0	0	0	USH
172	Lot 2 on RP701632	216	2.8	0	0	0	0	0	0	0	0	USH
173	Lot 42 on RP703476	285	0	0	0	0	0	0	1	0	0	KSQ Exception
174	Lot 21 on T118288	220	2.8	0	0	0	0	0	0	0	0	Church
175	Lot 21 on T118638	265	0	0	0	0	0	0	0	0	63	Vacant
176	Lot 2 on RP748152	493	0	0	0	0	0	0	5	0	0	Transport Terminal
177	Lot 1 on RP865807	460	0	0	0	0	0	8	0	0	0	Racecourse
178	Lot 2 on RP701653	217	0	0	0	0	0	6	12	12	0	School
179	Lot 277 on T11868	265	0	0	0	0	0	0	1	0	0	School
180	Lot 3 on RP701665	217	0	0	0	0	0	8	18	17	0	FSE exception
181	Lot 170 on RP703537	332	2.8	0	0	0	0	0	0	0	0	Vacant
182	Lot 43 on RP703374	268	0	0	0	0	0	14	29	27	0	USH
183	Lot 2 on RP709434	256	0	0	0	0	0	0	1	0	0	estimated
184	Lot 3 on RP745504	230	2.8	0	0	0	0	0	0	0	0	Church
185	Lot 152 on T11884	226	0	3.6	0	0	0	0	0	0	0	USH
186	Lot 85 on T11884	227	2.8	0	0	0	0	0	0	0	0	2 Units
187	Lot 86 on T11884	227	2.8	0	0	0	0	0	0	0	0	USH
188	Lot 138 on T11884	226	2.8	0	0	0	0	0	0	0	0	USH
189	Lot 43 on RP703389	268	2.8	0	0	0	0	0	0	0	0	USH
190	Lot 4 on RP713165	224	0	0	0	0	0	17	35	33	0	USH
191	Lot 247 on EP2301	224	0	0	0	0	0	0	5	0	0	estimated
192	Lot 69 on T11884	226	2.8	0	0	0	0	0	0	0	0	Toobrook Pool

ID	Description	GMZ	Ultimate population by dwelling					Ultimate employment by category				Comment
			Single (Urban)	Multiple	Rural Residential	Rural	Other	Retail	Service	Professional	Industrial	
193	Lot 3 on RP703437	291	2.8	0	0	0	0	0	0	0	0	USH
194	Lot 7 on RP724203	293	2.8	0	0	0	0	0	0	0	0	boarding house
196	Lot 21 on RP906488	225	2.8	0	0	0	0	0	0	0	0	1 RSH
197	Lot 1 on RP739248	225	2.8	0	0	0	0	0	0	0	0	USH
198	Lot 71 on T11867	225	2.8	0	0	0	0	0	0	0	0	USH
199	Lot 1 on SP156441	216	2.8	0	0	0	0	0	0	0	0	KSQ Exception
200	Lot 2 on RP701818	216	0	5.4	0	0	0	0	0	0	0	USH
201	Lot 3 on RP701927	230	2.8	0	0	0	0	0	0	0	0	KSQ Exception
202	Lot 6 on T118212	217	0	0	0	0	0	16	33	31	0	FSE Exception
203	Lot 48 on T118117	258	0	0	0	0	0	0	1	0	0	FSE exception
204	Lot 46 on T118117	258	0	0	0	0	0	0	1	0	0	Church
205	Lot 1 on RP701632	216	2.8	0	0	0	0	0	0	0	0	Church
206	Lot 73 on T11813	216	0	0	0	0	0	0	1	0	0	USH
207	Lot 1 on RP719858	225	2.8	0	0	0	0	0	0	0	0	Church
208	Lot 2 on RP715005	268	0	0	0	0	0	1	0	0	0	FSE exception
209	Lot 1 on RP735183	217	0	0	0	0	0	35	73	69	0	shop
210	Lot 1 on RP708807	226	2.8	0	0	0	0	0	0	0	0	Vacant
211	Lot 53 on T11884	226	2.8	0	0	0	0	0	0	0	0	USH
212	Lot 2 on RP707023	225	0	5.4	0	0	0	0	0	0	0	USH
213	Lot 15 on T11840	216	2.8	0	0	0	0	0	0	0	0	3 units
214	Lot 9 on RP701633	216	2.8	0	0	0	0	0	0	0	0	included in GM
215	Lot 1 on RP717329	225	2.8	0	0	0	0	0	0	0	0	USH
216	Lot 2 on RP702042	216	2.8	0	0	0	0	0	0	0	0	1 USH
217	Lot 1 on RP701812	216	2.8	0	0	0	0	0	0	0	0	vacant
218	Lot 13 on T11840	216	2.8	0	0	0	0	0	0	0	0	USH
219	Lot 3 on SP172355	209	0	0	0	0	0	0	10	0	0	USH
220	Lot 1 on SP172355	209	0	0	0	0	0	0	10	0	0	Hotel
221	Lot 160 on EP708	209	2.8	0	0	0	0	0	0	0	0	Hotel
222	Lot 2 on SP172355	209	0	0	0	0	0	0	10	0	0	1 USH
223	Lot 158 on T118105	269	2.8	0	0	0	0	0	0	0	0	Hotel
224	Lot 99 on T118105	267	2.8	0	0	0	0	0	0	0	0	USH
225	Lot 2 on RP745103	267	2.8	0	0	0	0	0	0	0	0	USH
226	Lot 320 on T11823	214	0	0	0	0	0	20	41	39	0	USH
227	Lot 4 on RP701770	224	0	0	0	0	0	13	27	25	0	estimated

ID	Description	GMZ	Ultimate population by dwelling					Ultimate employment by category				Comment
			Single (Urban)	Multiple	Rural Residential	Rural	Other	Retail	Service	Professional	Industrial	
228	Lot 203 on T11823	460	2.8	0	0	0	0	0	0	0	0	estimated
229	Lot 2 on RP701770	224	0	0	0	0	0	9	19	18	0	USH
230	Lot 3 on RP701770	224	0	0	0	0	0	8	16	15	0	estimated
231	Lot 1 on RP748513	234	0	0	0	0	0	0	0	0	15	estimated
232	Lot 44 on RP703476	285	0	0	0	0	0	0	1	0	0	Furniture Manufacturer
233	Lot 3 on RP701851	460	2.8	0	0	0	0	0	0	0	0	Church
234	Lot 1 on RP712482	267	0	5.4	0	0	0	0	0	0	0	USH
235	Lot 32 on RP703409	287	2.8	0	0	0	0	0	0	0	0	3 units
236	Lot 51 on SP126582	278	0	0	0	0	0	3	0	0	0	School
237	Lot 28 on T118117	258	2.8	0	0	0	0	0	0	0	0	Shop
238	Lot 1 on RP715489	209	0	7.2	0	0	0	0	0	0	0	vacant
239	Lot 2 on T118125	226	2.8	0	0	0	0	0	0	0	0	4 units
240	Lot 75 on T118105	267	0	0	0	0	0	0	1	0	0	USH
241	Lot 87 on T118105	267	0	0	0	0	0	0	1	0	0	Church
242	Lot 72 on T118105	267	0	0	0	0	0	0	1	0	0	Church
243	Lot 88 on T118105	267	0	0	0	0	0	0	1	0	0	Church
244	Lot 71 on T118105	267	0	0	0	0	0	0	1	0	0	Church
245	Lot 74 on T118105	267	0	0	0	0	0	0	1	0	0	Church
246	Lot 73 on T118105	267	0	0	0	0	0	0	1	0	0	Church
247	Lot 89 on T118105	267	0	0	0	0	0	0	1	0	0	Church
248	Lot 90 on T118105	267	0	0	0	0	0	0	1	0	0	Church
249	Lot 37 on T11813	224	0	0	0	0	0	20	41	39	0	vacant
250	Lot 18 on T11840	216	0	9	0	0	0	0	0	0	0	estimated
251	Lot 55 on T11813	216	2.8	0	0	0	0	0	0	0	0	5 units
252	Lot 1 on RP701662	217	0	0	0	0	0	6	13	13	0	FSE exception
253	Lot 2 on RP725371	459	0	0	0	2.8	0	0	0	0	0	estimated
254	Lot 156 on T118192	249	0	0	0	0	0	0	1	0	0	School
255	Lot 157 on T118192	249	0	0	0	0	0	0	1	0	0	Church
256	Lot 202 on CP895209	211	2.8	0	0	0	0	0	0	0	0	Church
257	Lot 43 on T11868	270	0	0	0	0	0	20	41	39	0	School
258	Lot 35 on T11868	270	0	0	0	0	0	20	41	39	0	estimated
259	Lot 1 on RP701722	254	2.8	0	0	0	0	0	0	0	0	Vacant
260	Lot 219 on T1181	218	0	0	0	0	0	20	41	39	0	USH
261	Lot 2 on RP701959	265	2.8	0	0	0	0	0	0	0	0	estimated

ID	Description	GMZ	Ultimate population by dwelling					Ultimate employment by category				Comment
			Single (Urban)	Multiple	Rural Residential	Rural	Other	Retail	Service	Professional	Industrial	
262	Lot 23 on RP745734	219	0	0	0	0	0	10	20	19	0	Vacant
263	Lot 6 on RP745498	254	2.8	0	0	0	0	0	0	0	0	School
264	Lot 219 on T1186	228	2.8	0	0	0	0	0	0	0	0	USH
265	Lot 36 on T11868	270	0	0	0	0	0	7	0	0	0	USH
266	Lot 1 on RP709895	217	0	1.8	0	0	0	6	0	0	0	restaurant
267	Lot 33 on T11860	217	0	0	0	0	0	10	20	19	0	1 Unit 1 shop
268	Lot 170 on EP2263	255	2.8	0	0	0	0	0	2.8	0	0	estimated
269	Lot 105 on RP703355	272	2.8	0	0	0	0	0	0	0	0	Boarding House
270	Lot 1 on RP738946	179	0	3.6	0	0	0	0	0	0	0	USH
271	Lot 401 on P8363	100	2.8	0	0	0	0	0	0	0	0	2 Units
272	Lot 633 on EP1908	243	0	0	0	0	0	0	0	200	0	1 USH
273	Lot 254 on T11869	252	2.8	0	0	0	0	0	0	0	0	office
274	Lot 4 on SP120464	267	2.8	0	0	0	0	0	0	0	0	USH
275	Lot 63 on RP748781	209	0	0	0	0	0	0	6	0	0	USH
276	Lot 1 on RP739077	460	0	0	0	0	0	86	0	0	0	Alma Den
277	Lot 304 on T11823	460	0	0	0	0	0	0	1	0	0	estimated
278	Lot 319 on T11823	214	0	0	0	0	0	0	1	0	0	Church
279	Lot 1 on SP188739	260	2.8	0	0	0	0	0	0	0	0	Prison
280	Lot 1 on SP229803	214	0	0	0	0	0	49	75	71	0	USH
281	Lot 1 on RP726632	459	0	0	0	2.8	0	0	0	0	0	KSQ Exception
281	Lot 1 on RP726632	459	0	0	0	2.8	0	0	0	0	0	KSQ Exception
282	Lot 294 on RP703355	275	0	0	0	0	0	0	1	0	0	vacant
283	Lot 295 on RP703355	275	0	0	0	0	0	0	1	0	0	Church
284	Lot 4 on CWL812290	100	0	0	0	0	0	0	1	0	0	Church
285	Lot 123 on RP703476	285	2.8	0	0	0	0	0	0	0	0	Church
286	Lot 122 on RP703476	285	2.8	0	0	0	0	0	0	0	0	USH
287	Lot 14 on T11834	460	2.8	0	0	0	0	0	0	0	0	USH
288	Lot 293 on RP703355	275	0	0	0	0	0	0	1	0	0	USH
289	Lot 15 on T11834	460	2.8	0	0	0	0	0	0	0	0	Vacant
290	Lot 3 on RP882869	129	0	0	0	0	0	0	1	0	0	USH
291	Lot 4 on RP736178	123	0	0	2.8	0	0	0	0	0	0	Church
292	Lot 4 on RP736178	123	0	0	2.8	0	0	0	0	0	0	USH
293	Lot 203 on P8363	100	2.8	0	0	0	0	0	0	0	0	Vacant
294	Lot 89 on CWL1621	100	0	0	0	0	0	0	5	0	0	USH

ID	Description	GMZ	Ultimate population by dwelling					Ultimate employment by category				Comment
			Single (Urban)	Multiple	Rural Residential	Rural	Other	Retail	Service	Professional	Industrial	
295	Lot 308 on P8363	100	2.8	0	0	0	0	0	0	0	0	School (Paluma)
296	Lot 2 on RP716527	217	0	0	0	0	0	14	29	27	0	Masonic Lodge
297	Lot 44 on T118114	231	2.8	0	0	0	0	0	0	0	0	estimated
298	Lot 43 on T118114	231	2.8	0	0	0	0	0	0	0	0	USH
299	Lot 491 on E12463	393	0	0	0	0	0	0	1	0	0	Vacant
300	Lot 3 on RP721229	230	2.8	0	0	0	0	0	0	0	0	Church
301	Lot 2 on RP882869	129	0	0	0	0	0	0	1	0	0	vacant
302	Lot CP on SP175565	462	2.8	0	0	0	0	0	0	0	0	FSE exception
303	Lot 2 on RP709839	462	2.8	0	0	0	0	0	0	0	0	FSE exception
304	Lot 323 on T118105	270	0	0	0	0	0	20	41	39	0	FSE exception
305	Lot 181 on T1181	219	0	0	0	0	0	20	41	39	0	School
306	Lot 16 on P83615	100	2.8	0	0	0	0	0	0	0	0	water tank vacant
307	Lot 6 on P8366	100	2.8	0	0	0	0	0	0	0	0	1 USH
308	Lot 1 on P8363	100	2.8	0	0	0	0	0	0	0	0	USH
309	Lot 41 on T11884	226	2.8	0	0	0	0	0	0	0	0	Old school Horseshoe Bay Vacant
310	Lot 132 on T11888	234	2.8	0	0	0	0	0	0	0	0	vacant
311	Lot 2 on RP718721	217	0	0	0	0	0	0	23	22	0	USH
312	Lot 1 on RP701927	230	2.8	0	0	0	0	0	0	0	0	vacant
313	Lot 182 on T1181	219	0	0	0	0	0	20	41	39	0	USH
314	Lot 6 on P8368	100	2.8	0	0	0	0	0	0	0	0	estimated
315	Lot 2 on RP717551	283	2.8	0	0	0	0	0	0	0	0	USH
316	Lot 3 on RP701722	254	2.8	0	0	0	0	0	0	0	0	USH
317	Lot 2 on SP123456	213	0	0	0	0	0	0	1	0	0	USH
318	Lot 33 on RP703409	287	2.8	0	0	0	0	0	0	0	0	Church
319	Lot 2 on RP701722	254	2.8	0	0	0	0	0	0	0	0	USH
320	Lot 6 on RP706869	223	0	7.2	0	0	0	0	0	0	0	USH
321	Lot 47 on RP701649	254	2.8	0	0	0	0	0	0	0	0	4 units
322	Lot 2 on RP710003	224	0	0	0	0	0	0	1	0	0	USH
323	Lot 2 on RP701606	255	2.8	0	0	0	0	0	0	0	0	Church
324	Lot 1 on RP743522	178	2.8	0	0	0	0	0	0	0	0	Vacant
325	Lot 102 on B9031	107	2.8	0	0	0	0	0	0	0	0	USH
326	Lot 2 on SP212760	217	0	0	0	0	0	11	23	21	0	USH
327	Lot 9 on T118290	258	0	0	0	0	0	16	24	23	0	Vacant
328	Lot 1 on RP723447	466	0	0	0	0	0	0	0	0	4	estimated
329	Lot 1 on SP239094	100	2.8	0	0	0	0	0	0	0	0	Sewerage Treatment Plant Mt St John)

ID	Description	GMZ	Ultimate population by dwelling					Ultimate employment by category				Comment
			Single (Urban)	Multiple	Rural Residential	Rural	Other	Retail	Service	Professional	Industrial	
330	Lot 1 on RP716539	225	2.8	0	0	0	0	0	0	0	0	USH
331	Lot 5 on RP711405	284	2.8	0	0	0	0	0	0	0	0	FSR and HSR exceptions
332	Lot 716 on T118501	217	0	0	0	0	0	0	306	0	0	Vacant
333	Lot 453 on EP1600	217	0	0	0	0	0	0	1	0	0	Courthouse
334	Lot CP on SP222359	217	0	0	0	0	0	36	75	71	0	Vacant
335	Lot 224 on RP713516	252	0	0	0	0	0	0	30	0	0	vacant
336	Lot 16 on SP236486	225	2.8	0	0	0	0	0	0	0	0	Green Street SES

Table 4.2.2.4-Assumed population, housing and employment exceptions (special cases)

Description	GMZ	Ultimate population by dwelling					Ultimate employment by category				
		Single (Urban)	Multiple	Rural Res.	Rural	Other	Retail	Service	Professional	Industrial	Other
Breakwater	215	73	2,129	0	0	3	134	1,800	79	0	17
Breakwater	461	46	434	0	0	117	6	10	8	2	4
North Ward Hospital site	225	0	365	0	0	0	115	135	103	0	3
JCU Discovery Rise	385	4,424	1,267	0	0	838	70	2,383	106	0	3
Hospital	510	14	0	0	0	0	0	700	47	5	0
Hospital	511	6	4	0	0	36	26	4,720	77	16	0
Port	261	0	0	0	0	0	0	0	0	500	0
Port	262	0	0	0	0	0	0	0	0	0	0
Port	264	0	0	0	0	0	0	0	0	500	0
Port	266	0	0	0	0	0	0	0	0	360	0
QNI	194	0	0	0	0	0	13	3	300	1,497	5
Defence land RAAF	247	0	0	0	0	100	0	0	0	0	800
Defence Lavarack	375	70	4	0	0	2000	22	147	5,200	56	143
Airport	246	0	0	0	0	0	118	208	693	500	30
Rocky Springs	457	27692	0	0	0	0	1860	6482	3301	83	277
Rocky Springs	206	1,812	0	0	0	0	99	190	179	0	18
Flinders Street East	462	0	0	0	0	0	400	620	590	0	0
Honeycombes' Development	214	0	1080	0	0	0	132	163	154	0	9
Historic Rail Station	219	0	0	0	0	0	0	121	115	0	0
Kings Street Quarter	462	0	1161	0	0	0	936	2522	2382	0	9
Dean Park Car Park	270	0	0	0	0	0	27	196	11	108	18
South Townsville Rail Yards	277	0	0	0	0	0	116	823	46	452	75

Click here to view PDF high resolution map - Special Exceptions

Figure 4.2.2.1 - Location of areas 'exception' to the land use zones and precinct assumptions

Table 4.2.2.5-Delayed start date for growth associated with preliminary approvals

Application	Development	Description	GMZ	Start Date
MI13/0020	Sanctum West	master planned community (4,750 residential lots, etc)		2021
MI14/0011	Wingate	Approx. 1,500 residential lots		2026
MI10/0026	Willowbend	Approx. 350 residential lots		2028
MI07/0092	Rocky Springs	master planned community (12,500 residential lots, etc)	206, 457	2018

Table 4.2.2.6-Residential dwelling and non-residential floor space assumption summary

Column 1 Description		Column 2 - Assumptions				
		2016	2021	2026	2031	Ultimate
Housing	Single	63,616	64,745	69,130	75,742	111,270
	Multiple dwelling	16,101	16,403	17,533	19,378	48,402
	Other	1,720	1,719	1,736	1,756	3,137
	Total	81,437	82,867	88,399	96,876	162,809
Non-residential floor space (m2 GFA)	Retail	477,555	497,438	525,820	581,788	2,821,490
	Services	559,105	584,707	626,738	692,812	2,184,806
	Professional	408,480	427,538	458,868	507,606	1,591,110
	Industrial	1,903,644	1,997,210	2,165,521	2,392,768	8,872,650
	Other	55,183	57,242	60,897	67,247	438,460
	Total	3,403,968	3,564,135	3,837,844	4,242,222	15,908,516

Table 4.2.2.7-Education assumptions summary

Column 1 Description		Column 2 - Assumptions					
		2011	2016	2021	2026	2031	Ultimate
Education enrolments	Pre-primary	18,730	19,615	20,807	21,926	18,730	25,662
	Secondary	12,904	13,514	14,335	15,200	12,904	17,948
	Tertiary	14,574	15,292	16,484	17,950	14,574	19,269
	Total	46,208	48,421	51,627	55,076	46,208	62,879

Editor's note—Student enrolments are also a critical aspect of infrastructure planning, so their assumptions and projections have been made in addition, and supplementary to, the statutory requirements of the LGIP.

(5) Detailed assumptions about future development for each projection area and LGIP development type are identified in the following tables in Schedule 3 - Local government infrastructure plan mapping and tables:

(a) Table SC3.1.3 - Existing and projected residential dwellings;

(b) Table SC3.1.4 - Existing and projected non-residential floor space; and

(c) Table SC3.1.5 - Existing and projected education enrolments.

Editor's note—More detailed projections by growth model zone areas are available in the extrinsic material. Projections are based on the Townsville Growth Model (18.5.2016), moderated to provide for an earlier start for Rocky Springs, and a later start for Mt Low Developments.

4.2.3 Infrastructure demand

(1) The demand generation rate for a trunk infrastructure network is stated in Column 4 of Table SC3.1.6a and Table SC3.1.6b, Schedule 3, Local government infrastructure plan mapping and tables.

These rates are for land which is, respectively, less than or greater than thresholds of size that represent infill or broad-hectare development that correlate with the development assumptions in section 4.2.2.

(2) The service catchments are identified in Schedule 3 Local government infrastructure plan mapping and tables, SC3.3.3 – Service area maps. They are also shown in finer detail in the plans for trunk infrastructure[1].

(3) A summary of the projected infrastructure demand for each service catchment is stated in Table 4.2.3.1 to Table 4.2.3.5.

[1] This is different to the LGIP template. Reference to the service catchment maps are made here rather than from the tables.

Table 4.2.3.1 - Water supply demand summary

Service area	Water supply demand (EP)				
	2016	2021	2026	2031	Ultimate
Central, urban	210,037	214,828	230,569	254,890	467,939
Central, non-urban	23,585	23,767	24,404	25,413	32,722
Cungulla	435	445	463	495	881
Magnetic Island, urban	4,962	5,202	5,450	5,453	9,358
Magnetic Island, non-urban	179	185	191	191	224
Paluma (non-urban)	141	142	142	142	155
Total	239,339	244,568	261,218	286,583	511,280

Table 4.2.3.2 - Sewerage demand summary

Service area	Sewerage demand (EP)				
	2016	2021	2026	2031	Ultimate
Central, urban	220,721	226,001	242,452	267,766	497,853
Central, non-urban	1,043	1,079	1,290	1,560	4,222
Magnetic Island, urban	5,038	5,280	5,529	5,533	9656
Magnetic Island, non-urban	-	-	-	-	
Toomulla	259	259	259	260	308
Total	227,062	232,619	249,531	275,118	512,039

Table 4.2.3.3 - Roads demand summary

Service area	Roads demand (Trip ends/d)				
	2016	2021	2026	2031	Ultimate
Central, urban	1,124,537	1,163,691	1,248,463	1,378,885	3,699,153
Central, non-urban	47,091	48,219	52,660	59,109	130,450
Magnetic Island, urban	18,103	18,900	19,608	19,681	46,047
Magnetic Island, non-urban	680	700	718	719	843
Rural	60,233	61,279	62,445	64,000	217,080
Total	1,250,644	1,292,789	1,383,895	1,522,394	4,093,574

Table 4.2.3.4 - Pathways demand summary

Service area	Pathways demand (Trip ends/d)				
	2016	2021	2026	2031	Ultimate
Urban	51,219	52,810	56,498	61,452	95,298
Non-urban	-	-	-	-	-
Total	51,219	52,810	56,498	61,452	95,298

Table 4.2.3.5 - Parks and land for community facilities demand summary

Service area	Parks etc demand (ERP)				
	2016	2021	2026	2031	Ultimate
Urban	166,484	174,658	189,687	209,041	359,605
Non-urban	25,631	27,112	27,402	28,341	44,741
Total	192,115	201,770	217,089	237,382	404,346

4.3 Priority infrastructure area

(1) The priority infrastructure area identifies the area prioritised for the provision of trunk infrastructure to service the existing and assumed future urban development up to 2031.

(2) The priority infrastructure area is identified in Schedule 3 - Local government infrastructure plan mapping and tables, SC3.3.4 - Priority infrastructure area map.

4.4 Desired standards of service

(1) This section states the key standards of performance for a trunk infrastructure network.

(2) Details of the standard of service for a trunk infrastructure networks are identified in the extrinsic material.

4.4.1 Water supply network

The water supply desired standards of service is to:

(1) Ensure drinking water complies with the National Health and Medical Research Council (NHMRC) Australian drinking water guidelines for colour, turbidity and microbiology.

(2) Collect, store, treat and convey potable water from source to consumers in accordance with the *Water Act 2000*.

(3) Minimise non-revenue water loss.

(4) Design the water supply network in accordance with council's adopted standards identified in the planning scheme to provide:

- (a) average day consumption (AD) – 600 l/EP/day;
- (b) minimum and maximum supply pressure of 220 kPa and 800 kPa at each property boundary; and
- (c) fire flow for residential (15 l/s for 2 hours), industrial and commercial (30 l/s for 4 hours) development.

(5) Ensure water systems meet the requirements of the *Water Supply (Safety and Reliability) Act 2008*.

4.4.2 Sewerage network

The sewerage desired standards of service is to:

(1) Provide a reliable network that collects, stores, transports, treats and releases sewerage from premises.

(2) Design the sewerage network in accordance with:

- (a) council's adopted standards identified in the planning scheme;
- (b) Water Services Association of Australia (WSAA) guidelines;
- (c) the *Water Act 2000*;
- (d) the requirements of the *Water Supply (Safety and Reliability) Act 2008*;
- (e) all Environment Protection (EPA) legislation, regulations and licence conditions; and
- (f) key design parameters identified in Table 4.4.2.1.

Table 4.4.2.1 - Key design parameters for the sewerage network

Infrastructure item	Design parameters
All (network)	average dry weather flow (ADWF) - 230 l/EP/day peak wet weather flow (PWWF) - 5 x ADWF or C1 x ADWF (whichever is larger). C1 = $15x(EP)^{-0.1587}$
Pump stations	emergency storage of 6 hrs @ ADWF in pump stations and contributing gravity sewer catchments. installed large pump capacity - PWWF installed small pump capacity - 2 x ADWF
Gravity sewers	air space of at least 30% of pipe diameter at design flow slope to achieve self-cleansing velocity
Rising mains	minimum velocity for small pump: 0.5 m/s minimum velocity for large pump: 0.75 m/s maximum velocity: 2.5 m/s
Sewerage treatment/release	existing and future DEHP licence conditions, Recycled Water Management Plan requirements, EPBC requirements, biosolids guidelines and other relevant state and federal government guidelines and legislation.

The above table provides a summary of a few of the key design parameters for the sewage network. Reference should be made to the full council planning and design standards in the relevant planning scheme code and policy along with

other nominated standards, guidelines and legalisation for the planning and design of sewerage networks.

4.4.3 Roads network

The roads desired standards of service is to:

(1) Provide a functional, safe and efficient road hierarchy that supports settlement patterns, commercial and economic activities, and freight movement.

(2) Design the road network to comply with the following:

(a) adopted standards identified in the planning scheme, and where deficient: the Department of Transport and Main Roads' Interim Guide to Road Planning and Design or the AUSTROADS guides;

(b) maximum road volume to capacity ratios (Table 4.4.3.1); and

(c) maximum degree of saturation for intersections (Table 4.4.3.2).

Table 4.4.3.1 - Maximum volume to capacity ratios for the road network

Infrastructure item	Maximum volume to capacity ratio by land use	
	Residential	Non-residential
Arterial	0.75	0.75
Sub-arterial	0.75	0.75
Major collector	0.75	0.75
Arterial (state-controlled)	0.75	0.75

Table 4.4.3.2 - Maximum degree of saturation for road intersections

Road network item	Maximum degree of saturation
Traffic signals	0.8
Roundabout	0.8
Priority controlled	0.8
Traffic signals (state-controlled)	0.8

4.4.4 Footpaths and cycleways network

The footpaths and cycleways desired standards of service is to:

(1) Provide a safe, attractive and convenient network that links residential areas to major activity nodes and public transport interchanges, thereby encouraging walking and cycling as acceptable travel alternatives; and

(2) Comply with council's adopted standards identified in the planning scheme, and Table 4.4.4.1.

Table 4.4.4.1 - Key footpath and cycleway design characteristics

Characteristic	Description
Coherence	Continuity of routes, consistent quality of routes and facilities, easy to follow, freedom of choice of routes.
Directness	Efficient operating speed, minimal delay times on commuting routes, avoid detour effects.
Safety	Minimal risk of accidents, conflict with motorised traffic or exposure to unsafe infrastructure.
Attractiveness	Lighting, personal safety, aesthetics, integration with surrounding area, access to different activities.
Comfort	Smooth, skid resistant surfaces, gentle gradients, minimal obstructions, minimal need to stop, minimal complicated movements, protection from adverse weather, journey facilities (e.g. seats, shade, drinking fountains).

4.4.5 Public parks and land for community facilities network

The parks and land for community facilities DSS is to:

(1) Provide an accessible network of parks, open space, and opportunities for co-located community facilities that meets the needs of residents and visitors in accordance with the rate of provision identified in Table 4.4.5.1 and accessibility standards outlined in Table 4.4.5.2.

(2) Ensure land for public parks and community facilities has:

(a) minimum land size as identified in Table 4.4.5.3;

(b) configuration, slope, and acceptable level of flood immunity in accordance with adopted standards identified in Table 4.4.5.3; and

(c) embellish public parks to complement the type and purpose of the public park as identified in Table 4.4.5.4.

Table 4.4.5.1 - Park provision

Infrastructure	Rate of provision (m^2/ERP)	
	District	Regional
Recreation parks	4	6
Sports parks	12	5

Table 4.4.5.2 - Park access

Infrastructure	Accessibility standard (km)	
	District	Regional
Recreation parks	2	25
Sports parks	5	10

Table 4.4.5.3 - Land characteristics

Infrastructure	Recreation parks		Sports parks	
	District	Regional	District	Regional
Minimum usable size (ha)	2	6	3	10
Average (desired) size (ha)	4	13	6	18
Shape of land	Preferred square or rectangular aspect ratio no greater than 2:1		To maximise area available for playing fields, a square or rectangle is most efficient	
Minimum desired flood immunity	20% of total area to be above Q50, 10% to be above Q100	50% of total area to be above Q50, 20% to be above Q100	Free of hazards. Fields and courts above Q50. Built facilities above Q100	
Maximum desired grade	Average grade of 1:14 for 50% of site		1:80 for all playing surfaces. Laser levelling to a maximum gradient of 1:100	
Road frontage and visibility	50% of park perimeter to have direct road frontage, preferably on a collector road		Approximately 25-50% of the park perimeter to have direct road frontage	

Table 4.4.5.4 - Standard facilities/embellishments for trunk public parks

Embellishment type	Recreation parks		Sport parks	
	District	Regional	District	Regional
Playground	✓	✓		
Half-basketball court	✓	✓		
Re-bound wall	✓	✓		
Skate facility	✓	✓		
Exercise equipment	✓	✓		
Fencing – bollards or log and rail to prohibit car access	✓	✓	✓	✓
Shade trees clustered near activity areas	✓	✓	✓	✓
Turf	✓	✓	✓	✓
Landscaped garden beds	✓	✓	✓	✓
Irrigation	✓	✓	✓	✓
Lighting	✓	✓	✓	✓
Internal pathways and paving	✓	✓	✓	✓
Bicycle racks	✓	✓	✓	✓
Signage	✓	✓	✓	✓
Shade structures	✓	✓	✓	✓
Tap/bubbler	✓	✓	✓	✓
Bench seating	✓	✓	✓	✓
Electric barbeque	✓	✓		
Picnic shelters	✓	✓	✓	✓
Bins	✓	✓	✓	✓
Dog off-leash areas	✓	✓		
Toilets	✓	✓	✓	✓
Internal roads and car parking		✓	✓	✓
Clubhouse			✓	✓
Spectator facilities			✓	✓
Sports fields			✓	✓
Sports courts			✓	✓

4.5 Plans for trunk infrastructure

(1) The plans for trunk infrastructure identify the trunk infrastructure networks intended to service the existing and assumed future urban development at the desired standard of service up to 2031.

4.5.1 Plans for trunk infrastructure maps

(1) The existing and future trunk infrastructure networks are shown on the following maps in Schedule 3-Local government infrastructure plan mapping and tables:

(a) SC3.3.5 - Plans for trunk water supply infrastructure;

(b) SC3.3.6 - Plans for trunk sewerage infrastructure;

(c) SC3.3.7 - Plans for trunk roads infrastructure;

(d) SC3.3.8 - Plan for trunk footpaths and cycleways infrastructure;

(e) SC3.3.9 - Plan for trunk parks and land for community facilities infrastructure.

(2) The State infrastructure forming part of transport trunk infrastructure network has been identified using information provided by the relevant State infrastructure supplier.

4.5.2 Schedules of works

(1) Details of the existing and future trunk infrastructure networks are identified in the electronic Excel schedule of works model which can be viewed here: (Click here).

(2) The future trunk infrastructure is identified in the following tables in Schedule 3-Local government infrastructure plan mapping and tables:

(a) for the water supply network, Table SC3.3.5.1

(b) for the sewerage network, Table SC3.3.6.1

(c) for the road network, Table SC3.3.7.1

(d) for the footpath and cycleway network, Table SC3.3.8.1

(e) for the parks and land for community facilities network, Table SC3.3.9.1

Editor's note—Extrinsic material

The below table identifies the documents that assist in the interpretation of the local government infrastructure plan and are extrinsic material under the *Statutory Instruments Act 1992*.

List of extrinsic material

Column 1 **Title of document**	**Column 2** **Date**	**Column 3** **Author**
Local government infrastructure plan - Interim Amendment 2019 - Explanatory Note	15.11.19	D. Irwin
Local government infrastructure plan - 2019 SOW model EXCEL spreadsheet. Townsville City Council	15.11.19	D. Irwin
LGIP projections and densities 2019. EXCEL spreadsheet. Townsville City Council	27.9.19	D. Irwin
Local government infrastructure plan – planning assumptions & PIA. Townsville City Council. (Superseded LGIP)	11.4.17	D. Irwin
Local government infrastructure plan – DSS, definitions and demand. Townsville City Council. (Superseded LGIP)	11.4.17	D. Irwin
Local government infrastructure plan – PFTI. Townsville City Council. (Superseded LGIP)	11.4.17	D. Irwin
Local government infrastructure plan – alignment with the long term financial plan. Townsville City Council. (Superseded LGIP)	11.4.17	D. Irwin
Local government infrastructure plan – SOW model user manual. Townsville City Council. (Superseded LGIP)	11.4.17	D. Irwin
LGIP projections and densities. EXCEL spreadsheet. Townsville City Council (Superseded LGIP)	11.4.17	D. Irwin

PIP water infrastructure planning summary of water supply strategies. DPM Water Pty Ltd report for Townsville City Council. (37386545) (Superseded LGIP)	2013	DPM Water Pty Ltd
PIP sewer infrastructure planning summary of sewer strategies. DPM Water Pty Ltd report for Townsville City Council (37386503) (Superseded LGIP)	Jan 2013	DPM Water Pty Ltd
Townsville City Council road network planning report . Townsville City Council (78587969).	Nov 2014	B. Bailey
Townsville City Council report for footpath and cycleway network for priority infrastructure plans. Townsville City Council (37384255).	Jan 2013	B. Bailey
Townsville City Council parks planning report (94191754)	14.3.17	D. Irwin

4.6 Definitions

This local government infrastructure plan has been prepared as part of a planning scheme compliant with the Queensland Planning Provisions version 3.0, 17 February 2013. As such, terms defined elsewhere in the planning scheme are applicable here. In addition, the following terms also apply.

Table 4.6.1 - Zoning code abbreviations

Note – these are not a complete list, but are relevant to the tables elsewhere in this local government infrastructure plan and relate to zones described in the planning scheme.

Abbreviation	Zoning
CF	Community Facilities
CR	Character Residential
DC	District Centre
EC	Emerging Communities
HDR	High Density Residential
HII	High Impact Industry
LC	Local Centre
LDR	Low Density Residential
LII	Low Impact Industry
MC	Major Centre
MDR	Medium Density Residential
MII	Medium Impact Industry
MU	Mixed Use
NC	Neighbourhood Centre
OS	Open Space
PC	Principal Centre
RR	Rural Residential
RUR	Rural
SC	Specialised Centre
SR	Sport and Recreation

Table 4.6.2 - Precinct code abbreviations

Note - these are not a complete list, but are relevant to the tables elsewhere in this local government infrastructure plan and relate to precincts described in the planning scheme, or growth model precincts identified in the extrinsic material.

Abbreviation	Precinct
AC	Arcadia Central
ACC	Aitkenvale Centre Core
ACF	Aitkenvale Centre Frame
AMC	Aitkenvale Major Centre
AMD	Aitkenvale Medium Density
AV	Aitkenvale Village
BBCG	Balgal Beach Golf Course
BRM	Bayswater Road Medical - Mixed use precinct
C	Cungulla
CA	Civic Administration
CBDG	Sturt Street Gateway
CTR	Charters Towers Road Business - Mixed Use precinct
D	Domain Central (growth model precinct)
FRM	Fulham Road Medical (growth model precinct)
FSR	Flinders Street Retail
H	Horticulture
HPMC	Hyde Park Major Centre

Abbreviation	Precinct
HPMD	Hyde Park Medium Density
J	Jensen
KR	Kings Road
KT	Kirwan Traders
MCF1	Major Centre Fringe 1 (growth model precinct)
MCF2	Major Center Fringe 2 (growth model precinct)
MCF3	Major Center Fringe 3 (growth model precinct)
MCNS	Major Center North Shore (growth model precinct)
MH	Mater Hospital (growth model precinct)
MHF1	Mater Hospital Frame 1 (growth model precinct)
MHF2	Mater Hospital Frame 2 (growth model precinct)
NBG	Nelly Bay Gateway
NBT	Nelly Bay Tourist
NWV	North Ward Villages
PB	Picnic Bay
PS	Palmer Street
R	Riverway
RRRC	Ross River Road Corridor (growth model precinct)
RRRD	Rural Residential Ross Dam (growth model precinct)
S	The Strand
STRD	South Townsville Rail yards and Dean Park
TCMC	Thuringowa Central Major Centre
TSDA	Townsville State Development Area (model precinct)
WS	Wotton Street

Table 4.6.3 - Sub-precinct code abbreviations

Note - these are not a complete list, but are relevant to the tables elsewhere in this local government infrastructure plan and relate to sub-precincts described in the planning scheme, or growth model precincts identified in the extrinsic material.

Abbreviation	Sub-precinct
BP	Buffer (TSDA) – (growth model precinct)
ECP	Environmental Conservation (TSDA) – (growth model precinct)
ECOP	Ecological Corridor & Offsets (TSDA) – (growth model precinct)
HIIP	High Impact Industry (TSDA) – (growth model precinct)
LMI	Low Medium Impact Industry (TSDA) – (growth model precinct)
TCS	Thuringowa Centre Support
TD	Thuringowa Drive

Part 5 Tables of assessment

5.1 Preliminary

The tables in this part identify the category of development, and the category of assessment and assessment benchmarks for assessable development in the planning scheme area.

5.2 Reading the tables

The tables identify the following:

(1) The category of development:

- (a) prohibited;
- (b) accepted, including accepted with requirements; and
- (c) assessable development: that requires code or impact assessment

(2) The category of assessment - code or impact - for assessable development in:

- (a) a zone and, where used, a precinct or sub-precinct of a zone;
- (b) an overlay where used.

(3) the assessment benchmarks for assessable development and requirements for accepted development, including:

- (a) whether a zone code or specific provisions in the zone code apply (shown in the 'assessment benchmarks for assessable development and requirements for accepted development' column);
- (b) if there is an overlay:
  - (i) whether an overlay code applies (shown in Table 5.9.1); or
  - (ii) whether the assessment benchmarks as shown on the overlay map (noted in the 'assessment benchmarks for assessable development and requirements for accepted development' column) applies;
- (c) any other applicable code(s) (shown in the 'assessment benchmarks for assessable development and requirements for accepted development' column).
- (d) any requirements for accepted development which will need to be met in order for the development to remain accepted.

(4) any variation to the category of assessment (shown as an 'if' in the 'Categories of development and assessment' column) that applies to the development.

Note—Development will only be taken to be prohibited development under the planning scheme if it is identified as prohibited development in schedule 10 of the Regulation.

Editor's note—Examples of matters that can vary the categories of development and assessment are gross floor area, height, numbers of people or precinct provisions.

5.3 Categories of development and assessment

5.3.1 Process for determining the category of development and the category of assessment for assessable development

The process for determining a category of development and category of assessment is:

(1) for a material change of use, establish the use by reference to the use definitions in Schedule 1;

(2) for all development, identify the following:

(a) the zone or zone precinct that applies to the premises, by reference to the zone map in Schedule 2;

Editor's note—Local plans are not used in this planning scheme.

(b) if an overlay applies to the premises, by reference to the overlay map in Schedule 2;

(3) determine if the development is accepted development under schedule 6 of the Regulation.

Editor's note—Schedule 6 of the Regulation prescribes development that a planning scheme can not state is assessable development where the matters identified in the schedule are met.

(4) if the development is not regulated by the Regulation, determine the initial level of assessment by reference to the tables in:

- section 5.5 Categories of development and assessment -Material change of use,
- section 5.6 Categories of development and assessment -Reconfiguring a lot,
- section 5.7 Categories of development and assessment -Building work,
- section 5.8 Categories of development and assessment -Operational work;

(5) a precinct of a zone may change the categories of development and assessment and this will be shown in the 'categories of development and assessment' column of each of the tables in sections 5.5, 5.6, 5.7, and 5.8;

(6) if an overlay applies, refer to section 5.9 Categories of development and assessment-Overlays, to determine if the overlay further changes the category of development or assessment;

5.3.2 Determining the category of development and categories of assessment

(1) A material change of use is assessable development:

(a) unless the tables in section 5.5 Categories of development and assessment state otherwise;

(b) if a use is not listed or defined in the tables in section 5.5 Categories of development and assessment;

(c) unless otherwise prescribed within the Act or the Regulation.

(2) Reconfiguring a lot is assessable development requiring code assessment unless the tables in section 5.6 Categories of development and assessment state otherwise or unless otherwise prescribed within the Act or the Regulation.

(3) Building work and operational work are accepted development, unless the tables in sections 5.7 and 5.8 Categories of development and assessment state otherwise or unless otherwise prescribed within the Act or the Regulation.

(4) Where an aspect of development is proposed on premises included in more than one zone or overlay, category of development and assessment for that aspect is the highest category for each aspect of the development under each of the applicable zones or overlays.

(5) Where development is proposed on premises partly affected by an overlay, the category of development for assessment for the overlay only relates to the part of the premises affected by the overlay.

(6) For the purposes of Schedule 6, Part 2 Material change of use section (2)(2)(d)(i) or (ii) of the Regulation, an overlay does not apply to the premises if the development meets the acceptable outcomes that form the requirements for accepted development in the relevant overlay code.

(7) If development is identified as having a different category of development or category of assessment under a zone than under an overlay, the highest category of development or assessment applies as follows:

(a) accepted development subject to requirements prevails over accepted development;

(b) code assessment prevails over accepted development where subject to requirements and accepted

development;

(c) impact assessment prevails over code assessment, accepted development where subject to requirements and accepted development.

(8) Provisions of Part 10 may override any of the above.

(9) The category of development prescribed under schedule 6 of the Regulation overrides all other categories of development or assessment for that development under the planning scheme to the extent of any inconsistency.

(10) Despite all of the above, if development is listed as prohibited development under schedule 10 of the Regulation, a development application cannot be made.

Editor's note - Schedule 7 of the Regulation also identifies development that the state categorises as accepted development. Some development in the schedule may still be made assessable under the planning scheme.

Note—Development is to be taken to be prohibited development under the planning scheme only if it is identified in schedule 10 of the Regulations.

5.3.3 Determining the requirements for accepted development and assessment benchmarks and other matters for assessable development

(1) Accepted development does not require a development approval and is not subject to assessment benchmarks. However, certain requirements or variations may apply to some types of development for it to be accepted development. Where nominated in the categories of development and assessment, accepted development (where stated as 'accepted development subject to requirements') must comply with the requirements contained in the identified assessment benchmark(s) as identified in the 'assessment benchmarks for assessable development and requirements for accepted development' column.

(2) Accepted development that does not comply with one or more of the requirements of an identified assessment benchmark, becomes code assessable development unless otherwise specified in the Categories or development and assessment column.

(3) The following rules apply in determining assessment benchmarks for each category of development and assessment.

Development subject to code assessment:

(a) is to be assessed against all the assessment benchmark(s) identified in the assessment benchmarks for assessable development and requirements for accepted development column;

(b) that occurs as a result of development becoming subject to code assessment pursuant to sub-section 5.3.3(2), must:

(i) be assessed against the assessment benchmark(s) for the development application, limited to the subject matter of the accepted development assessment benchmark(s) acceptable outcomes that were not complied with or were not capable of being complied with under sub-section 5.3.3(2);

(ii) comply with all required acceptable outcomes of the assessment benchmarks identified in sub-section 5.3.3(1), other than those mentioned in sub-section 5.3.3(2);

(c) that complies with:

(i) the purpose and overall outcomes of the code complies with the code;

(ii) the performance or acceptable outcomes complies with the purpose and overall outcomes of the code;

(d) must be assessed against any assessment benchmarks for the development identified in section 30 of the Regulation.

Development subject to Impact assessment:

(a) is to be assessed against the identified assessment benchmarks in the assessment benchmarks column (where relevant);

(b) assessment is to have regard to the whole of the planning scheme, to the extent relevant; and

(c) is to be be assessed against any assessment benchmarks for the development identified in section 30

of the Regulation.

Note—The first row of each of the assessment benchmarks is to be checked to confirm if there are assessment benchmarks that commonly apply to general scenarios in the zone or overlay.

Editor's note— Section 31 of the Regulation identifies the matters that impact assessment must have regard to.

5.4 Regulated categories of development and categories of assessment prescribed by the Regulation

Editor's note— The following schedules of the Regulation are relevant to the Townsville Planning Scheme:

- Schedule 6, Part 2, 6 of the Regulation, Material change of use for community residence
- Schedule 13 of the Regulation, Requirements for cropping involving forestry for wood production
- Schedule 12 of the Regulation, Particular reconfiguring a lot requiring code assessment

And other parts of the Regulation may also be relevant.

5.5 Categories of development and assessment - Material change of use

The following tables identify the categories of development and assessment and the corresponding assessment benchmarks for assessable development and accepted development for development in a zone for making a material change of use.

Table 5.5.1 - Low density residential zone

Low density residential zone code Low density residential zone code Low density residential zone code

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Dwelling unit **Editor's note—**This category of development and assessment may be altered by the Water resource catchment, Flood hazard, Coastal environment and Landslide hazard overlays. Refer to Table 5.9.1. Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Dwelling house **Editor's note—**This level of assessment may be altered by the Water resource catchment, Flood hazard, Coastal environment and Landside hazard overlays. Refer to Table 5.9.1.	**Accepted development**	
	If not a Secondary dwelling	
	Accepted development subject to requirements	
	If a Secondary dwelling	**Low density residential zone code**
Dual occupancy **Editor's note—**This category of development and assessment may be altered by the Water resource catchment, Flood hazard, Coastal environment and Landslide hazard overlays. Refer to Table 5.9.1.	**Accepted development**	
	If not in the Stables precinct	No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply

Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
Caretaker's accommodation	**Accepted development subject to requirements**	
	If located in the Stables precinct and associated with a stables use on the same site.	Low density residential zone code Works code
	Assessable development - Code-assessment	
	If: (a) not Accepted development subject to requirements; and (b) in the Stables precinct.	Low density residential zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Sales office	**Accepted development subject to requirements**	
		Low density residential zone code
Animal keeping **Editor's note—**Council's local laws also establish requirements regarding the keeping of animals.	**Accepted development subject to requirements**	
	If a stable and in the Stables precinct	Low density residential zone code
Home based business	**Accepted development subject to requirements**	
	If: (a) the gross floor area does not exceed 60m²; and (b) the use is contained within an existing domestic outbuilding or dwelling.	Low density residential zone code
Emergency services	**Assessable development - Code assessment**	
		Low density residential zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.2 - Medium density residential zone

Medium density residential zone code Medium density residential zone code Medium density residential zone code

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Dual occupancy Dwelling unit **Editor's note—**This category of development and assessment may be altered by the Water resource catchment, Flood hazard, Coastal environment and Landslide hazard overlays. Refer to Table 5.9.1. Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Dwelling house **Editor's note—**This level of assessment may be altered by the Water resource catchment, Flood hazard, Coastal environment and Landside hazard overlays. Refer to Table 5.9.1.	**Accepted development**	
	If not a Secondary dwelling	
	Accepted development subject to requirements	
	If a Secondary dwelling	Medium density residential zone code
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
Sales office	**Accepted development subject to requirements**	
		Medium density residential zone code
Home based business	**Accepted development subject to requirements**	
	If: (a) the gross floor area does not exceed 60m²; and (b) the use is contained within an existing domestic outbuilding or dwelling.	Medium density residential zone code
	Assessable development - Code assessment	

Community use Food and drink outlet	If: (a) in the Picnic Bay precinct, Nelly Bay tourist precinct, North Ward villages precinct, Hyde Park medium density precinct, The Strand precinct or the Aitkenvale village precinct; and (b) the use is located on the ground floor.	Medium density residential zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Health care services Office Service industry Shop	**Assessable development - Code assessment**	
	If: (a) in the Picnic Bay precinct, Nelly Bay tourist precinct, North Ward villages precinct, Hyde Park medium density precinct or the Aitkenvale village precinct; (b) the gross floor area does not exceed 250m²; (c) the use is located on the ground floor; and (d) fronting Gregory Street where in the North Ward villages precinct. **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing use and the additional gross floor area forming part of the development application.	Medium density residential zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Multiple dwelling Residential care facility Retirement facility Rooming accommodation Short-term accommodation	**Assessable development - Code assessment**	
	If building height does not exceed the number of storeys applicable in Table 5.5.3	Medium density residential zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Community care centre Emergency services	**Assessable development - Code assessment**	
		Medium density residential zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the caterories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Thuringowa South precinct

Table 5.5.3-Assessable development - Code assessment building height thresholds for the Medium density residential zone

Location	Number of storeys
Thuringowa South precinct	5 storeys where on a site fronting Riverway Drive 3 storeys otherwise

Thuringowa East precinct

Table 5.5.3-Assessable development - Code assessment building height thresholds for the Medium density residential zone

Location	Number of storeys
Thuringowa East precinct	3 storeys where on a site fronting Jenkins Street or Garner Road 5 storeys otherwise

Rossiter Park precinct

Table 5.5.3-Assessable development - Code assessment building height thresholds for the Medium density residential zone

Location	Number of storeys
Rossiter Park precinct	6 storeys

Aitkenvale medium density precinct

Table 5.5.3-Assessable development - Code assessment building height thresholds for the Medium density residential zone

Location	Number of storeys
Aitkenvale medium density precinct	5 storeys

Aitkenvale village precinct

Table 5.5.3-Assessable development - Code assessment building height thresholds for the Medium density residential zone

Location	Number of storeys
Aitkenvale village precinct	5 storeys

Hyde Park medium density precinct

Table 5.5.3-Assessable development - Code assessment building height thresholds for the Medium density residential zone

Location	Number of storeys
Hyde Park medium density precinct	5 storeys

Kings Road medium density precinct

Table 5.5.3-Assessable development - Code assessment building height thresholds for the Medium density residential zone

Location	Number of storeys
Kings Road medium density precinct	5 storeys

The Strand precinct

Table 5.5.3-Assessable development - Code assessment building height thresholds for the Medium density residential zone

Location	Number of storeys
The Strand precinct	5 storeys

North Ward Gateway precinct

Table 5.5.3-Assessable development - Code assessment building height thresholds for the Medium density residential zone

Location	Number of storeys
North Ward gateway precinct	8 storeys

North Ward villages precinct

Table 5.5.3-Assessable development - Code assessment building height thresholds for the Medium density residential zone

Location	Number of storeys
North Ward villages precinct	8 storeys

North Ward medium density precinct

Table 5.5.3-Assessable development - Code assessment building height thresholds for the Medium density residential zone

Location	Number of storeys
North Ward medium density precinct	5 storeys

Magnetic Island medium density precinct

Table 5.5.3-Assessable development - Code assessment building height thresholds for the Medium density residential zone

Location	Number of storeys
Magnetic Island medium density precinct	2 storeys

Picnic Bay precinct

Table 5.5.3-Assessable development - Code assessment building height thresholds for the Medium density residential zone

Location	Number of storeys
Picnic Bay precinct	2 storeys

Nelly Bay tourist precinct

Table 5.5.3-Assessable development - Code assessment building height thresholds for the Medium density residential zone

Location	Number of storeys
Nelly Bay tourist precinct	4 storeys

Wills Street precinct

Table 5.5.3-Assessable development - Code assessment building height thresholds for the Medium density residential zone

Location	Number of storeys
Wills Street precinct	4 storeys

Where not in a precinct or in a precinct not listed above

Table 5.5.3-Assessable development - Code assessment building height thresholds for the Medium density residential zone

Location	Number of storeys
Where not in a precinct or in a precinct not listed in Table 5.5.3	3 storeys

Table 5.5.4 - High density residential zone

High density residential zone code High density residential zone code High density residential zone code

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Dual occupancy Dwelling unit **Editor's note—**This category of development and assessment may be altered by the Water resource catchment, Flood hazard, Coastal environment and Landslide hazard overlays. Refer to Table 5.9.1. Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Dwelling house **Editor's note—**This level of assessment may be altered by the Water resource catchment, Flood hazard, Coastal environment and Landslide hazard overlays. Refer to Table 5.9.1.	**Accepted development**	
	If not a Secondary dwelling	
	Accepted development subject to requirements	
	If a Secondary dwelling	High density residential zone code
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
Sales office	**Accepted development subject to requirements**	
		High density residential zone code
Home based business	**Accepted development subject to requirements**	
	If: (a) the gross floor area does not exceed 60m²; and (b) the use is contained within an existing domestic outbuilding or dwelling.	High density residential zone code
Educational establishment	**Accepted development subject to requirements**	
	If: (a) in the Flinders Street West precinct; (b) within an existing building; and (c) not involving more than minor building work.	High density residential zone code Works code
	Assessable development - Code assessment	

	Otherwise	High density residential zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Child care centre Community use Health care services Office Service industry Shop	**Assessable development - Code assessment**	
	If: (a) the gross floor area does not exceed 250m²; and (b) the use is located on the ground floor. **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing use and the additional gross floor area forming part of the development application.	High density residential zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Bar	**Assessable development - Code assessment**	
	If the use is located on the ground or the first floor levels.	High density residential zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Food and drink outlet	**Assessable development - Code assessment**	
	If: (a) the use is located on the ground or the first floor levels; and (b) the use does not involve a drive through facility.	High density residential zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Multiple dwelling Residential care facility Resort complex Retirement facility Rooming accommodation Short-term accommodation	**Assessable development - Code assessment**	
	If building height does not exceed 12 storeys	High density residential zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Community care centre Emergency services Function facility Market	**Assessable development - Code assessment**	
		High density residential zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.5 - Rural residential zone

Rural residential zone code Rural residential zone code Rural residential zone code

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Landing **Editor's note–**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Dwelling house **Editor's note–**This level of assessment may be altered by the Water resource catchment, Flood hazard, Coastal environment and Landslide hazard overlays. Refer to Table 5.9.1.	**Accepted development**	
	If not a Secondary dwelling	
	Accepted development subject to requirements	
	If a Secondary dwelling	Rural residential zone code
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
Cropping	**Accepted development**	
	If the area of cropping does not exceed 100m²	No assessment benchmarks apply
	Assessable development - Code assessment	
	Otherwise	Rural residential zone code
Roadside stall Sales office	**Accepted development subject to requirements**	
		Rural residential zone code
Home based business	**Accepted development subject to requirements**	
	If: (a) the gross floor area does not exceed 60m²; and (b) the use is contained within an existing domestic outbuilding or dwelling.	Rural residential zone code
Animal keeping **Editor's note–**Council's local laws also establish requirements regarding the keeping of animals.	**Accepted development subject to requirements**	
	If not a cattery or kennel	Rural residential zone code
	Assessable development - Code assessment	

Emergency services		Rural residential zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.6 - Character residential zone

Character residential zone code Character residential zone code Character residential zone code

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Editor's note-Building in the Character residential zone may be made assessable under the table of assessment for building work. Refer to Table 5.7.1. Dual occupancy **Editor's note—**This category of development and assessment may also be altered by the Water resource catchment, Flood hazard, Coastal environment and Landslide hazard overlays. Refer to Table 5.9.1. Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Dwelling house **Editor's note—**This level of assessment may be altered by the Water resource catchment, Flood hazard, Coastal environment and Landslide hazard overlays. Refer to Table 5.9.1.	**Accepted development**	
	If not a Secondary dwelling	
	Accepted development subject to requirements	
	If a Secondary dwelling	Character residential zone code
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
Home based business	**Accepted development subject to requirements**	
	If: (a) the gross floor area does not exceed 60m²; and (b) the use is contained within an existing domestic outbuilding or dwelling.	Character residential zone code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.7 - Neighbourhood centre zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Home based business Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
Caretaker's accommodation Child care centre Community care centre Community use Dwelling unit Emergency services	**Accepted development subject to requirements**	
	If in an existing building and not involving more than minor building work	Neighbourhood centre zone code Works code
	Assessable development - Code assessment	
	Otherwise	Neighbourhood centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Food and drink outlet	**Accepted development subject to requirements**	
	If: (a) in an existing building and not involving more than minor building work; and (b) where not involving a drive through facility.	Neighbourhood centre zone code Works code
	Assessable development - Code assessment	
	If: (a) not accepted development subject to requirements; and (b) the gross floor area does not exceed 500m^2; and (c) where not involving a drive through facility **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing centre and the additional gross floor area forming part of the development application.	Neighbourhood centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Accepted development subject to requirements	

Health care services Office Sales office Service industry Shop Shopping centre Veterinary services	If in an existing building and not involving more than minor building work	Neighbourhood centre zone code Works code
	Assessable development - Code assessment	
	If: (a) not accepted development subject to requirements; and (b) the gross floor area does not exceed 500m^2. **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing centre and the additional gross floor area forming part of the development application.	Neighbourhood centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Club Educational establishment Indoor sport and recreation	**Assessable development - Code assessment**	
	If the gross floor area does not exceed 500m^2 **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing centre and the additional gross floor area forming part of the development application.	Neighbourhood centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Community residence Market Multiple dwelling Rooming accommodation Short-term accommodation	**Assessable development - Code assessment**	
		Neighbourhood centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use		The planning scheme

Editor's note-The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.8 - Local centre zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Home based business Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
Caretaker's accommodation Child care centre Community care centre Community residence Community use Dwelling unit Emergency services Multiple dwelling Place of worship Rooming accommodation Sales office Short-term accommodation	**Accepted development subject to requirements**	
	If in an existing building and not involving more than minor building work	Local centre zone code Works code
	Assessable development - Code assessment	
	Otherwise	Local centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Adult store Health care services Office Market Shop Shopping centre Service industry Veterinary services	**Accepted development subject to requirements**	
	If in an existing building and not involving more than minor building work	Local centre zone code Works code
	Assessable development - Code assessment	
	If: (a) not accepted development subject to requirements; and (b) the gross floor area does not exceed 1000m^2. **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing centre and the additional gross floor area forming part of the development application.	Local centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Accepted development subject to requirements	
	If: (a) in an existing building and not involving more than minor building work; and (b) where not involving a drive through facility.	Local centre zone code Works code
	Assessable development - Code assessment	

Food and drink outlet	If: (a) not accepted development subject to requirements; and (b) the gross floor area does not exceed 1000m^2; and (c) where not involving a drive through facility. **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing centre and the additional gross floor area forming part of the development application.	Local centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Club Educational establishment Indoor sport and recreation	**Accepted development subject to requirements**	
	If in an existing building and not involving more than minor building work	Local centre zone code Works code
	Assessable development - Code assessment	
	If: (a) not accepted development subject to requirements; and (b) gross floor area does not exceed 500m². **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing centre and the additional gross floor area forming part of the development application.	Local centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Bar Function facility Hotel	**Assessable development - Code assessment**	
	If in the North Ward local centre precinct	Local centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.9 - District centre zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Home based business Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
	Assessable development - Code assessment	
	Otherwise	District centre zone code Telecommunications facilities and utilities code Healthy waters code Landscape code Transport impact, access and parking code Works code
Bar Car wash Caretaker's accommodation Child care centre Community care centre Community residence Community use Club Dwelling unit Educational establishment Emergency services Health care services Hotel Function facility Funeral parlour Indoor sport and recreation Market Multiple dwelling Place of worship Retirement facility Rooming accommodation Sales office Service station Short-term accommodation Veterinary services	**Accepted development subject to requirements**	
	If in an existing building and not involving more than minor building work	District centre zone code Works code
	Assessable development - Code assessment	
	Otherwise	District centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Accepted development subject to requirements	

Adult store Food and drink outlet Office Shop Shopping centre Service industry	If in an existing building and not involving more than minor building work	District centre zone code Works code
	Assessable development - Code assessment	
	If: (a) not accepted development subject to requirements; and (b) the gross floor area does not exceed 4,200m2. **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing centre and the additional gross floor area forming part of the development application.	District centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Garden centre Hardware and trade supplies Showroom	**Accepted development subject to requirements**	
	If in an existing building and not involving more than minor building work	District centre zone code Works code
	Assessable development - Code assessment	
	If not not accepted development subject to requirements and: (a) in the Idalia district centre precinct; or (b) not in the Idalia district centre precinct and the gross floor area does not exceed 3,500m2. **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing centre and the additional gross floor area forming part of the development application.	District centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Parking station	**Assessable development - Code assessment**	
		District centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.10 - Major centre zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Home based business Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
	Assessable development - Code assessment	
	Otherwise	Major centre zone code Telecommunications facilities and utilities code Healthy waters code Landscape code Transport impact, access and parking code Works code
Bar Car wash	**Accepted development subject to requirements**	
	If in an existing building and not involving more than minor building work	Major centre zone code Works code
	Assessable development - Code assessment	

Caretaker's accommodation Child care centre Community care centre Community residence Community use Club Dwelling unit Educational establishment Emergency services Health care services Hotel Function facility Indoor sport and recreation Market Multiple dwelling Place of worship Retirement facility Rooming accommodation Sales office Service station Short-term accommodation Theatre Veterinary services	Otherwise	Major centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Adult store Food and drink outlet Office Showroom Service industry	**Accepted development subject to requirements**	
	If in an existing building and not involving more than minor building work	Major centre zone code Works code
	Assessable development - Code assessment	
	If: (a) not accepted development subject to requirements; and (b) the gross floor area does not exceed 6,000m^2. **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing centre and the additional gross floor area forming part of the development application.	Major centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Accepted development subject to requirements	
	If: (a) in an existing building and not involving more than minor building work; and (b) not in the Thuringowa centre support sub-precinct.	Major centre zone code Works code

Shop Shopping centre	**Assessable development - Code assessment**	
	If: (a) not accepted development subject to requirements; (b) not in the Thuringowa centre support sub-precinct; and (c) the gross floor area does not exceed 6,000m^2. **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing centre and the additional gross floor area forming part of the development application.	Major centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Parking station	**Assessable development - Code assessment**	
		Major centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.11 - Principal centre (CBD) zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Home based business Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
	Assessable development - Code assessment	
	Otherwise	Principal centre (CBD) zone code Telecommunications facilities and utilities code Healthy waters code Landscape code Transport impact, access and parking code Works code
Adult store Bar Caretaker's accommodation Child care centre Community care centre	**Accepted development subject to requirements**	
	If in an existing building and not involving more than minor building work	Works code
	Assessable development - Code assessment	

Community residence Community use Club Dwelling unit Educational establishment Emergency services Food and drink outlet Function facility Health care services Hotel Indoor sport and recreation Market Office Place of worship Rooming accommodation Sales office Shop Shopping centre Showroom Service industry Service station Theatre Veterinary services	If not accepted development subject to requirements and: (a) not in the Civic and administration precinct; or (b) in the Civic and administration precinct and the proposed building height is 8 storeys or less.	Principal centre (CBD) zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Multiple dwelling Retirement facility Short-term accommodation	**Accepted development subject to requirements**	
	If: (a) not located at ground floor level; and (b) within an existing building and not involving more than minor building work.	Principal centre (CBD) zone code Works code
	Assessable development - Code assessment	
	If not located at ground floor level and: (a) not in the Civic and administration precinct; or (b) in the Civic and administration precinct and the building height is 8 storeys or less.	Principal centre (CBD) zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Nightclub entertainment facility	**Accepted development subject to requirements**	
	If: (a) in the Flinders Street East precinct; and (b) within an existing building and not involving more than minor building work.	Works code
	Assessable development - Code assessment	
	Otherwise	Principal centre (CBD) zone code Healthy waters code Landscape code Transport impact, access and parking code Works code

Assessable development - Impact assessment	
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.	The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.12 - Specialised centre zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Home based business Landing **Editor's note–**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
	Assessable development - Code assessment	
	If: (a) not accepted; and (b) not in the James Cook University-Townsville Hospital precinct, Fulham Road medical precinct or Bayswater Road medical precinct.	Specialised centre zone code Telecommunications facilities and utilities code Healthy waters code Landscape code Transport impact, access and parking code Works code
Caretaker's accommodation Child care centre Community care centre Community use Dwelling unit Emergency services Indoor sport and recreation Sales office	**Accepted development subject to requirements**	
	If within an existing building and not involving more than minor building work	Works code
	Assessable development - Code assessment	
	Otherwise	Specialised centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Community residence	**Assessable development - Code assessment**	
	If in the Bayswater Road medical precinct or the Fulham Road medical precinct	Specialised centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Assessable development - Code assessment	

Bar Club Food and drink outlet Market Service industry	If: (a) not in the James Cook University-Townsville Hospital precinct and the gross floor area does not exceed 250m^2; or (b) if in the James Cook University-Townsville Hospital precinct and the gross floor area does not exceed 1,000m². **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing centre and the additional gross floor area forming part of the development application.	Specialised centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Shop Shopping centre	**Assessable development - Code assessment**	
	If in the James Cook University - Townsville Hospital precinct and the gross floor area does not exceed 1,000m² **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing centre and the additional gross floor area forming part of the development application.	Specialised centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Educational establishment Health care services Multiple dwelling Place of worship Research and technology industry Residential care facility Retirement facility Rooming accommodation Short-term accommodation	**Assessable development - Code assessment**	
	If in the James Cook University-Townsville Hospital precinct, Bayswater Road medical precinct or Fulham Road medical precinct	Specialised centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Outdoor sport and recreation	**Assessable development - Code assessment**	
	If in the James Cook University-Townsville Hospital precinct	Specialised centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Garden centre Hardware and trade supplies Showroom	**Assessable development - Code assessment**	
	If in the Domain Central precinct	Specialised centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Assessable development - Code assessment	

Parking station		Specialised centre zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the level of assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Editor's note—Development of James Cook University (Douglas Campus), which is undertaken in terms of a Ministerial Designation, does not fall within the regulatory jurisdiction of the Townsville City Plan.

Table 5.5.13 - Mixed use zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Home based business Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
Bar Caretaker's accommodation Child care centre Club Community care centre Community use Dwelling unit Educational establishment Emergency services Food and drink outlet Funeral parlour Health care services Indoor sport and recreation Low impact industry Market Place of worship Sales office Service industry Veterinary services	**Accepted development subject to requirements**	
	If within an existing building and not involving more than minor building work	Mixed use zone code Works code
	Assessable development - Code assessment	
	Otherwise	Mixed use zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Function facility	**Accepted development subject to requirements**	
	If: (a) in the Magnetic Island villages precinct, Nelly Bay gateway precinct, Arcadia Central precinct, South Townsville Railyards and Dean Park precinct, King Street quarter precinct or Breakwater precinct; and (b) in an existing building and not involving more than minor building work.	Mixed use zone code Works code
	Assessable development - Code assessment	

	If: (a) not accepted development subject to requirements; and (b) located in the Magnetic Island villages precinct, Nelly Bay gateway precinct, Arcadia Central precinct, South Townsville Railywards and Dean Park precinct, King Street quarter precinct or Breakwater precinct.	Mixed use zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Community residence Multiple dwelling Retirement facility Rooming accommodation Short-term accommodation	**Accepted development subject to requirements**	
	If: (a) not in the Charters Towers Road business precinct, CBD gateway precinct or Wotton Street precinct; and (b) within an existing building and not involving more than minor building work.	Mixed use zone code Works code
	Assessable development - Code assessment	
	If: (a) not accepted development subject to requirements; and (b) not in the Charters Towers Road business precinct, CBD gateway precinct or Wotton Street precinct.	Mixed use zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Adult store Office Shop Shopping centre	**Accepted development subject to requirements**	
	If: (a) within an existing building and not involving more than minor building work; and (b) the gross floor area does not exceed 500m^2.	Mixed use zone code Works code
	Assessable development - Code assessment	
	If: (a) not accepted development subject to requirements; and (b) the gross floor area does not exceed 1,000m^2. **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing use and the additional gross floor area forming part of the development application.	Mixed use zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Accepted development subject to requirements	

Hardware and trade supplies Showroom	If: (a) not in the Breakwater precinct; (b) within an existing building and not involving more than minor building work; and (c) the gross floor area does not exceed 500m^2.	Mixed use zone code Works code
	Assessable development - Code assessment	
	If: (a) not accepted development subject to requirements; (b) not in the Breakwater precinct; and (c) the gross floor area does not exceed 1,500m². **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing use and the additional gross floor area forming part of the development application.	Mixed use zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Car wash Garden centre Outdoor sales Parking station Service station	**Assessable development - Code assessment**	
	If not in the Breakwater precinct	Mixed use zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Major sport recreation and entertainment facility Outdoor sport and recreation	**Assessable development - Code assessment**	
	If in the South Townsville Railyards and Dean Park precinct	Mixed use zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Hotel	**Assessable development - Code assessment**	
		Mixed use zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.14 - Sport and recreation zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Dwelling house Dual occupancy **Editor's note—**This category of development and assessment may also be altered by the Water resource catchment, Flood hazard, Coastal environment and Landslide hazard overlays. Refer to Table 5.9.1.	**Accepted development**	
	If in the Balgal Beach golf course precinct	No assessment benchmarks apply
Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
	Assessable development - Code assessment	
	Otherwise	Sport and recreation zone code Telecommunications facilities and utilities code Healthy waters code Landscape code Transport impact, access and parking code Works code
Caretaker's accommodation	**Accepted development subject to requirements**	
		Sport and recreation zone code Works code
Community use Outdoor sport and recreation	**Accepted development subject to requirements**	
	If provided by a public sector entity	Sport and recreation zone code Works code
	Assessable development - Code assessment	
	Otherwise	Sport and recreation zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Accepted development subject to requirements	
	If provided by a public sector entity	Sport and recreation zone code Works code
	Assessable development - Code assessment	

Major sport, recreation and entertainment facility	If: (a) not accepted development subject to requirements; and (b) for a racecourse (horses) or ancillary activities in the Cluden precinct.	Sport and recreation zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Bar Club Shop	**Assessable development - Code assessment**	
	If the gross floor area does not exceed 250m² **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing use and the additional gross floor area forming part of the development application.	Sport and recreation zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Food and drink outlet	**Assessable development - Code assessment**	
	If: (a) the gross floor area does not exceed 250m²; and (b) where not involving a drive through facility. **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing use and the additional gross floor area forming part of the development application.	Sport and recreation zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Child care centre Community care centre Educational establishment Emergency services Function facility Health care services Indoor sport and recreation Market	**Assessable development - Code assessment**	
		Sport and recreation zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Motor sport facility	**Assessable development - Code assessment**	
	If located in the Lansdown motor sport facility precinct	Sport and recreation zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.15 - Open space zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
Community use Outdoor sport and recreation	**Accepted development subject to requirements**	
	If provided by a public sector entity	Open space zone code Works code
	Assessable development - Code assessment	
	Otherwise	Open space zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Club Food and drink outlet	**Assessable development - Code assessment**	
	If: (a) in the Riverway precinct; or (b) not in the Riverway precinct, and the gross floor area does not exceed 150m². **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing use and the additional gross floor area forming part of the development application.	Open space zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Shop	**Assessable development - Code assessment**	
	If in the Riverway precinct	Open space zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Assessable development - Code assessment	

Community care centre Market		Open space zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.16 - Community facilities zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
Caretaker's accommodation Community care centre Community residence Community use Emergency services	**Accepted development subject to requirements**	
		Community facilities zone code Works code
Child care centre Educational establishment Health care services Indoor sport and recreation Market Outdoor sport and recreation Place of worship Retirement facility Residential care facility Rooming accommodation	**Assessable development - Code assessment**	
		Community facilities zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Bar Club Shop	**Assessable development - Code assessment**	
	If the gross floor area does not exceed 250m² **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing use and the additional gross floor area forming part of the development application.	Community facilities zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Food and drink outlet	**Assessable development - Code assessment**	
	If: (a) the gross floor area does not exceed 250m²; and (b) where not involving a drive through facility. **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing use and the additional gross floor area forming part of the development application.	Community facilities zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Accepted development	
	If provided by a public sector entity	No assessment benchmarks apply

Cemetery Crematorium Funeral parlour	**Assessable development - Code assessment**	
	Otherwise	Community facilities zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.17 - Environmental management and conservation zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Dwelling house	**Assessable development - Code assessment**	
		Environmental management and conservation zone code Works code
Telecommunications facility	**Assessable development - Code assessment**	
		Environmental management and conservation zone code Telecommunications facilities and utilities code Healthy waters code Landscape code Transport impact, access and parking code Works code
Outdoor sport and recreation	**Assessable development - Code assessment**	
		Environmental management and conservation zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Caretaker's accommodation Club Community care centre Community use Educational establishment Food and drink outlet Shop	**Assessable development - Code assessment**	
	If gross floor area does not exceed 100m^2 **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing use and the additional gross floor area forming part of the development application.	Environmental management and conservation zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.18 - Low impact industry zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park Sales office	**Accepted development**	
		No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
	Assessable development - Code assessment	
	Otherwise	Low impact industry zone code Telecommunications facilities and utilities code Healthy waters code Landscape code Transport impact, access and parking code Works code
Agricultural supplies store Caretaker's accommodation Emergency services Low impact industry Service industry Warehouse	**Accepted development subject to requirements**	
	If not in the Nelly Bay low impact industry precinct	Low impact industry zone code Works code
	Assessable development - Code assessment	
	If in the Nelly Bay low impact industry precinct	Low impact industry zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Food and drink outlet	**Accepted development subject to requirements**	
	If: (a) not in the Nelly Bay low impact industry precinct; and (b) the gross floor area does not exceed 150m². **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing use and the additional gross floor area forming part of the development application.	Low impact industry zone code Works code
	Assessable development - Code assessment	

	If: (a) in the Nelly Bay low impact industry precinct; and (b) the gross floor area does not exceed 150m². **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing use and the additional gross floor area forming part of the development application.	Low impact industry zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Bulk landscape supplies Car wash Garden centre Indoor sport and recreation Outdoor sales Research and technology industry Service station	**Assessable development - Code assessment**	
		Low impact industry zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Hardware and trade supplies	**Assessable development - Code assessment**	
	If involving an area for display and sales to the general public of not more than 35% of the gross floor area	Low impact industry zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in the table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.19 - Medium impact industry zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park Sales office	**Accepted development**	
		No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
	Assessable development - Code assessment	
	Otherwise	Telecommunications facilities and utilities code Medium impact industry zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
	Accepted development subject to requirements	
	Otherwise	Medium impact industry zone code Telecommunications facilities and utilities code Works code
Caretaker's accommodation Emergency services Low impact industry Medium impact industry Research and technology industry	**Accepted development subject to requirements**	
	If not in the Roseneath medium impact industry precinct	Medium impact industry zone code Works code
	Assessable development - Code assessment	
	If in the Roseneath medium impact industry precinct	Medium impact industry zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Agricultural supplies store Warehouse	**Accepted development subject to requirements**	
	If not in the Roseneath medium impact industry precinct	Medium impact industry zone code Works code
	Assessable development - Code assessment	
	Otherwise	Medium impact industry zone code Healthy waters code Landscape code Transport impact, access and parking code Works code

Brothel Bulk landscape supplies Car wash Indoor sport and recreation Outdoor sales Parking station Service industry Service station Transport depot	**Assessable development - Code assessment**	
		Medium impact industry zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Food and drink outlet	**Accepted development subject to requirements**	
	If gross floor area does not exceed 150m^2 **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing use and the additional gross floor area forming part of the development application.	Medium impact industry zone code Works code
Hardware and trade supplies	**Assessable development - Code assessment**	
	If involving an area for display and sales to the general public of not more than 20% of the gross floor area	Medium impact industry zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.20 - High impact industry zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park Sales office	**Accepted development**	
		No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
	Assessable development - Code assessment	
	Otherwise	Telecommunications facilities and utilities code High impact industry zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
	Accepted development subject to requirements	
	Otherwise	High impact industry zone code Telecommunications facilities and utilities code Works code
Caretaker's accommodation	**Accepted development subject to requirements**	
		High impact industry zone code Works code
Emergency services Medium impact industry Research and technology industry Warehouse	**Accepted development subject to requirements**	
	Where not in the Lansdown high impact industry precinct	High impact industry zone code Works code
	Assessable development - Code assessment	
	If in the Lansdown high impact industry precinct	High impact industry zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Accepted development subject to requirements	

Food and drink outlet	If the gross floor area does not exceed 150m^2 **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing use and the additional gross floor area forming part of the development application.	High impact industry zone code Works code
Extractive industry High impact industry Parking station Service station Transport depot	**Assessable development - Code assessment**	
		High impact industry zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.21 - Rural zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Animal husbandry **Editor's note—**Council's local laws also establish requirements regarding the keeping of animals. Emergency services Landing **Editor's note—**Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Intensive horticulture	**Accepted development**	
	If not a mushroom farm	No assessment benchmarks apply
Animal keeping **Editor's note—**Council's local laws also establish requirements regarding the keeping of animals.	**Accepted development**	
	If not a cattery or kennel	No assessment benchmarks apply
	Assessable development - Code assessment	
	If a cattery or kennel in the Mixed farming precinct or Grazing precinct	Rural zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Cropping	**Accepted development**	
	If other than forestry for wood production	No assessment benchmarks apply
Community use Cemetery Crematorium	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
	Assessable development - Code Assessment	
	Otherwise	Rural zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
	Accepted development	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
	Assessable development - Code assessment	

Telecommunications facility	Otherwise	Rural zone code Telecommunications facilities and utilities code Healthy waters code Landscape code Transport impact, access and parking code Works code
Permanent plantation	**Accepted development**	
	If in the Mixed farming precinct or Grazing precinct and located outside of strategic cropping land or potential strategic cropping land	No assessment benchmarks apply
Caretaker's accommodation Community residence Dwelling house	**Accepted development subject to requirements**	
	If it will not result in more than two dwellings of any kind on a lot	Rural zone code
Rural workers accommodation	**Accepted development subject to requirements**	
	If accommodating no more than 15 workers	Rural zone code
	Assessable development - Code assessment	
	Otherwise	Rural zone code
Home based business Roadside stall	**Accepted development subject to requirements**	
		Rural zone code
Rural industry	**Accepted development subject to requirements**	
	If storing and packaging products produced on the site	Rural zone code
	Assessable development - Code assessment	
	Otherwise	Rural zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Extractive industry	**Assessable development - Code assessment**	
	If in an extractive resource area shown on overlay map OM-05	Rural zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Wholesale nursery	**Assessable development - Code assessment**	
		Rural zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Assessable development - Code assessment	

Outdoor sport and recreation	If: (a) in the Mixed farming precinct or Grazing precinct; (b) there is no outdoor lighting; and (c) the gross floor area of any buildings does not exceed 150m^2. **Editor's note—**The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing use and the additional gross floor area forming part of the development application.	Rural zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Assessable development - Code assessment	
Aquaculture Bulk landscape supplies	If in the Mixed farming precinct or Grazing precinct	Rural zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.22 - Emerging community zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Animal husbandry **Editor's note—**Council's local laws also establish requirements regarding the keeping of animals. Cropping Landing **Editor's note—**This Landings are separately regulated under the Prescribed Tidal Works Code. Park	**Accepted development**	
		No assessment benchmarks apply
Community residence Dwelling house Dual occupancy **Editor's note—**This category of development and assessment may be altered by the Flood hazard, Coastal environment and Landslide hazard overlays. Refer to Table 5.9.1.	**Accepted development**	
	If it will not result in more than two dwellings of any kind on a lot	No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	**Accepted development**	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	**Accepted development**	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
	Assessable development - Code assessment	
	Otherwise	Emerging community zone code Healthy waters code Landscape code Telecommunications facilities and utilities code Transport impact, access and parking code Works code
Sales office	**Accepted development subject to requirements**	
		Emerging community zone code
Home based business	**Accepted development subject to requirements**	
	If: (a) the gross floor area does not exceed 60m²; and (b) the use is contained within an existing domestic outbuilding or dwelling.	Emerging community zone code
	Assessable development - Code assessment	

Emergency services		Emerging community zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Impact assessment		
Any other use not listed in this table. Any use listed in this table and not meeting the description listed in the categories of development and assessment column. Any other undefined use.		The planning scheme

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.5.23 - Special purpose zone

Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Development in the Townsville State Development Area is administered by the Coordinator-General through its adopted development scheme. In this area, only development applications for reconfiguration of a lot and operational works will be assessed by Townsville City Council.		No assessment benchmarks apply

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

5.6 Categories of development and assessment - Reconfiguring a lot

The following table identifies the categories of development and assessment and corresponding assessment benchmarks for assessable development and requirements for accepted development for reconfiguring a lot.

Table 5.6.1-Reconfiguring a lot

Editor's note—Refer also to Table 5.4.2 for Regulated categories of development and assessment: Reconfiguring a lot and to Schedule 6 of the Regulation for Reconfiguring a lot which is accepted.

Emerging community

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Emerging community zone	**Assessable development - Code assessment**	
	If: (a) the size of each lot created is equal to or greater than 10ha; or (b) in the Burdell precinct.	Emerging community zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Assessable development - Impact assessment	
	Otherwise	The planning scheme including: Emerging community zone code Reconfiguring a lot code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed the Regulation.

Character residential

Table 5.6.1-Reconfiguring a lot (Part)

<table>
<tr><th>Zone</th><th>Categories of development and assessment</th><th>Assessment benchmarks for assessable development and requirements for accepted development</th></tr>
<tr><td rowspan="4">Character residential zone</td><td colspan="2">Assessable development - Code assessment</td></tr>
<tr><td>If:
(a) not in the Inter-war to 1950s asymmetrical gable precinct, the Interwar gables and Queensland bungalows precinct,or the Queenslanders precinct; or
(b) in the Inter-war to 1950s asymmetrical gable precinct or the Interwar gables and Queensland bungalows precinct or the Queenslanders precinct and the size of each lot created is equal to or greater than 500m2.</td><td>Character residential zone code
Reconfiguring a lot code
Healthy waters code
Landscape code
Transport impact, access and parking code
Works code</td></tr>
<tr><td colspan="2">Assessable development - Impact assessment</td></tr>
<tr><td>Otherwise</td><td>The planning scheme including:
Character residential zone code
Reconfiguring a lot code</td></tr>
<tr><td colspan="3">Assessable development - Code assessment</td></tr>
<tr><td colspan="3">Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation.
Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.</td></tr>
</table>

Editor's note—The above categories of development and assessment apply unless otherwise prescribed the Regulation.

Rural residential

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Rural residential zone	**Assessable development - Code assessment**	
	If the size of each lot created is equal to or greater than: (a) 4ha (if on land to which a Water resource catchment overlay applies); or (b) 4,000m^2 otherwise.	Rural residential zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Assessable development - Impact assessment	
	Otherwise	The planning scheme including: Rural residential zone code Reconfiguring a lot code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed the Regulation.

Low density residential

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Low density residential zone	**Assessable development - Code assessment**	
	All	Low density residential zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed the Regulation.

Medium density residential

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Medium density residential zone	**Assessable development - Code assessment**	
	All	Medium density residential zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed the Regulation.

High density residential

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
High density residential zone	**Assessable development - Code assessment**	
	All	High density residential zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation.. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed the Regulation.

Neighbourhood centre

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Neighbourhood centre zone	**Assessable development - Code assessment**	
	All	Neighbourhood centre zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed the Regulation.

Local centre

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Local centre zone	**Assessable development - Code assessment**	
	All	Local centre zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed the Regulation.

District centre

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
District centre zone	**Assessable development - Code assessment**	
	All	District centre zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed the Regulation.

Major centre

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Major centre zone	**Assessable development - Code assessment**	
	All	Major centre zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed the Regulation.

Principal centre (CBD)

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Principal centre (CBD) zone	**Assessable development - Code assessment**	
	All	Principal centre (CBD) zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed the Regulation.

Specialised centre

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Specialised centre zone	**Assessable development - Code assessment**	
	All	Specialised centre zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed the Regulation.

Mixed use

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Mixed use zone	**Assessable development - Code assessment**	
	All	Mixed use zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed the Regulation.

Community facilities

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Community facilities zone	**Assessable development - Code assessment**	
	All	Community facilities zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed the Regulation.

Low impact industry

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Low impact industry zone	**Assessable development - Code assessment**	
	All	Low impact industry zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed the Regulation.

Medium impact industry

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Medium impact industry zone	**Assessable development - Code assessment**	
	All	Medium impact industry zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

High impact industry

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
High impact industry zone	**Assessable development - Code assessment**	
	All	High impact industry zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Special purpose

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Special purpose zone	**Assessable development - Code assessment**	
	All	Special purpose zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Open space

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Open space zone	**Assessable development - Code assessment**	
	All	Open space zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Sport and recreation

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Sport and recreation zone	**Assessable development - Code assessment**	
	All	Sport and recreation zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Environmental management and conservation

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Environmental management and conservation zone	**Assessable development - Code assessment**	
	All	Environmental management and conservation zone code Reconfiguring a lot code Healthy waters code Landscape code Transport impact, access and parking code Works code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Rural

Table 5.6.1-Reconfiguring a lot (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Rural zone	**Assessable development - Code assessment**	
	If the size of each lot created is equal to or greater than: (a) in the Horticulture precinct: 40ha; or (b) in the Mixed farming precinct: (i) 400ha if on land to which a Water resource catchment overlay applies; or (ii) 40ha otherwise; or (c) in the Grazing precinct: 400ha; or (d) in the Jensen precinct: 10ha; or (e) in the Cungulla precinct: 10ha.	Rural zone code Reconfiguring a lot code Healthy waters code Transport impact, access and parking code Works code
	Assessable development - Impact assessment	
	Otherwise	The planning scheme including: Rural zone code Reconfiguring a lot code
Assessable development - Code assessment		
Any other reconfiguring a lot not listed in this table, unless otherwise prescribed in the Regulation. Any reconfiguring a lot listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

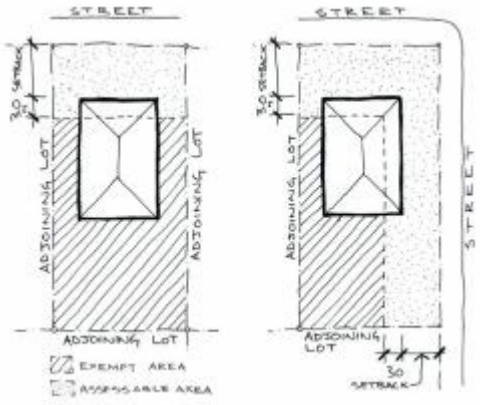
5.7 Categories of development and assessment - Building work

The following table identifies the categories of development and assessment and the assessment benchmarks for assessable development and requirements for accepted development for building work regulated under the planning scheme.

Table 5.7.1 - Building work

Editor's note—The planning scheme also regulates building work through the categories of development and assessment for overlays.
Editor's note—Contributing character buildings and non-contributing properties are identified in Character residential planning scheme policy SC6.2.

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Character residential zone	**Assessable development - Code assessment**	
	If: (a) involving partial demolition, external alteration, extension (including minor building work and the construction of a class 10a building (as defined by the Building Code of Australia)), to a contributing character building where all or part of the work is in front of or within a depth of 3m from the facade facing any street; or (b) raising or lowering a contributing character building by more than 1m; or (c) relocating a contributing character building within the same site; or (d) involving construction of a class 10a building (as defined by the Building Code of Australia) on the site of a non-contributing property, where all or part of the work is in front of, or within a depth of 3m from the main building façade facing any street; or (e) construction of any new class 1a or class 2 building (as defined by the Building Code of Australia) on either a contributing or non-contributing character site, unless on a rear lot.	Character residential zone code

		
	Assessable development - Impact assessment	
	If involving relocation off the site or the total demolition of a contributing character building	The planning scheme including: Character residential zone code Reconfiguring a lot code
Accepted development		
Replacement or refurbishment of stairs on a contributing character building. Raising or lowering a contributing character building by 1m or less. Any other building work not listed in this table. Any building work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

5.8 Categories of development and assessment - Operational work

The following tables identify the categories of development and assessment and corresponding assessment benchmarks for assessable development and requirements for accepted development for operational work.

Table 5.8.1 - Operational work

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
All zones	**Assessable development - Code assessment**	
	If operational works (other than filling or excavation) for the reconfiguration of a lot	Healthy waters code Landscape code Reconfiguration of a lot code Transport impact, access and parking code Works code
	If operational works (other than filling or excavation) for a material change of use	Healthy waters code Landscape code Transport impact, access and parking code Works code
	If filling and excavation: (a) within 1.5m of a lot boundary and exceeding a depth of 300mm; or (b) involving: (i) a depth exceeding 1m; or (ii) a volume of 100m³ or more.	Healthy waters code Works code
Accepted development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.8.2-Operational work being placing an advertising device on premises

Editor's note—Council's local laws also establish requirements regarding the placement of advertising devices on a premises.

Editor's note—Advertising devices in unallocated State land, reserve or road may require a permit to occupy under the *Land Act 1994*.

Editor's note—Advertising device within or adjacent to a State-controlled road corridor may require approval by the Department of Transport and Main Roads.

Note—Advertising devices required to meet statutory purposes are exempt.

Editor's note—Refer to Table 9.4.1.3(b) - Types of advertising devices in section 9.4.1 Advertising devices code for descriptions of the various types of advertising devices.

Neighbourhood centre zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
	Accepted development	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) otherwise: (i) a blind/canopy sign; or (ii) a commercial flag; or (iii) a footway sign; or (iv) a hamper sign; or (v) a stallboard sign; or (vi) a street furniture sign; or (vii) a window sign.	
	Accepted development subject to requirements	

Neighbourhood centre zone	If: (a) an above-awning sign; or (b) an animated sign; or (c) an awning fascia sign; or (d) a banner sign; or (e) a bunting; or (f) a fence sign; or (g) a ground sign; or (h) an inflatable sign; or (i) a panel sign; or (j) a pole sign; or (k) a projecting sign; or (l) a pylon sign; or (m) a roof sign; or (n) an under-awning sign; or (o) a wall sign.	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Local centre zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Local centre zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) otherwise: (i) a blind/canopy sign; or (ii) a commercial flag; or (iii) a footway sign; or (iv) a hamper sign; or (v) a stallboard sign; or (vi) a street furniture sign; or (vii) a window sign.	
	Accepted development subject to requirements	
	If: (a) an above-awning sign; or (b) an animated sign; or (c) an awning fascia sign; or (d) a banner sign; or (e) a bunting; or (f) a fence sign; or (g) a ground sign; or (h) an inflatable sign; or (i) a panel sign; or (j) a pole sign; or (k) a projecting sign; or (l) a pylon sign; or (m) a roof sign; or (n) an under-awning sign; or (o) a wall sign.	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Exempt development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

District centre zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
District centre zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) otherwise: (i) a blind/canopy sign; or (ii) a commercial flag; or (iii) a footway sign; or (iv) a hamper sign; or (v) a stallboard sign; or (vi) a street furniture sign; or (vii) a window sign.	
	Accepted development subject to requirements	
	If: (a) an above-awning sign; or (b) an animated sign; or (c) an awning fascia sign; or (d) a banner sign; or (e) a bunting; or (f) a fence sign; or (g) a ground sign; or (h) an inflatable sign; or (i) a panel sign; or (j) a pole sign; or (k) a projecting sign; or (l) a pylon sign; or (m) a roof sign; or (n) an under-awning sign; or (o) a wall sign.	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Exempt development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Major centre zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Major centre zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) otherwise: (i) a blind/canopy sign; or (ii) a commercial flag; or (iii) a footway sign; or (iv) a hamper sign; or (v) a stallboard sign; or (vi) a street furniture sign; or (vii) a window sign.	
	Accepted development subject to requirements	
	If: (a) an above-awning sign; or (b) an animated sign; or (c) an awning fascia sign; or (d) a banner sign; or (e) a bunting; or (f) a fence sign; or (g) a ground sign; or (h) an inflatable sign; or (i) a panel sign; or (j) a pole sign; or (k) a projecting sign; or (l) a pylon sign; or (m) a roof sign; or (n) an under-awning sign; or (o) a wall sign.	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		

Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Principal centre (CBD) zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
	Exempt	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) if in the Flinders Street East precinct: (i) a commercial flag; or (ii) a footway sign; or (iii) a street furniture sign; or (c) otherwise: (i) a blind/canopy sign; or (ii) a commercial flag; or (iii) a footway sign; or (iv) a hamper sign; or (v) a stallboard sign; or (vi) a street furniture sign; or (vii) a window sign.	
	Accepted development subject to requirements	

Principal centre (CBD) zone	If: (a) in the Flinders Street East precinct; (i) an awning fascia sign; or (ii) a blind/canopy sign; or (iii) a hamper sign; or (iv) a stallboard sign; or (v) an under-awning sign; or (vi) a wall sign; or (vii) a window sign; or (b) otherwise: (i) an above-awning sign; or (ii) an animated sign; or (iii) an awning fascia sign; or (iv) a banner sign; or (v) a bunting; or (vi) a fence sign; or (vii) a ground sign; or (viii) an inflatable sign; or (ix) a panel sign; or (x) a pole sign; or (xi) a projecting sign; or (xii) a pylon sign; or (xiii) a roof sign; or (xiv) an under-awning sign; or (xv) a wall sign.	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Exempt development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Specialised centre zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Specialised centre zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) otherwise: (i) a blind/canopy sign; or (ii) a commercial flag; or (iii) a footway sign; or (iv) a hamper sign; or (v) a stallboard sign; or (vi) a street furniture sign; or (vii) a window sign.	
	Accepted development subject to requirements	
	If: (a) an above-awning sign; or (b) an animated sign; or (c) an awning fascia sign; or (d) a banner sign; or (e) a bunting; or (f) a fence sign; or (g) a ground sign; or (h) an inflatable sign; or (i) a panel sign; or (j) a pole sign; or (k) a projecting sign; or (l) a pylon sign; or (m) a roof sign; or (n) an under-awning sign; or (o) a wall sign.	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Exempt development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Mixed use zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Mixed use zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) otherwise: (i) a blind/canopy sign; or (ii) a commercial flag; or (iii) a footway sign; or (iv) a hamper sign; or (v) a stallboard sign; or (vi) a street furniture sign; or (vii) a window sign.	
	Accepted development subject to requirements	
	If: (a) an above-awning sign; or (b) an animated sign; or (c) an awning fascia sign; or (d) a banner sign; or (e) a bunting; or (f) a fence sign; or (g) a ground sign; or (h) an inflatable sign; or (i) a panel sign; or (j) a pole sign; or (k) a projecting sign; or (l) a pylon sign; or (m) a roof sign; or (n) an under-awning sign; or (o) a wall sign.	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Community facilities zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Community facilities zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) a footway sign; or (c) a street furniture sign.	
	Accepted development subject to requirements	
	If: (a) an above-awning sign; or (b) an awning fascia sign; or (c) a banner sign; or (d) a blind/canopy sign; or (e) a bunting; or (f) a commercial flag; or (g) a fence sign; or (h) a ground sign; or (i) a hamper sign; or (j) a panel sign; or (k) a projecting sign; or (l) a stallboard sign; or (m) an under-awning sign; or (n) a wall sign; or (o) a window sign.	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Environmental management and conservation zone	**Assessable development - Code assessment**	
	All advertising devices listed in Table 9.3.1.3(b)	Advertising devices code
Accepted development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Low impact industry zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Low impact industry zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) otherwise: (i) an above-awning sign; or (ii) an awning fascia sign; or (iii) a banner sign; or (iv) a blind/canopy sign; or (v) a bunting; or (vi) a commercial flag; or (vii) a footway sign; or (viii) a fence sign; or (ix) a ground sign; or (x) a hamper sign; or (xi) a panel sign; or (xii) a projecting sign; or (xiii) a stallboard sign; or (xiv) a street furniture sign; or (xv) an under-awning sign; or (xvi) a wall sign; or (xvii) a window sign.	
	Accepted development subject to requirements	
	If: (a) an animated sign; or (b) an inflatable sign; or (c) a pole sign; or (d) a pylon sign; or (e) a roof sign.	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Medium impact industry zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Medium impact industry zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) otherwise: (i) an above-awning sign; or (ii) an awning fascia sign; or (iii) a banner sign; or (iv) a blind/canopy sign; or (v) a bunting; or (vi) a commercial flag; or (vii) a footway sign; or (viii) a fence sign; or (ix) a ground sign; or (x) a hamper sign; or (xi) a panel sign; or (xii) a projecting sign; or (xiii) a stallboard sign; or (xiv) a street furniture sign; or (xv) an under-awning sign; or (xvi) a wall sign; or (xvii) a window sign.	
	Accepted development subject to requirements	
	If: (a) an animated sign; or (b) an inflatable sign; or (c) a pole sign; or (d) a pylon sign; or (e) a roof sign.	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

High impact industry zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
High impact industry zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) otherwise: (i) an above-awning sign; or (ii) an awning fascia sign; or (iii) a banner sign; or (iv) a blind/canopy sign; or (v) a bunting; or (vi) a commercial flag; or (vii) a footway sign; or (viii) a fence sign; or (ix) a ground sign; or (x) a hamper sign; or (xi) a panel sign; or (xii) a projecting sign; or (xiii) a stallboard sign; or (xiv) a street furniture sign; or (xv) an under-awning sign; or (xvi) a wall sign; or (xvii) a window sign.	
	Accepted development subject to requirements	
	If: (a) an animated sign; or (b) an inflatable sign; or (c) a pole sign; or (d) a pylon sign; or (e) a roof sign.	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Special purpose zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) otherwise: (i) an above-awning sign; or (ii) an awning fascia sign; or (iii) a banner sign; or (iv) a blind/canopy sign; or (v) a bunting; or (vi) a commercial flag; or (vii) a footway sign; or (viii) a fence sign; or (ix) a ground sign; or (x) a hamper sign; or (xi) a panel sign; or (xii) a projecting sign; or (xiii) a stallboard sign; or (xiv) a street furniture sign; or (xv) an under-awning sign; or (xvi) a wall sign; or (xvii) a window sign.	
	Accepted development subject to requirements	
	If: (a) an animated sign; or (b) an inflatable sign; or (c) a pole sign; or (d) a pylon sign; or (e) a roof sign.	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Open space zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) a footway sign; or (c) a street furniture sign.	
	Accepted development subject to requirements	
	If: (a) a blind/canopy sign; or (b) a commercial flag; or (c) a hamper sign; or (d) a stallboard sign; or (e) an under-awning sign; or (f) a window sign.	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Low density residential zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Low density residential zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) a street furniture sign.	
	Accepted development subject to requirements	
	If a fence sign or a wall sign for a Home based business	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Medium density residential zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Medium density residential zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) a street furniture sign.	
	Accepted development subject to requirements	
	If: (a) a fence sign or a wall sign for a Home based business; or (b) in the Picnic Bay precinct, Nelly Bay tourist precinct, North Ward villages, Hyde Park medium density residential precinct or The Strand precinct; and (i) a blind/canopy sign; or (ii) a commercial flag; or (iii) a footway sign; or (iv) a hamper sign; or (v) a stallboard sign; or (vi) an under-awning sign; or (vii) a window sign.	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

High density residential zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
High density residential zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) a blind/canopy sign; or (c) a commercial flag; or (d) a footway sign; or (e) a hamper sign; or (f) a stallboard sign; or (g) a street furniture sign; or (h) a window sign.	
	Accepted development subject to requirements	
	If: (a) an above-awning sign; or (b) an awning fascia sign; or (c) a banner sign; or (d) a fence sign; or (e) a ground sign; or (f) a panel sign; or (g) a projecting sign; or (h) a roof sign; or (i) an under-awning sign; or (j) a wall sign.	Advertising devices code
	Accepted development subject to requirements	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		
Any other operational work not listed in this table. Any operational work listed in the table and not complying with the criteria in the level of assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Character residential zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Character residential zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) a street furniture sign.	
	Accepted development subject to requirements	
	If a fence sign or a wall sign for a home based business	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		
Any other work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Rural residential zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Rural residential zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) a street furniture sign.	
	Accepted development subject to requirements	
	If a fence sign or a wall sign for a home based business	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Emerging community zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Emerging community zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) a street furniture sign.	
	Accepted development subject to requirements	
	If a fence sign or a wall sign for a Home based business	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Rural zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Rural zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) a street furniture sign.	
	Accepted development subject to requirements	
	(a) If for a business activity, roadside stall or winery and: (i) an above-awning sign; or (ii) an awning fascia sign; or (iii) a banner sign; or (iv) a bunting; or (v) a commercial flag; or (vi) a fence sign; or (vii) a footway sign; or (viii) a ground sign; or (ix) a panel sign; or (x) a projecting sign; or (xi) a wall sign ; or (b) a roof sign.	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		
Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.		

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

Sport and recreation zone

Table 5.8.2—Operational work being placing an advertising device on premises (Part)

Zone	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Sport and recreation zone	**Accepted development**	
	If: (a) any advertising device located internally within a building and not generally visible from outside; or (b) any advertising device for a major sport, recreation and entertainment facility comprising a sports stadium or motor sport facility; or (c) for a club, food and drink outlet, functions facility, indoor sport and recreation, outdoor sport and recreation, bar or shop, and: (i) a blind/canopy sign; or (ii) a commercial flag; or (iii) a hamper sign; or (iv) a stallboard sign; or (v) an under-awning sign; or (vi) a window sign; or (d) otherwise: (i) a street furniture sign; or (ii) footway sign.	
	Accepted development subject to requirements	
	If: (a) an above-awning sign; or (b) an awning fascia sign; or (c) a banner sign; or (d) a bunting; or (e) a fence sign; or (f) a ground sign; or (g) a panel sign; or (h) a projecting sign; or (i) a wall sign.	Advertising devices code
	Assessable development - Code assessment	
	If not made accepted development subject to requirements, any advertising device listed in Table 9.3.1.3(b).	Advertising devices code
Accepted development		

Any other operational work not listed in this table. Any operational work listed in this table and not meeting the description listed in the categories of development and assessment column.

Editor's note—The above categories of development and assessment apply unless otherwise prescribed in the Regulation.

5.9 Categories of development and assessment—Overlays

The following table identifies where an overlay changes the categories of development and assessment from that stated in a zone and the relevant assessment benchmarks.

Airport environs overlay

Table 5.9.1 - Assessment benchmarks for overlays

Development	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Airport environs overlay		
Any material change of use, reconfiguring a lot or operational work within: (a) the airport's operational airspace shown on overlay Map OM-01.1; or (b) the lighting area buffer zones shown on overlay Map OM-01.5; or (c) aviation facilities' buffers areas shown on overlay Map OM-01.3.	No change to the category of development and assessment	Airport environs overlay code where the development is accepted development subject to requirements or assessable development under the categories of development and assessment for the relevant zone. **Editor's note—**This overlay code is applicable to accepted development subject to requirements development.
Any material change of use: (a) within 13km of an airport runway shown on overlay Map OM-01.2; or (b) within a public safety area shown on overlay Map OM-01.2.	No change to the category of development and assessment	Airport environs overlay code where the development is accepted development subject to requirements or assessable development under the categories of development and assessment for the relevant zone.
Any material change of use above the 20 ANEF contour shown on overlay Map OM-01.4 for: (a) Dwelling house; or (b) Dual occupancy.	Accepted development subject to requirements.	Airport environs overlay code
Any other material change of use above the 20 ANEF contour shown on overlay Map OM-01.4.	No change to the category of development and assessment	Airport environs overlay code where the development is accepted development subject to requirements or assessable development under the categories of development and assessment for the relevant zone.

Bushfire hazard overlay (high hazard area)

Table 5.9.1 - Assessment benchmarks for overlays

Development	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Bushfire hazard overlay (high hazard area)		
Material change of use for: (a) Child care centre; or (b) Detention facility; or (c) Educational establishment; or (d) Emergency services; or (e) Hospital; or (f) Industry activities involving manufacture or storage of hazardous materials in bulk; or (g) Multiple dwelling; or (h) Residential care facility; or (i) Retirement facility; or (j) Relocatable home park; or (k) Rooming accommodation; or (l) Shopping centre; or (m) Short-term accommodation; or (n) Telecommunications facility; or (o) Tourist park; or (p) Tourist attraction; or (q) Transport depot; or (r) Utility installation.	Assessable development - impact assessable	Bushfire hazard overlay code
Any other material change of use	No change to the category of development and assessment	Bushfire hazard overlay code where the development is assessable development under the categories of development and assessment for the relevant zone. **Editor's note—**This overlay code is not applicable to accepted development subject to requirements development.
Reconfiguration of a lot	No change to the category of development and assessment	Bushfire hazard overlay code where the development is assessable development under the categories of development and assessment for reconfiguration of a lot.

Bushfire hazard overlay (medium hazard area)

Table 5.9.1 - Assessment benchmarks for overlays

Development	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Bushfire hazard overlay (medium hazard area)		
Any material change of use	No change to the category of development and assessment	Bushfire hazard overlay code where the development is assessable development under the categories of development and assessment for the relevant zone. **Editor's note—**This overlay code is not applicable to accepted development subject to requirements development.
Reconfiguration of a lot	No change to the category of development and assessment	Bushfire hazard overlay code where the development is assessable development under the categories of development and assessment for reconfiguration of a lot.

Coastal environment overlay

Table 5.9.1 - Assessment benchmarks for overlays

Development	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Coastal environment overlay		
Material change of use for: (a) Dwelling house; or (b) Community residence.	Accepted development subject to requirements.	Coastal environment overlay code
Material change of use for a Dual occupancy	Assessable development - code assessment	Coastal environment overlay code
Building work involving the lowering of floor levels or enclosure of a ground floor storey on an existing: (a) Dwelling house; or (b) Dual occupancy; or (c) Community residence.	Accepted development subject to requirements.	Coastal environment overlay code
Any other material change of use	No change to the category of development and assessment	Coastal environment overlay code where the development is assessable development under the categories of development and assessment for the relevant zone.
Reconfiguration of a lot	No change to the category of development and assessment	Coastal environment overlay code where the development is assessable development under the categories of development and assessment for reconfiguration of a lot.
Operational work	No change to the category of development and assessment	Coastal environment overlay code where the development is assessable development under the categories of development and assessment for operational work.

Cultural heritage overlay

On a heritage place

Table 5.9.1 - Assessment benchmarks for overlays

Development	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Cultural heritage overlay		
On a heritage place		
Building work where an 'Exemption Certificate' has been issued for work under Section 75 of the *Queensland Heritage Act 1992*	Accepted development	No assessment benchmarks applicable
Material change of use	No change to the category of development and assessment	Cultural heritage overlay code where the development is assessable development under the categories of development and assessment for the relevant zone. **Editor's note—**This overlay code is not applicable to accepted development subject to requirements development.
Building work, where involving the total demolition or relocation of a heritage place	Assessable development - impact assessment	Cultural heritage overlay code
Building work, including minor building work, where involving: (a) alterations to a heritage place, including alterations to the interior of buildings; or (b) extensions to a heritage place; or (c) erecting a new or separate building on a heritage place site; or (d) the partial demolition of a heritage place	Assessable development - code assessment	Cultural heritage overlay code
Operational work where involving a change to landscaping, fencing or natural features of land referred to in the citation for a heritage place listed in SC6.3 Cultural heritage planning scheme policy	Assessable development - code assessment	Cultural heritage overlay code
Reconfiguration of a lot	No change to the category of development and assessment	Cultural heritage overlay code where the development is assessable development under the categories of development and assessment for reconfiguration of a lot.

Cultural heritage overlay

Adjoining a heritage place

Table 5.9.1 - Assessment criteria for overlays

Development	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Cultural heritage overlay		
Adjoining a heritage place		
Material change of use	No change to the category of development and assessment	Cultural heritage overlay code where the development is assessable development under the categories of development and assessment for the relevant zone. **Editor's note—**This overlay code is not applicable to accepted development subject to requirements development.
Reconfiguration of a lot	No change to the category of development and assessment	Cultural heritage overlay code where the development is assessable development under the categories of development and assessment for reconfiguration of a lot.

Natural assets overlay

Table 5.9.1 - Assessment benchmark for overlays

Development	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Natural assets overlay		
Material change of use	No change to the category of development and assessment	Natural assets overlay code where the development is assessable development under the categories of development and assessment for the relevant zone. **Editor's note—**This overlay code is not applicable to accepted development subject to requirements.
Reconfiguration of a lot	No change to the category of development and assessment	Natural assets overlay code where the development is assessable development under the categories of development and assessment for reconfiguration of a lot.
Operational work being clearing of vegetation	Assessable development - code assessment if: (a) within an urban area; (b) not associated with an assessable development material change of use or reconfiguration of a lot; and (c) in the very high importance area shown on the overlay map OM-08. **Editor's note—** Urban area has the same meaning as in the Regulations.	Natural assets overlay code

Any other operational work	No change to the category of development and assessment	Natural assets overlay code where the development is assessable development under the categories of development and assessment for operational work. **Editor's note—**This overlay code is not applicable to accepted development subject to requirements development.

Extractive resources overlay

Table 5.9.1 - Assessment benchmarks for overlays

Development	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Extractive resources overlay		
Material change of use	No change to the category of development and assessment	Extractive resources overlay code where the development is assessable development under the categories of development and assessment for the relevant zone. **Editor's note—**This overlay code is not applicable to accepted development subject to requirements.
Reconfiguration of a lot	No change to the category of development and assessment	Extractive resources overlay code where the development is assessable development under the categories of development and assessment for reconfiguration of a lot.

Flood hazard overlay (high and medium hazard areas)

Table 5.9.1 - Assessment benchmarks for overlays

Development	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Flood hazard overlay (high and medium hazard areas) **Note—**to avoid any doubt, the term medium hazard area includes areas shown on the overlay maps as medium hazard — further investigation areas.		
Material change of use for a telecommunications facility	Assessable development - code assessment	Flood hazard overlay code
Material change of use for: (a) Dwelling house; or (b) Dual occupancy; or (c) Community residence.	Accepted development subject to requirements	Flood hazard overlay code
Material change of use for: (a) Emergency services; or (b) Hospital; or (c) Special industry; or (d) High impact industry; or (e) Residential care facility; or (f) Retirement facility; or (g) Major electricity infrastructure; or (h) Air services.	Assessable development - code assessment	Flood hazard overlay code

Building work involving the lowering of floor levels or enclosure of a ground floor storey on an existing: (a) Dwelling house; or (b) Dual occupancy; or (c) Community residence.	Accepted development subject to requirements	Flood hazard overlay code
Any other material change of use	No change to the category of development and assessment	Flood hazard overlay code where the development is assessable development under the categories of development and assessment for the relevant zone. **Editor's note—**This overlay code is applicable to accepted development subject to requirements identified in the categories of development and assessment for the relevant zone.
Reconfiguration of a lot	No change to the category of development and assessment	Flood hazard overlay code where the development is assessable development under the categories of development and assessment for reconfiguration of a lot.
Operational Works involving filling or excavation of more than $10m^3$ of material	Code assessment	Flood hazard overlay code
Any other operational works	No change to the category of development and assessment	Flood hazard overlay code where the development is assessable development under the categories of development and assessment for operational works.

Flood hazard overlay (low hazard area)

Table 5.9.1 - Assessment benchmarks for overlays

Development	**Categories of development and assessment**	**Assessment benchmarks for assessable development and requirements for accepted development**
Flood hazard overlay (low hazard area)		
Material change of use for: (a) Emergency services; or (b) Hospital; or (c) Special industry; or (d) High impact industry; or (e) Residential care facility; or (f) Retirement facility; or (g) Major electricity infrastructure; or (h) Air services.	Assessable development - code assessment	Flood hazard overlay code

Landslide hazard overlay (high and potential debris flow hazard areas or slope angle greater than 23 degrees)

Table 5.9.1 - Assessment benchmarks for overlays

Development	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Landslide hazard overlay (high and potential debris flow hazard areas or slope angle greater than 23 degrees)		
Material change of use for: (a) Dwelling house; or (b) Dual occupancy.	Assessable development - code assessment	Landslide hazard overlay code
Any other material change of use	No change to the category of development and assessment	Landslide hazard overlay code where the development is assessable development under the categories of development and assessment for the relevant zone. **Editor's note-**This overlay code is not applicable to accepted development subject to requirements.
Reconfiguration of a lot	No change to the category of development and assessment	Landslide hazard overlay code where the development is assessable development under the categories of development and assessment for the reconfiguration of a lot.
Operational work	No change to the category of development and assessment	Landslide hazard overlay code where the development is assessable under the table of assessment for operational work. **Editor's note-**This overlay code is not applicable to Accepted development subject to requirements development.

Landslide hazard overlay (very low, low and medium hazard areas)

Table 5.9.1 - Assessment benchmarks for overlays

Development	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Landslide hazard overlay (very low, low and medium hazard areas)		
Material change of use	No change to the category of development and assessment	Landslide hazard overlay code where the development is assessable under the table of assessment for the relevant zone **Editor's note—**This overlay code is not applicable to accepted development subject to requirements development.
Reconfiguration of a lot	No change to the category of development and assessment	Landslide hazard overlay code where the development is assessable under the table of assessment for reconfiguration of a lot
Operational work	No change to the category of development and assessment	Landslide hazard overlay code where the development is assessable under the table of assessment for operational work **Editor's note—**This overlay code is not applicable to accepted development subject to requirements development.

Water resource catchment overlay

Table 5.9.1 - Assessment benchmarks for overlays

Development	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Water resource catchment overlay		
Material change of use for a Dwelling house	Accepted development subject to requirements	Water resource catchment overlay code
Any other material change of use	No change to the category of development and assessment	Water resource catchment overlay code **Editor's note—**This overlay code is applicable to accepted development subject to requirements.
Reconfiguration of a lot	No change to the category of development and assessment	Water resource catchment overlay code where the development is assessable development under the categories of development and assessment for reconfiguration of a lot.
Operational works	No change to the category of development and assessment	Water resource catchment overlay code where the development is assessable development under the categories of development and assessment for operational works. **Editor's note—**This overlay code is not applicable to accepted development subject to requirements operational work.

Note—Some overlays may only be included for information purposes. This should not change the category of development and assessment or assessment benchmarks in the planning scheme.

Editor's note—The Transport noise corridor overlay is contained in the planning scheme for information purposes only. The Transport noise corridor overlay identifies land affected by transport noise in accordance with Chapter 8B of the *Building Act 1975*. In these areas, building work will be assessable against the Queensland Development Code Part 4.4 — Buildings in a Transport Noise Corridor.

6.1 Preliminary

(1) Zones organise the planning scheme area in a way that facilitates the location of preferred or acceptable land uses.

(2) Zones are mapped and included in Schedule 2.

(3) The categories of development and assessment for development in a zone are in Part 5.

(4) Assessment benchmarks for zones are contained in a zone code.

(5) A precinct may be identified for part of a zone.

(6) Precinct provisions are contained in the zone code.

(7) Each zone code identifies the following:

- (a) the purpose of the code;
- (b) the overall outcomes that achieve the purpose of the code;
- (c) the performance outcomes that achieve the overall outcomes and the purpose of the code;
- (d) the acceptable outcomes that achieve the performance and overall outcomes and the purpose of the code; and
- (e) the performance and acceptable outcomes for the precinct.

(8) The following are the zone codes for the planning scheme:

- (a) Residential zones category:
  - (i) Low density residential zone code;
  - (ii) Medium density residential zone code;
  - (iii) High density residential zone code;
  - (iv) Rural residential zone code;
  - (v) Character residential zone code;
- (b) Centres zones category:
  - (i) Neighbourhood centre zone code;
  - (ii) Local centre zone code;
  - (iii) District centre zone code;
  - (iv) Major centre zone code;
  - (v) Principal centre (CBD) zone code;
  - (vi) Specialised centre zone code;
  - (vii) Mixed use zone code;
- (c) Community facilities and open space zones category:
  - (i) Sport and recreation zone code;
  - (ii) Open space zone code;
  - (iii) Community facilities zone code;
  - (iv) Environmental management and conservation zone code;
- (d) Industry zones category:
  - (i) Low impact industry zone code;
  - (ii) Medium impact industry zone code;
  - (iii) High impact industry zone code;
- (e) Rural zones category:
  - (i) Rural zone code;
- (f) Other zones category:
  - (i) Emerging community zone code;
  - (ii) Special purpose zone code.

6.2 Residential zones category

6.2.1 Low density residential zone code

6.2.1.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.2.1.2 Purpose

(1) The purpose of the Low density residential zone code is to provide for predominately dwelling houses.

(2) The particular purpose of the code is to:

- (a) primarily accommodate dwelling houses and dual occupancy dwellings;
- (b) provide for housing choice and affordability by allowing for a range of lot sizes;
- (c) maintain the low-rise and lower density character of Townsville's suburbs;
- (d) maintain a high level of residential amenity; and
- (e) achieve accessible, well-serviced and well-designed communities.

(3) The purpose of the zone will be achieved through the following overall outcomes:

- (a) built form is of a house compatible scale and consistent with the local streetscape character;
- (b) reconfiguration facilitates a range of lot sizes to accommodate dwelling houses and dual occupancy dwellings, typically on lots 400m^2 or greater (unless otherwise intended in a precinct);
- (c) development maintains a high level of residential amenity on the site and in the neighbourhood;
- (d) residential development is protected from the impacts of any nearby industrial activities, transport corridors, infrastructure, installations and major facilities such as the port, airport and Department of Defence landholdings;
- (e) the design of development promotes accessibility by walking, cycling and public transport;
- (f) the design of development is responsive to the city's climate and promotes sustainable practices including energy efficiency and water conservation;
- (g) low-rise multiple dwellings, residential care or retirement facilities may be acceptable within this zone where provided in locations that are within a convenient walkable distance to centres, public transport and community activities, and where of a scale that is consistent with the local character;
- (h) non-residential uses only occur within the zone where they primarily support the day-to-day needs of the immediate residential community, do not unreasonably detract from the residential amenity of the area and are not better located in nearby centre zones;
- (i) development minimises impacts on remaining areas of ecological significance within the zone; and
- (j) the natural bushland setting and village character of the northern beaches and Magnetic Island townships are maintained. Tourism accommodation in these communities is of a house compatible scale.

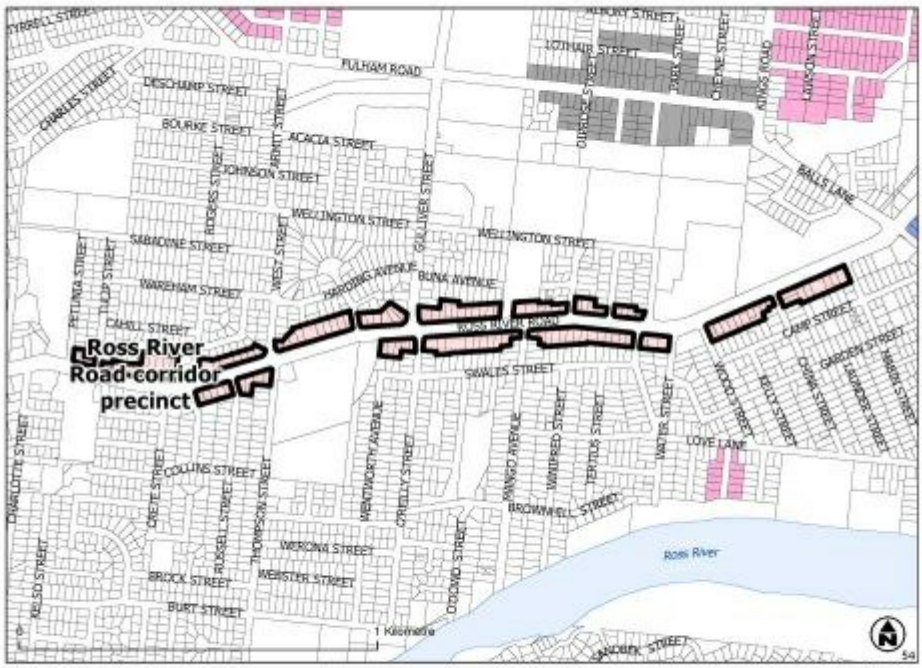
(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts:

Ross River Road corridor precinct:

(a) existing non-residential uses continue operation without significantly expanding;

(b) no additional non-residential development is established within the precinct to avoid the continuation of strip commercial development; and

(c) redevelopment of sites within this precinct may occur for the purposes of low-rise multiple dwellings, residential care or retirement facilities.



Click here to view high resolution image.

Figure 6.1 - Ross River Road corridor precinct

Stables precinct:

(a) stables are established in a manner that minimises impacts on residential amenity; and

(b) residential uses in the precinct do not intensify.

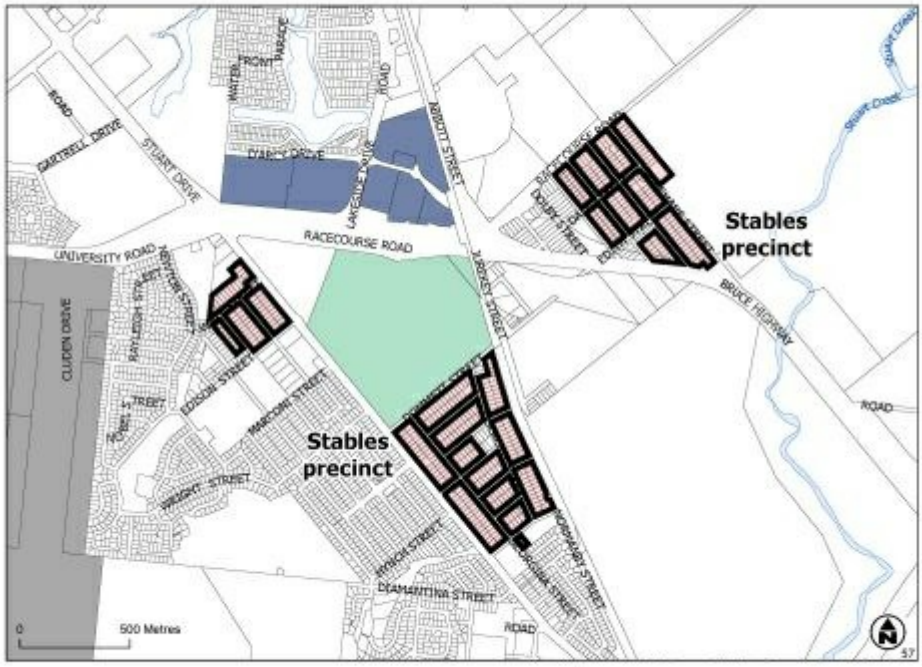


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Figure 6.2 - Stables precinct

Marlow Street precinct:

(a) residential development occurs primarily in the form of dwelling houses on large lots with a limited site cover;

(b) lots are not smaller than 750m^2 and the minimum average lot size across the whole of the precinct is not less than 1,700m^2;

(c) development facilities viable wildlife corridors through the precinct; and

(d) built form and infrastructure is sub-ordinate to the vegetation and the natural landform.

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Figure 6.3 - Marlow Street precinct

6.2.1.3 Assessment benchmarks

Table 6.2.1.3 Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Home based business	
PO1 The use does not adversely impact on the amenity of the surrounding residential land uses and local character.	**AO1.1** The home based business: (a) is carried out in an existing building or structure; (b) does not use more than 60m² of the gross floor area of the building or structure; (c) involves at least one or more residents of the dwelling house; (d) involves not more than one non-resident employee; (e) where bed and breakfast accommodation, does not exceed three bedrooms; (f) does not generate more than 1 heavy vehicle trip per week; **Editor's note—**a heavy vehicle is a vehicle with more than 4.5 tonnes gross vehicle mass. (g) does not generate more than 28 vehicle trips per day by other vehicles, where one trip includes arriving at the site and a second trip is departing the site. These trips are additional to normal domestic trips associated with the dwelling; (h) contains visitor parking within the site; (i) does not involve hiring out of materials, goods, appliances or vehicles; and (j) does not involve the repair or maintenance of vehicles, other than minor maintenance of vehicles used in conjunction of the home based business on the site. **Editor's note—**home based business operators should also refer to signage requirements under Table 5.8.2 -Operational work being placing an advertising device on a premises and Section 9.3.1-Advertising devices code.
	AO1.2 Functional aspects of the use such as service areas, material storage or use activities are not visible from the street.
	AO1.3 Other than where a bed and breakfast or home based childcare, the business use does not operate outside the hours of 8am to 5pm Monday to Friday, 8am to 2pm Saturday and does not operate on Sunday.
	AO1.4 Noise levels do not exceed acoustic quality objectives under the Environmental Protection (Noise) Policy 2008.

PO2 Commercial vehicle parking: (a) has a direct nexus with a home based business carried out on the site; and (b) does not adversely affect the amenity of neighbouring properties.	**AO2.1** Not more than one commercial vehicle is parked on the site.
	AO2.2 While on-site, vehicles: (a) are not left idling for more than 5 minutes at any one time; and (b) do not have a refrigeration unit running.
	AO2.3 Any commercial vehicle does not exceed 4.5 tonnes gross vehicle mass and is housed behind the building line.

Table 6.2.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
For accepted development subject to requirements and assessable development	
Sales office	
PO3 The use does not adversely impact on the amenity of the surrounding land uses and local character.	**AO3** Development of the sales office is in place for no more than two years.

Low density residential zone code - Table 6.2.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
For accepted development subject to requirements and assessable development	
Secondary dwelling	
PO4 Secondary dwellings are: (a) are subordinate, small-scaled dwellings; (b) contribute to a safe and pleasant living environment; and (c) does not cause adverse impacts on adjoining properties.	**AO4** The secondary dwelling: (a) has a GFA, exclusive of a single carport or garage, of not more than 90m^2; and (b) is located not more than 20m from the primary house.

Table 6.2.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
Additional benchmarks for accepted development subject to requirements and assessable development in precincts **Note—**Townsville City Council has an animal keeping local law that also sets out requirements for stables. These must also be complied with.	
For accepted development subject to requirements and assessable development	
Stables precinct	
PO5 Only dwelling houses or caretaker's accommodation are established in the precinct.	**AO5** The development does not involve a dual occupancy, rooming accommodation, multiple dwelling, retirement facility, residential care facility, short-term accommodation or tourist park.

PO6 Reconfiguration does not result in additional lots being created.	**AO6** Lot size is no less than 1,000m^2.
PO7 The site is of a size to accommodate stables and associated service areas and allows for setback of stables from adjacent houses.	**AO7** Where stables are proposed, the site has a minimum area of 1,000m^2.
PO8 Stables are established where provision is made for a manager living on-site.	**AO8** Stables are established on the same site as a dwelling house or caretaker's accommodation.
PO9 Residential uses in the precinct do not intensify.	**AO9.1** Not more than one dwelling house or caretaker's accommodation unit is established on each lot.
	AO9.2 The caretaker's accommodation unit has a gross floor area of no more than 70m^2.

Table 6.2.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
For assessable development	
Amenity	
PO10 Development minimises impacts on surrounding land and provides for an appropriate level of amenity within the site, having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) visual impact; (e) odour and emissions; (f) lighting; (g) access to sunlight; (h) privacy; and (i) outlook.	No acceptable outcome is nominated.
PO11 Landscaping is provided to enhance the appearance of the development, screen unsightly components, create an attractive on-site environment and provide shading.	No acceptable outcome is nominated.

PO12 Development for the purposes of a sensitive use within 500m of land included in the High impact industry zone or Special purpose zone, or within 250m of land in the Medium impact industry zone: (a) achieves indoor noise levels consistent with the objectives set out in the Environmental Protection (Noise) Policy 2008; (b) achieves air quality levels consistent with the objectives set out in the Environmental Protection (Air) Policy 2008 and the relevant national standard; and (c) does not experience offensive odours.	No acceptable outcome is nominated.

Table 6.2.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Crime prevention through environmental design	
PO13 Development facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building design that promotes safety; (c) adequate lighting; (d) appropriate signage and wayfinding; (e) minimisation of entrapment locations; and (f) building entrances, loading and storage areas that are well lit and lockable after hours. **Editor's note—**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.

Table 6.2.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
General	
PO14 Development minimises impacts on remaining areas of ecological significance within the zone.	No acceptable outcome is nominated.
PO15 On elevated or steeply sloping sites: (a) development is sympathetic to the natural landform through the use of terraced or split level building forms; (b) the understoreys of buildings are screened to maintain the quality of views from public vantage points below; and (c) buildings avoid highly reflective finishes.	No acceptable outcome is nominated.

Table 6.2.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Parking and servicing	
PO16 Parking facilities are located to be concealed from public view to ensure an attractive streetscape.	**AO16** Vehicle parking structures are located: (a) behind the building setback; or (b) behind the building; or (c) at basement level. Figure 6.4 – Concealment of parking structure illustrates.

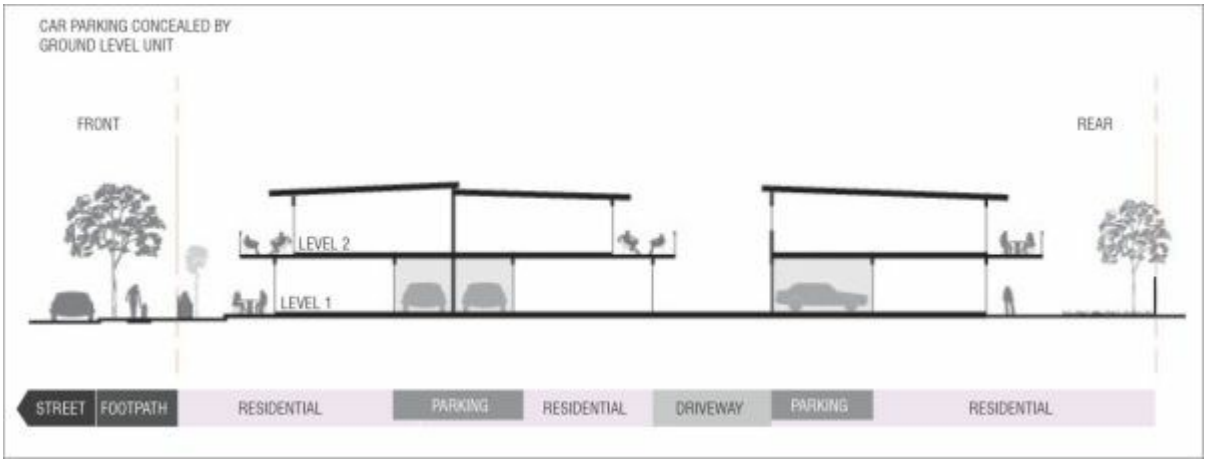

Figure 6.4 Concealment of parking structure

PO17 Waste disposal and servicing areas are screened from public view and do not have adverse amenity impacts on adjoining properties.	No acceptable outcome is nominated.

Table 6.2.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
For assessable development — where a non-residential or tourist accommodation use	
PO18 Non-residential uses are established only where: (a) compatible with local character and amenity; (b) limited in scale and supporting the day-to-day needs of the local community; and (c) not impacting on the role and function of the city's network of centres or more appropriately located in another zone.	No acceptable outcome is nominated. **Editor's note—**Applicants should have regard to Economic impact assessment planning scheme policy no. SC6.5 for guidance on how to demonstrate compliance with this performance outcome.
PO19 Tourist accommodation occurs only within the townships of Paluma, Balgal Beach, Toomulla, Toolakea and Saunders Beach and the Magnetic Island townships, and is compatible with the village character of these communities.	No acceptable outcome is nominated.
PO20 Development is of a house compatible scale.	**AO20.1** The use does not involve any building work or only minor building work. OR
	AO20.2 Where a new building is proposed: (a) buildings and other structures do not exceed 8.5m or 2 storeys, whichever is the lesser; (b) the building does not exceed 250m^2 in gross floor area; (c) site cover does not exceed 60%; and (d) the maximum length of any wall is 12m.

Table 6.2.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development – where a multiple dwelling, residential care facility or retirement facility development	
Location	
PO21 Multiple dwelling, residential care facility or retirement facility development occur only in locations where: (a) they can be designed to be compatible with local character and low density scale of development; (b) having convenient walkable access to the city's network of centres; (c) having convenient walkable access to public transport; and (d) having convenient walkable access to recreational facilities.	**AO21** The premises: (a) is located within 400m of a centre zone or public transport stop on a major road; (b) has a minimum site area of 1,000m² and 20m frontage where for a multiple dwelling; (c) has a minimum site area of 3,000m² and 20m frontage where for a residential care facility or retirement facility; and (d) is located within 400m of a park.
PO22 Buildings are low-rise and of a house compatible scale.	**AO22** Building design achieves: (a) a site cover that does not exceed 65% of site area; (b) a building height that does not exceed 2 storeys and 8.5m if it is within 10m of a site boundary, and 3 storeys if it is 10m or more from a site boundary; and (c) the maximum length of any wall is 12m.
PO23 Building setbacks and landscaping: (a) create an attractive, consistent and cohesive streetscape; (b) maintain appropriate levels of light and solar penetration, air circulation, privacy and amenity for existing and future buildings; and (c) do not prejudice the development or amenity of adjoining sites.	**AO23.1** Buildings are set back from street frontages: (a) within 20% of the average front setback of adjoining buildings; or (b) where there are no adjoining buildings, 3m. Figure 6.5 – Appropriate front setbacks illustrates.
	AO23.2 A landscape area with a minimum dimension of 1m is provided along the full frontage of any road frontage (excluding crossover and pedestrian access only). Figure 6.6 – Appropriate front and rear setbacks illustrates.
	AO23.3 The side boundary setback is a minimum of: (a) 1.5m for a wall up to 4.5m high; (b) 2m for a wall up to 7.5m high; and (c) 2.5m for any part of a wall over 7.5m high. **Editor's note—**Development should also comply with the requirements of AO21 (b), such that any part of the building that is 3 storeys is 10m or more from a site boundary.
	AO23.4 The rear boundary setback is a minimum of 6m. Figure 6.6 - Appropriate front and rear setbacks illustrates.

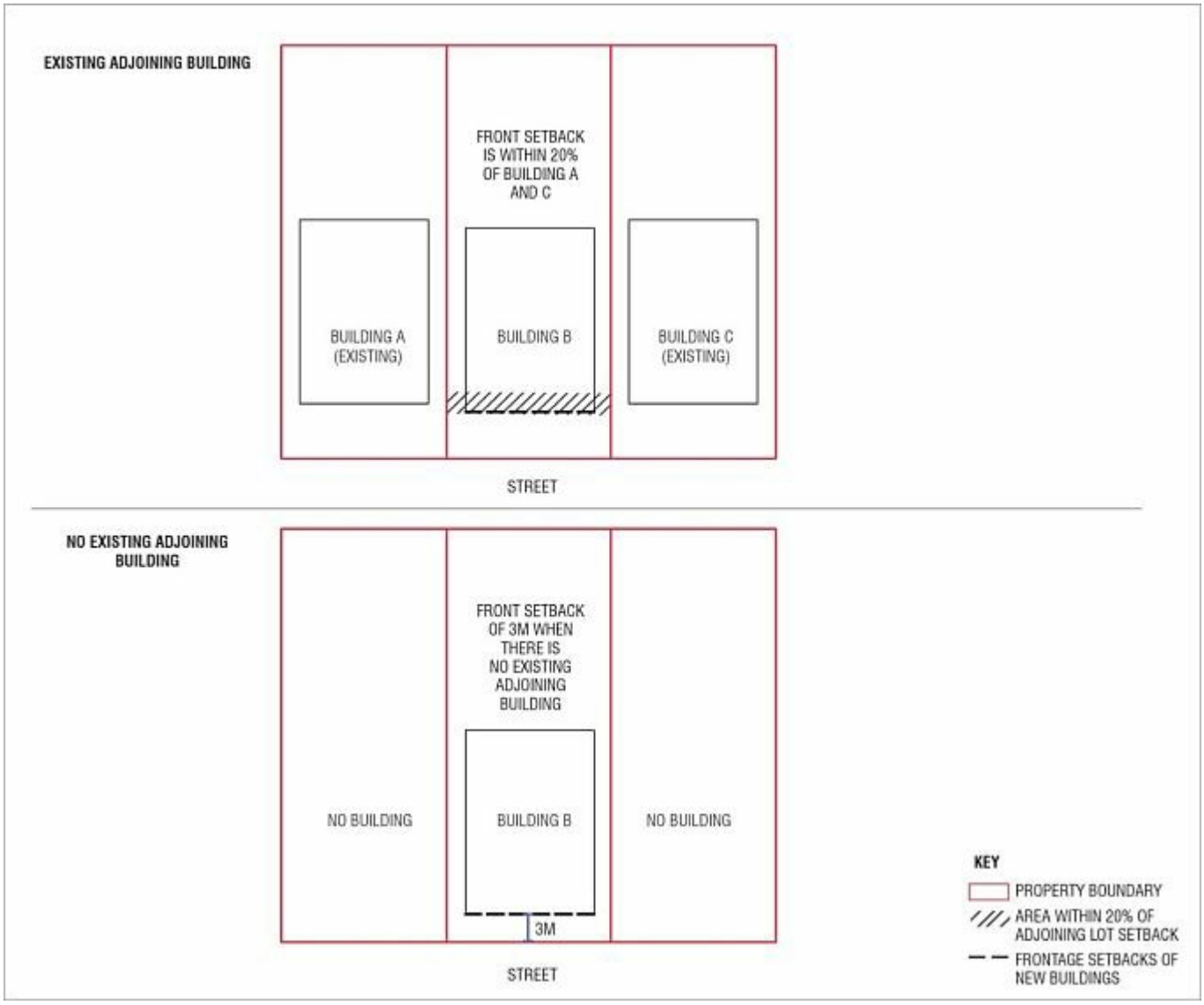

Figure 6.5 Appropriate front setbacks

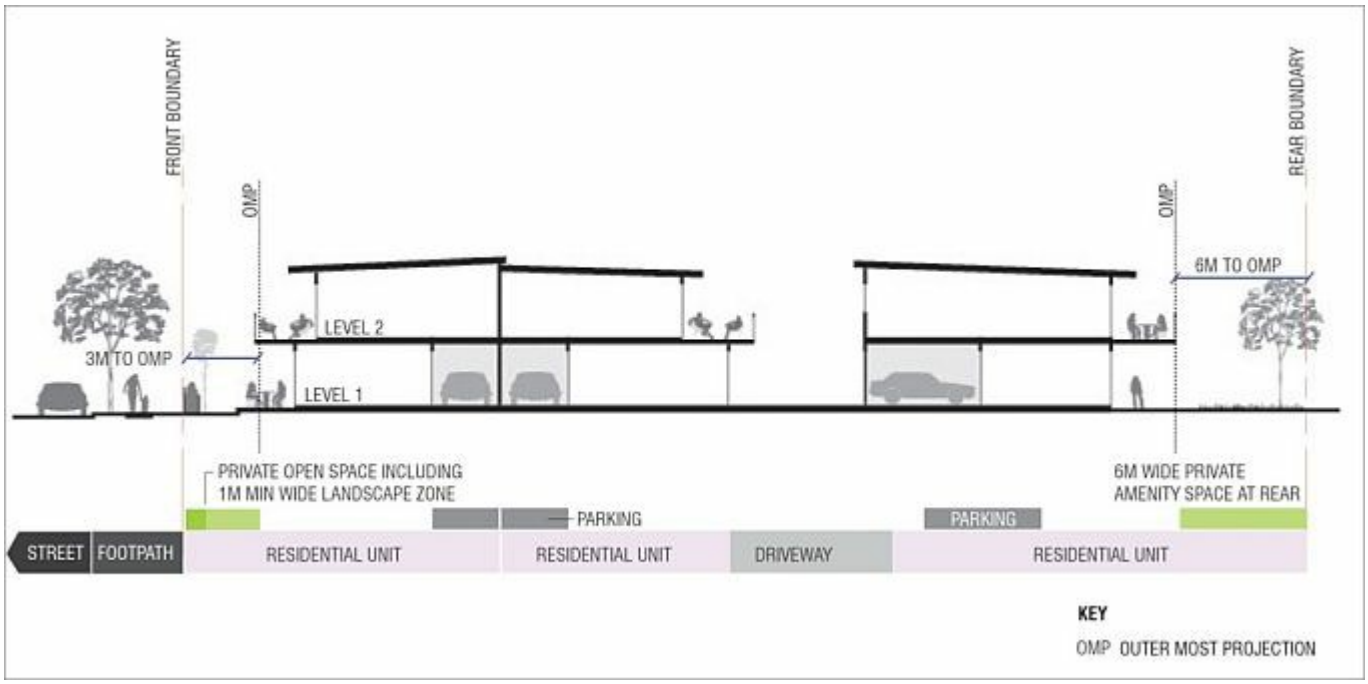

Figure 6.6 Appropriate front and rear setbacks

PO24 Built to boundary walls do not impact on the amenity or privacy of adjoining premises.	**AO24** Built to boundary walls: (a) are for non-habitable rooms or spaces only; (b) are not located within the front or rear setback; (c) are not located within 1.5m of a habitable room or house on an adjoining lot; (d) have a maximum height of 3m; and (e) have a maximum length of 9m.
PO25 Buildings are designed to achieve good solar access by: (a) minimising the extent of shadows on usable private open space or public spaces; and (b) providing adequate sunlight to habitable rooms.	No acceptable outcome is nominated.
PO26 Design elements contribute to an interesting and attractive streetscape and building through: (a) the provision of projections and recesses in the façade which reflect changes in internal functions of buildings, including circulation; (b) variations in material and building form; (c) modulation in the façade, horizontally or vertically; (d) articulation of building entrances and openings; (e) corner treatments to address both street frontages; (f) elements which assist in wayfinding and legibility; and (g) elements which relate to the context including surrounding buildings, parks, streets and open spaces. Figure 6.7 – Building design elements provides indicative guidance.	No acceptable outcome is nominated.
PO27 Roof form assists in reducing the appearance of building bulk by: (a) articulating individual dwellings; and (b) incorporating variety in design through use of roof pitch, height, gables and skillions. Figure 6.7 – Building design elements provides indicative guidance.	No acceptable outcome is nominated.

Figure 6.7 Building design elements

PO28 Development promotes the safety of residents and visitors, particularly through casual surveillance of the street and public spaces.	**AO28.1** Buildings are designed to have balconies, windows and building openings overlooking streets and other public spaces. Figure 6.8 – Design for casual surveillance illustrates.
	AO28.2 Fences or walls along a street frontage have a maximum height of 1.2m where solid, or 1.8m where that portion of the fence above 1.2m high is at least 50% transparent.

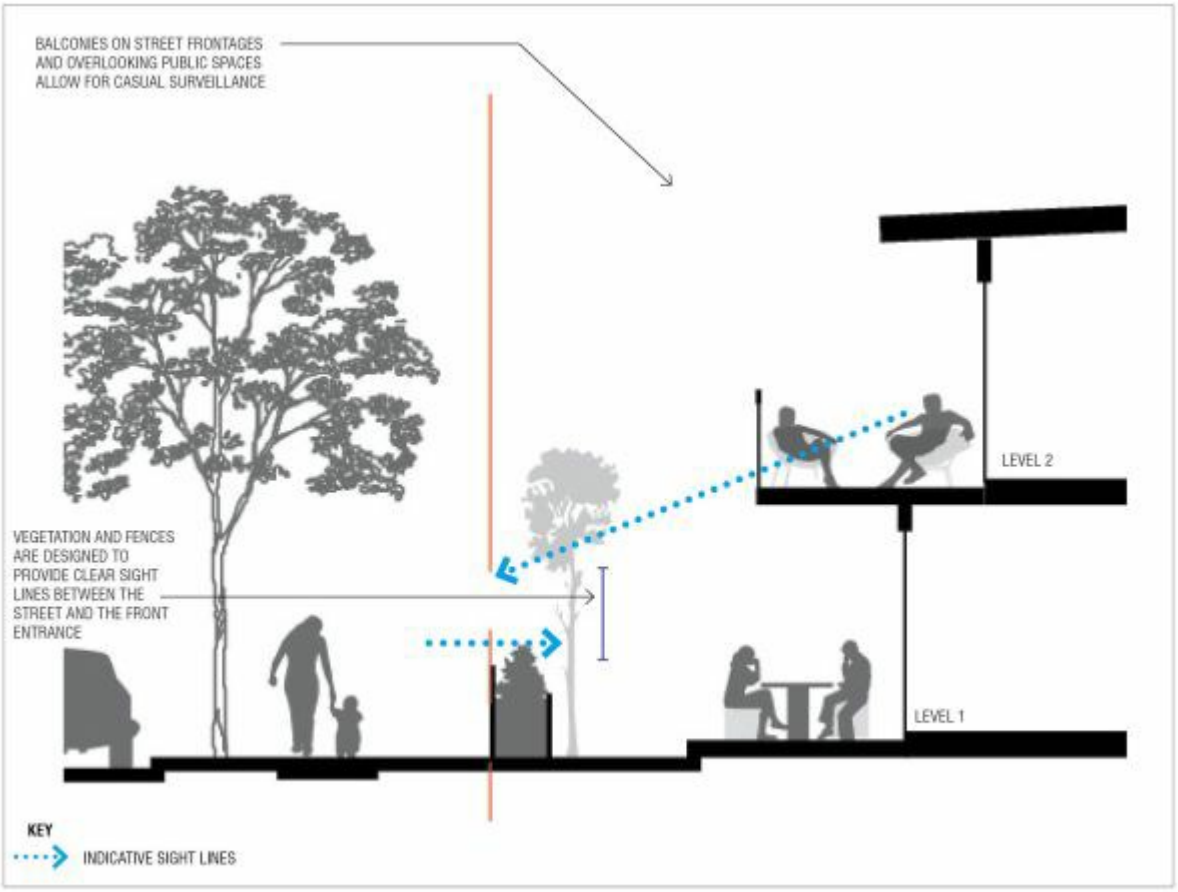

Figure 6.8 Design for casual surveillance

PO29 Development provides private open space that is: (a) well-proportioned, appealing, functional and easily accessible, and promotes outdoor living as an extension of the dwelling; (b) provides a high level of privacy for residents and neighbours; and (c) has sufficient size and shape to meet the needs of a diversity of potential residents.	**AO29.1** For a ground floor dwelling (where a multiple dwelling), ground floor private open space is provided with: (a) a minimum area of 35m²; (b) a minimum dimension of 3m; and (c) clear of any utilities such as gas, water tanks or air-conditioning units.
	AO29.2 For a dwelling above ground storey, private open space is provided as a balcony with: (a) a minimum area of 9m² for a 1 bedroom unit or 16m² for a 2 or more bedroom unit; (b) a minimum dimension of 3m; and (c) clear of any utilities such as air conditioning units or drying space.
	AO29.3 Where clothes drying areas are provided on private balconies they are screened from public view and do not take up more than 10% of the balcony area.
	AO29.4 Private open space is located or screened so it does not directly overlook main living areas or private open space of adjoining dwellings. Where screening is used, it is at least 50% translucent.
PO30 Sufficient communal open space is provided to create flexible spaces suitable for a range of activities.	No acceptable outcome is nominated.
PO31 Communal open space provides facilities including seating, landscaping and shade. Treatments such as green roofs, green walls or community gardens contribute to the attractiveness of these spaces.	No acceptable outcome is nominated.
PO32 Air conditioning units are insulated so that adjoining properties are not affected by the noise source, and are not significantly visible from the street.	No acceptable outcome is nominated.

Table 6.2.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Ross River Road corridor precinct	
PO33 No new non-residential development is established within the precinct.	No acceptable outcome is nominated.
PO34 Expansion of existing non-residential development is minor in nature and does not significantly increase the intensity of non-residential activity.	**AO34** New gross floor area is only added through internal building work to an existing building.

Table 6.2.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Marlow Street precinct	
PO35 Reconfiguration creates large residential lots which support the protection of environmental values.	**AO35** Lots are not smaller than 750m^2 and the minimum average lot size across the whole of the precinct is not less than 1,700m^2.
PO36 Residential development occurs primarily in the form of dwelling houses on large lots with a limited site cover.	No acceptable outcome is nominated.
PO37 Built form and infrastructure is subordinate to vegetation and the natural landform.	No acceptable outcome is nominated.

6.2.2 Medium density residential zone code

6.2.2.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.2.2.2 Purpose

(1) The purpose of the Medium density residential zone code is to provide for a range and mix of dwelling types including dwelling houses and multiple dwellings.

(2) The particular purpose of the code is to:

- (a) provide opportunities for medium density living close to centres and other community nodes in a generally low to medium-rise built form;
- (b) maintain a high level of residential amenity; and
- (c) achieve accessible, well-serviced and well-designed communities.

(3) The purpose of the zone will be achieved through the following overall outcomes:

- (a) residential development consists primarily of low-rise (up to 3 storeys in building height) apartments or town house style dwellings, together with a mix of lot sizes or duplex housing types. Taller, more intensive built form will generally be limited to key infill locations near the city's major centres, as specifically intended in particular precincts;
- (b) built form creates an attractive and pedestrian oriented streetscape which integrates with nearby centres, public transport and community activities;
- (c) reconfiguration creates lots which facilitate the location of dwellings which address the street and allow for climate-responsive building orientation;
- (d) residential uses may also include residential care facilities, retirement facilities, rooming accommodation and short-term accommodation;
- (e) development maintains a high level of residential amenity on the site and in the neighbourhood;
- (f) residential development is protected from the impacts of nearby centres, industrial activities, transport corridors and infrastructure installations and major facilities such as the port, airport and Department of Defence landholdings;
- (g) the design of development promotes accessibility by walking, cycling and public transport;
- (h) the design of development is responsive to the city's climate by taking into account prevailing breezes, slope and solar orientation, provision of awnings and promotes sustainable practices including energy efficiency and water conservation; and
- (i) non-residential uses only occur where they are specifically intended in particular precincts or where they primarily support the day-to-day needs of the immediate residential community, do not unreasonably detract from the residential amenity of the area and are not better located in nearby centres.

(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts:

Thuringowa South precinct:

(a) medium density housing reinforces the role and vibrancy of Thuringowa Central major centre, and includes student and visitor accommodation to reinforce economic links with James Cook University and Townsville Hospital;

(b) development facilitates improved accessibility to the major centre for pedestrians and cyclists and promotes access to public transport facilities;

(c) a new east-west road link is created through the precinct providing an alternative route to High Range Drive;

(d) built form creates a medium-rise environment (up to 5 storeys in building height) along Riverway Drive;

(e) otherwise, built form within the precinct is generally low-rise (up to 3 storeys in building height); and

(f) Riverway Drive becomes a tropical boulevard providing a sense of arrival at the centre and strong landscape amenity. This is achieved through street tree planting, stronger definition of road edges by buildings fronting the street and screening of parking areas.

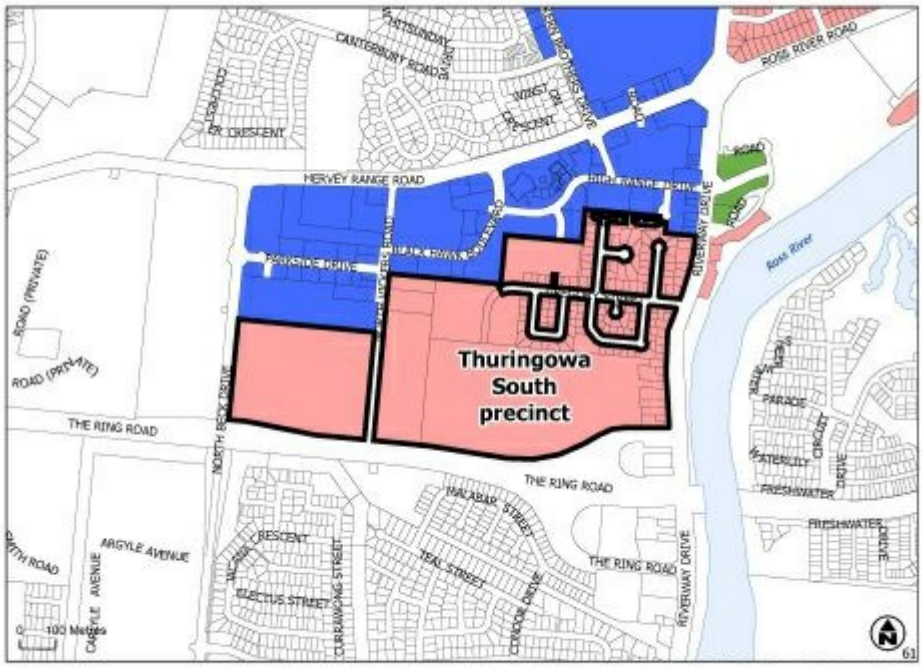

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Figure 6.9 - Thuringowa South precinct

Thuringowa East precinct:

(a) medium density housing reinforces the role and vibrancy of Thuringowa Central major centre, and includes student and visitor accommodation to reinforce economic links with James Cook University and Townsville Hospital;

(b) built form creates a medium-rise environment (up to 5 storeys in building height) along Thuringowa Drive and Ross River Road and transitions down to surrounding low-rise residential areas;

(c) development facilitates improved accessibility to the major centre for pedestrians and cyclists, provides for safer and shadier pedestrian routes and road crossings and promotes access to public transport facilities;

(d) Thuringowa Drive, Riverway Drive and Ross River Road become tropical boulevards providing a sense of arrival at the centre and strong landscape amenity. This is achieved through street tree planting, stronger definition of road edges by buildings fronting the street and reduction in vehicular access points and screening of parking areas; and

(e) existing non-residential uses do not significantly expand and no additional non-residential development is established within the precinct.

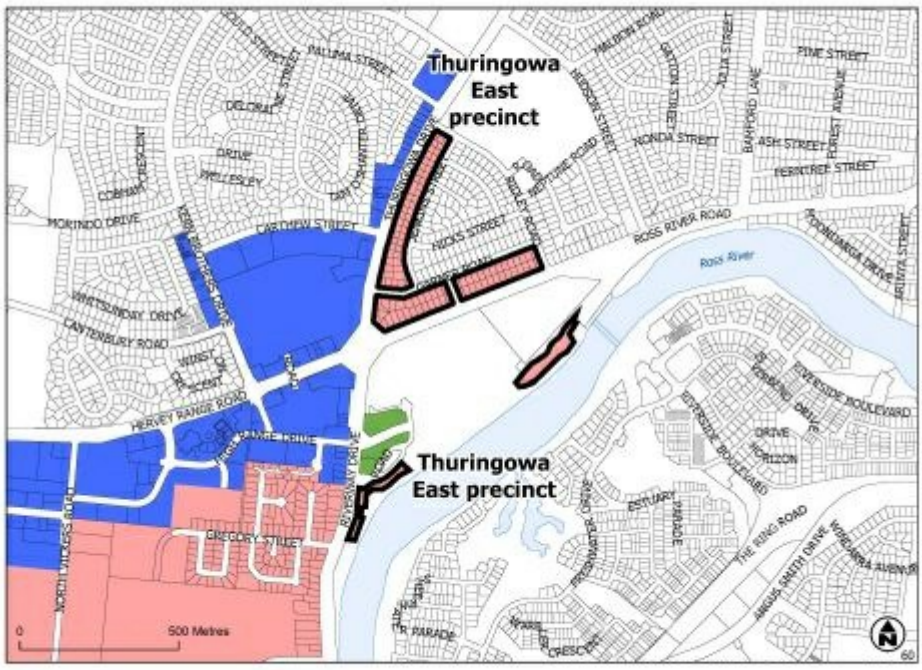

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Figure 6.10 - Thuringowa East precinct

Rossiter Park precinct:

(a) the precinct redevelops into a medium density residential community, through amalgamation of existing lots into larger sites that provide the opportunity for better designed medium density residential development;

(b) built form creates a medium-rise environment (up to 6 storeys in building height) fronting Rossiter Park and transitions down (up to 3 storeys in building height) to surrounding low-rise residential areas;

(c) development creates a strong orientation to the street and to Rossiter Park; and

(d) the redevelopment of this precinct aligns new streets with the existing street grid alignment to the north to integrate the emerging precinct into the surrounding Aitkenvale locality and re-establishes direct travel connections between the Aitkenvale major centre and Ross River and its parkland via Elizabeth Street.

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Figure 6.11 - Rossiter Park precinct

Aitkenvale medium density precinct:

(a) medium density housing reinforces the role and vibrancy of the Aitkenvale major centre, and includes student and visitor accommodation to reinforce economic links with James Cook University and Townsville Hospital;

(b) built form creates a medium-rise environment (up to 5 storeys in building height) throughout the precinct; and

(c) new development facilitates improved accessibility for pedestrians and cyclists, provides for safer and shadier pedestrian routes and road crossings and promotes access to public transport facilities.

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Figure 6.12 - Aitkenvale medium density precinct

Aitkenvale village precinct:

(a) non-residential uses occur in this precinct but are limited to small-scale retail, dining and entertainment activities accommodated on the ground floor of a residential development, and having direct frontage to Patrick Street or Elizabeth Street;

(b) built form creates a medium-rise environment (up to 5 storeys in building height);

(c) Patrick Street and Elizabeth Street are activated by small-scale shop fronts and kerbside activities at the ground storey with awnings providing protection from the elements;

(d) non-residential activities within the precinct do not impact on the role and function of the Aitkenvale major centre;

(e) large format retail and showroom uses do not establish within this precinct;

(f) development creates a safe environment, balancing vibrant street activity and the protection of visual amenity;

(g) linkages between the Aitkenvale centre and centre core sub-precinct, the Aitkenvale centre frame precinct and the Aitkenvale medium density precinct are improved through the strengthening of primary pedestrian linkages along Elizabeth Street and Patrick Street;

(h) streetscaping along Elizabeth Street and Patrick Street frontages occurs to improve the interface between the site and the street whilst also improving the pedestrian environment and experience; and

(i) Elizabeth Street is the focus for the creation of an active main street environment.

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Figure 6.13 - Aitkenvale village precinct

Hyde Park medium density precinct:

(a) land adjoining the open space corridor through Hyde Park provides for the emergence of a new residential community which complements the Hyde Park major centre;

(b) development provides for the improvement of access to the adjoining open space corridor for recreational use, whilst preserving its drainage function;

(c) a mix of housing types is provided within the precinct in generally low to medium-rise built form (up to 5 storeys in building height) which is oriented to the open space and assists in activating this interface;

(d) provision of a new road off Woolcock Street defines the precinct from adjoining commercial activities and connects it to the existing local street network via Dillane Street;

(e) the precinct connects with Virgil Street and development facilitates this becoming the major east-west pedestrian thoroughfare through the locality;

(f) non-residential uses may be established in the precinct where fronting Woolcock Street. Non-residential uses are generally small-scale and accommodated on the ground storey of a residential development; and

(g) non-residential activities within the precinct do not impact on the role and function of the Hyde Park major centre.

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Figure 6.14 Hyde Park medium density precinct

Kings Road medium density precinct:

(a) development creates a medium-rise built form (up to 5 storeys in building height), with variation in built form to create visual interest across the precinct;

(b) the interface with the showgrounds is enhanced; and

(c) impacts on residential amenity from the rail corridor are minimised.

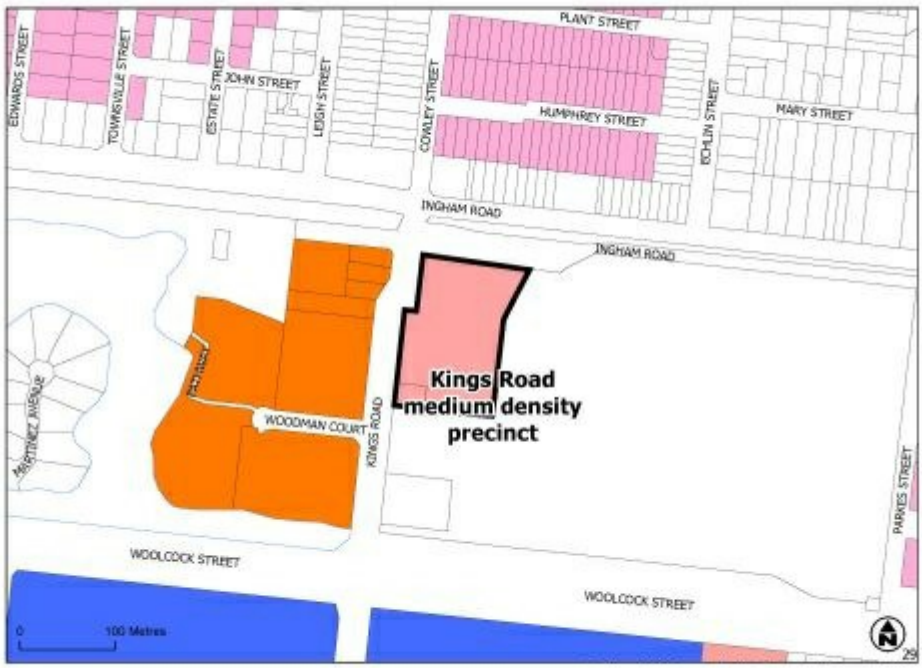

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Figure 6.15 Kings Road medium density precinct

The Strand precinct:

(a) this precinct enhances its role as Townsville's pre-eminent residential and tourist destination built on the amenity offered by The Strand parklands;

(b) The Strand forms the central focus of activity and concentration of medium density accommodation for tourists and residents;

(c) development creates a safe environment balancing vibrant street activity and the protection of residential amenity;

(d) The Strand plays a secondary role to nearby centres in accommodating non-residential uses. Non-residential uses are generally limited to small-scale cafes and restaurants accommodated on the ground storey of a residential development, to activate the street frontage and parkland;

(e) non-residential activities within the precinct do not impact on the role and function of the North Ward local centre;

(f) buildings within this precinct are designed to address The Strand parklands; and

(g) built form creates a medium-rise environment (up to 5 storeys in building height).

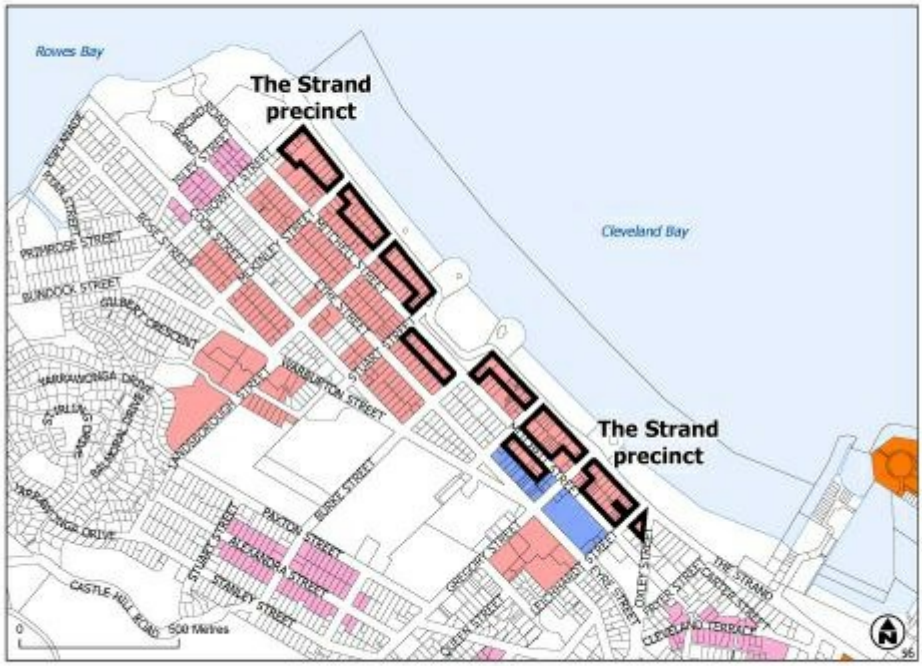

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Figure 6.16 The Strand precinct

North Ward gateway precinct:

(a) the precinct provides a key connectivity route between The Strand and Warburton Street by creating a distinctive built form along Landsborough Street;

(b) development reinforces the gateway role of the routes, creating a view corridor to The Strand and contributing to a sense of arrival and assisting in wayfinding to The Strand;

(c) built form creates a higher-medium rise environment (up to 8 storeys in building height); and

(d) an attractive tropical streetscape is created.

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Figure 6.17 North Ward gateway precinct

North Ward villages precinct:

(a) the North Ward villages are envisaged to contain the highest levels of activity and residential density in North Ward;

(b) the precinct plays a secondary role to nearby centres in accommodating non-residential uses. Non-residential uses are generally limited to small-scale cafes and restaurants accommodated on the ground floor of a residential development;

(c) Gregory Street village will expand its existing role and function as a destination for street dining and entertainment;

(d) non-residential activities within the precinct do not impact on the primacy of the principal centre or the role and function of the North Ward local centre;

(e) Landsborough Street village will develop into a secondary lifestyle focus of activity in North Ward. The role of Landsborough Street village will be to complement (not compete) with Gregory Street; and

(f) built form creates a higher-medium rise environment (up to 8 storeys in building height) along Gregory and Landsborough Streets.

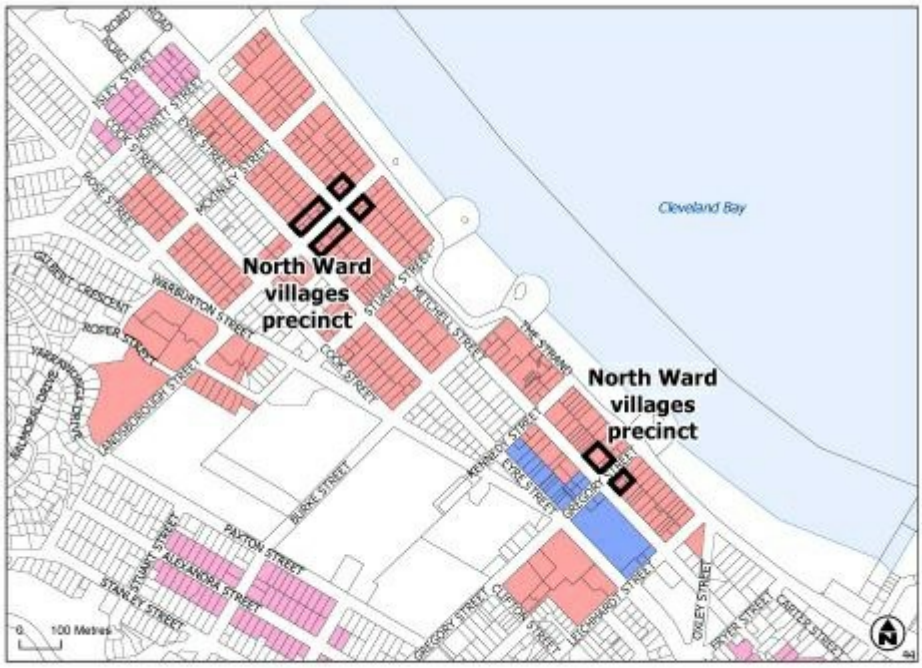

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Figure 6.18 North Ward villages precinct

North Ward medium density precinct:

(a) medium density housing reinforces the role and vibrancy of North Ward;

(b) built form creates a medium-rise environment (up to 5 storeys in building height) throughout the precinct;

(c) development of the former hospital site facilitates reuse of the hospital building for residential purposes and provides for improved accessibility for pedestrians and cyclists; and

(d) development creates a strong orientation to the street and to The Strand wherever possible.

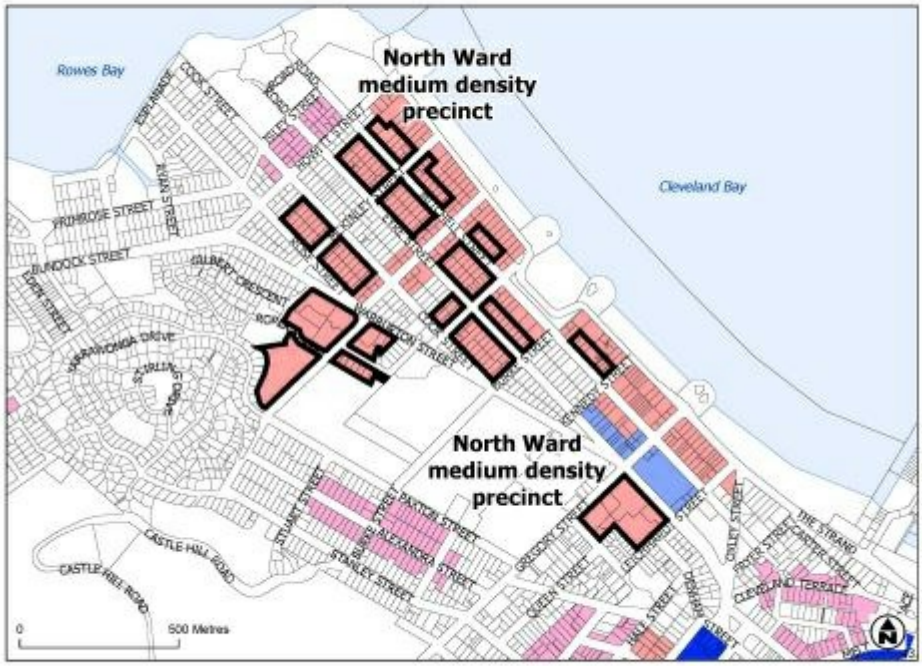

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Figure 6.19 North Ward medium density precinct

Magnetic Island medium density precinct:

(a) the precinct allows for the growth of short-term accommodation which minimises visual impact on the local natural setting, whilst providing opportunity for new investment in tourism;

(b) buildings within the precinct are low-rise (up to 2 storeys in building height) and are located to capitalise on views and beachfront settings;

(c) building scale and massing limits the impact on the natural character of Magnetic Island when viewed from the ocean and foreshore; and

(d) new buildings are in a design style that builds local character by articulation of individual units, incorporating extensive planting and climatically responsive design elements.

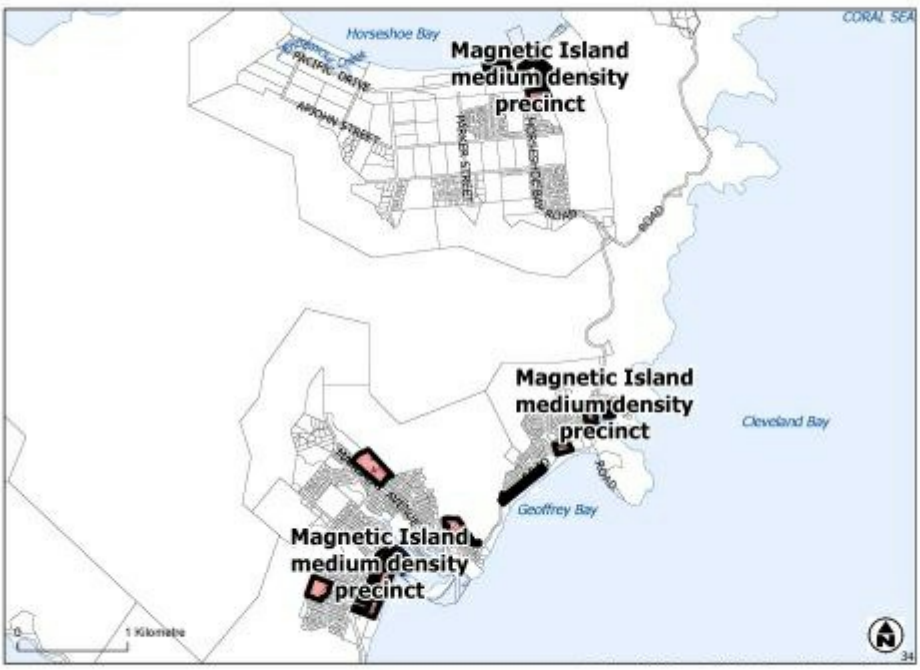

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Figure 6.20 Magnetic Island medium density precinct

Picnic Bay precinct:

(a) family oriented short-term accommodation is the predominant use established within the precinct with some non-residential uses on the ground floor;

(b) built form within the precinct consists of detached dwellings and multiple dwellings up to 2 storeys in building height; and

(c) new buildings are in a design style that builds local character by articulation of individual units, incorporating extensive planting and climatically responsive design elements.

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Figure 6.21 Picnic Bay precinct

Nelly Bay tourist precinct:

(a) the role of this precinct is to provide an attractive arrival place for the entire island, whilst also providing an accessible and convenient tourist hub, including accommodation and supporting tourist information and service facilities;

(b) built form accommodates the highest density short-term tourist accommodation on the island, with building heights up to 4 storeys;

(c) the ground floor of buildings within this precinct is activated by small scale café and restaurant uses where addressing the bay to create a waterfront promenade;

(d) tourist based businesses and services are located along Harbour Drive to support tourist needs for the island; and

(e) new buildings and streetscape improvements are in a design style that builds local character by articulation of buildings, incorporating extensive planting, use of a variety of materials and finishes and climatically responsive design elements.

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Figure 6.22 Nelly Bay tourist precinct

Wills Street precinct:

(a) built form creates a medium-rise environment (up to 4 storeys in building height) throughout the precinct and provides for a sensitive transition in scale to nearby Character residential zoned land.

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Figure 6.23 Wills Street precinct

6.2.2.3 Assessment benchmarks

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Sales office	
PO2 The use does not adversely impact on the amenity of the surrounding land uses and local character.	**AO2** Development of the sales office is in place for no more than two years.

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Home based business	
PO1 The use does not adversely impact on the amenity of the surrounding residential land uses and local character.	**AO1.1** The home based business: (a) is carried out in an existing building or structure; (b) does not use more than 60m² of the gross floor area of the building or structure; (c) involves at least one or more residents of the dwelling house; (d) involves not more than one non-resident employee; (e) where bed and breakfast accommodation does not exceed three bedrooms; (f) does not generate more than 1 heavy vehicle trip per week; **Editor's note—**A heavy vehicle is a vehicle with more than 4.5 tonnes gross vehicle mass. (g) does not generate more than 28 vehicle trips per day by other vehicles, where one trip includes arriving at the site and a second trip is departing the site. These trips are additional to normal domestic trips associated with the dwelling; (h) contains visitor parking within the site; (i) does not involve hiring out of materials, goods, appliances or vehicles; and (j) does not involve the repair or maintenance of vehicles, other than minor maintenance of vehicles used in conjunction of the home business on the site. **Editor's note—**Home based business operators should also refer to signage requirements under Table 5.8.2 -Operational work being placing an advertising device on a premises and Section 9.3.1-Advertising devices code.
	AO1.2 Functional aspects of the use such as service areas, material storage or use activities are not visible from the street.

	AO1.3 Other than where a bed and breakfast or home based childcare the business use does not operate outside the hours of 8am to 5pm Monday to Friday, 8am to 2pm Saturday and does not operate on Sunday.
	AO1.4 Noise levels do not exceed acoustic quality objectives under the Environmental Protection (Noise) Policy 2008.

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Secondary Dwelling	
PO3 Secondary dwellings are: (a) are subordinate, small-scaled dwellings; (b) contribute to a safe and pleasant living environment; and (c) does not cause adverse impacts on adjoining properties	**AO3** The secondary dwelling (a) has a GFA, exclusive of a single carport or garage, of not more than 90m^2; and (b) is located not more than 20m from the primary house

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Amenity	
PO4 Development minimises impacts on surrounding land and provides for an appropriate level of amenity within the site, having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) visual impact; (e) odour and emissions; (f) lighting; (g) access to sunlight; (h) privacy; and (i) outlook.	No acceptable outcome is nominated.
PO5 Landscaping is provided to enhance the appearance of the development, screen unsightly components, create an attractive on-site environment and provide shading.	No acceptable outcome is nominated.

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Crime prevention through environmental design	
PO6 Development facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building design that promotes safety; (c) adequate lighting; (d) appropriate signage and wayfinding; (e) minimisation of entrapment locations; and (f) building entrances, loading and storage areas that are well lit and lockable after hours. **Editor's note–**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.
PO7 Development promotes the safety of residents and visitors, particularly through casual surveillance of the street and public spaces.	**AO7.1** Buildings are designed to have balconies, windows and building openings overlooking streets and other areas which are accessible to the public. Figure 6.24 – Design for casual surveillance illustrates.
	AO7.2 Fences or walls along a street frontage have a maximum height of 1.2m where solid, or 1.8m where that portion of the fence above 1.2m high at least 50% transparent.

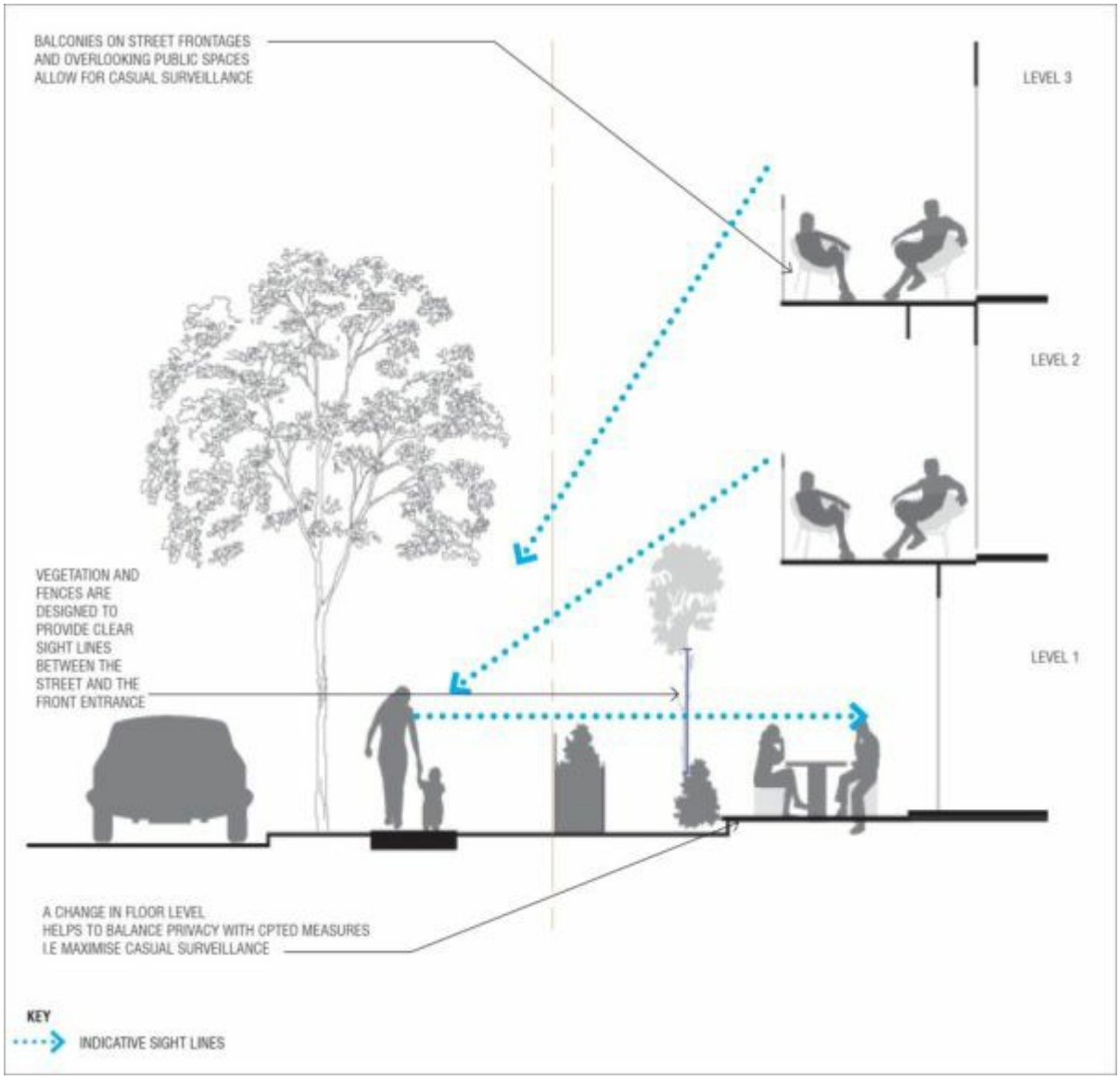
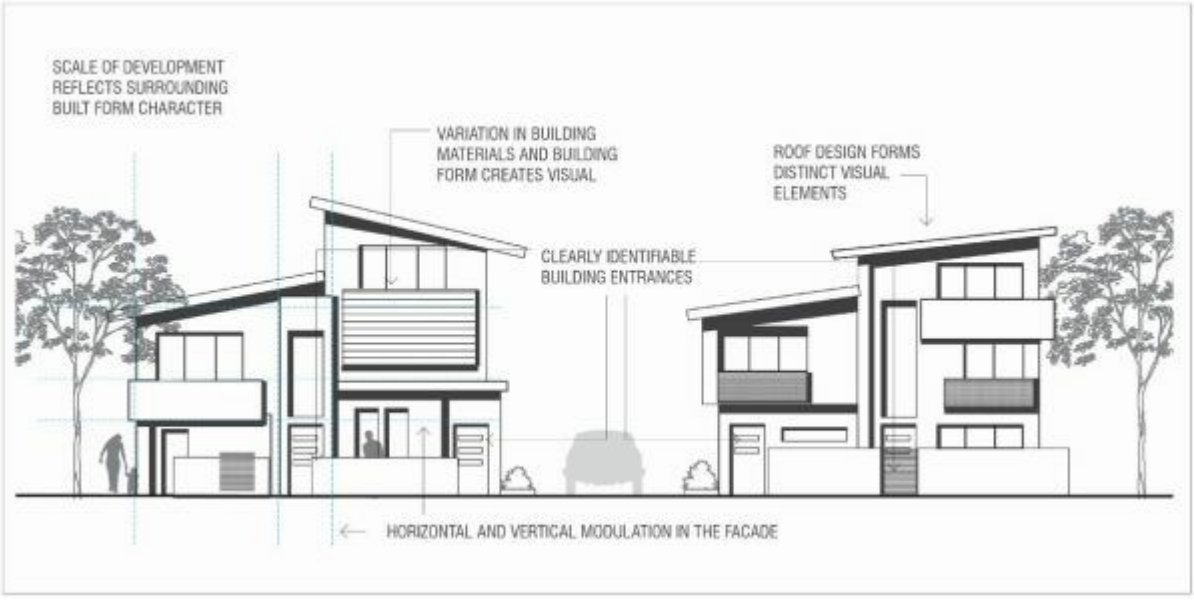


Figure 6.24 – Design for casual surveillance

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Built form	
PO8 Design elements contribute to an interesting and attractive streetscape and building through: (a) the provision of projections and recesses in the façade which reflect changes in internal functions of buildings including circulation; (b) variations in material and building form; (c) modulation in the façade, horizontally or vertically; (d) articulation of building entrances and openings; (e) corner treatments to address both street frontages for a premises on a corner; (f) elements which assist in wayfinding and legibility; and (g) elements which relates to the context including surrounding buildings, parks, streets and open spaces. Figure 6.25 – Building design elements provides indicative guidance.	No acceptable outcome is nominated.
PO9 Air conditioning units are insulated so that adjoining properties are not affected by the noise source, and are not significantly visible from the street.	No acceptable outcome is nominated.



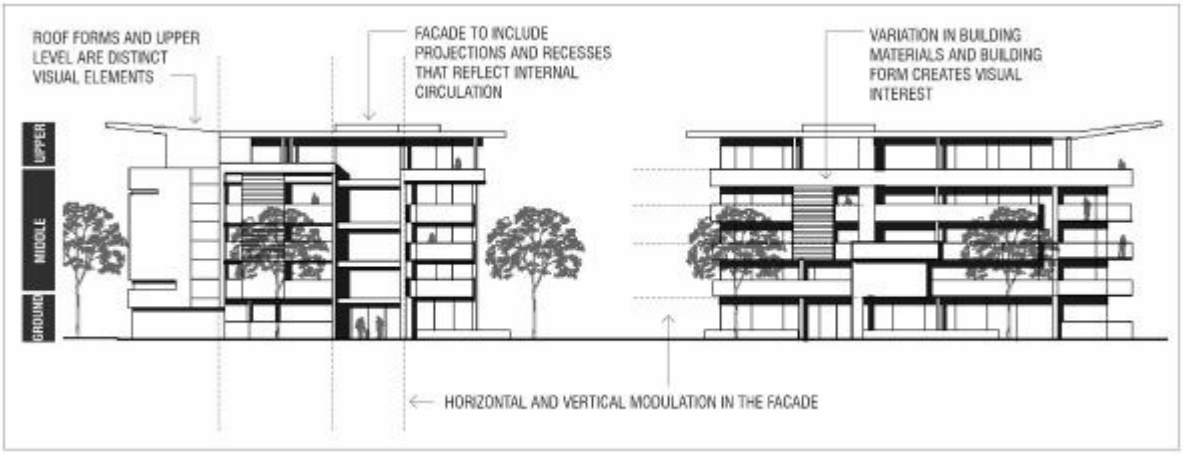


Figure 6.25 – Building design elements

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Parking and servicing	
PO10 Parking facilities are located to be concealed from public view to ensure an attractive streetscape.	**AO10** Vehicle parking structures are located: (a) behind the building setback; or (b) behind the building; or (c) at basement level. Figure 6.26 – Concealment of parking structures illustrates.

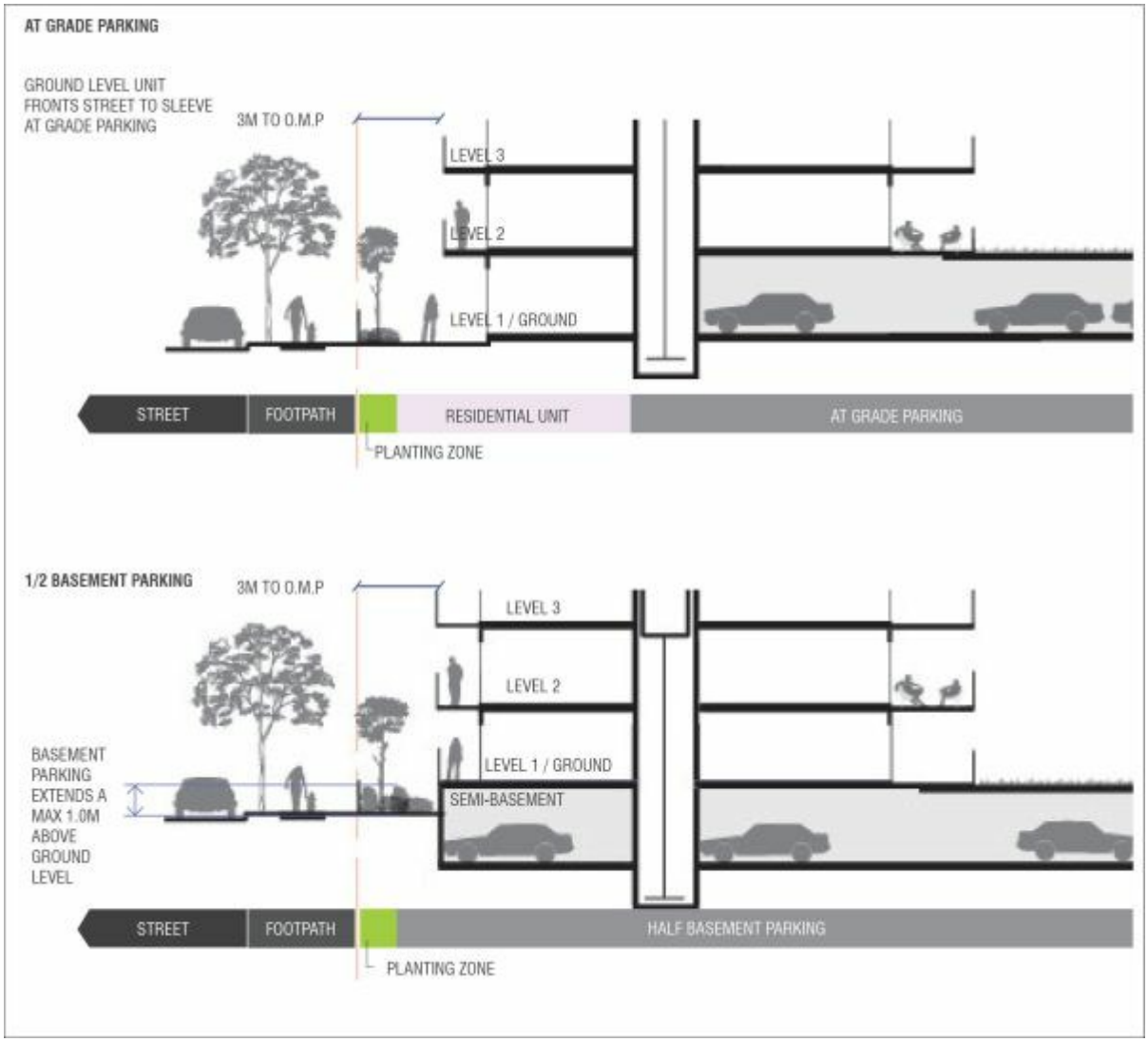


Figure 6.26 – Concealment of parking structures

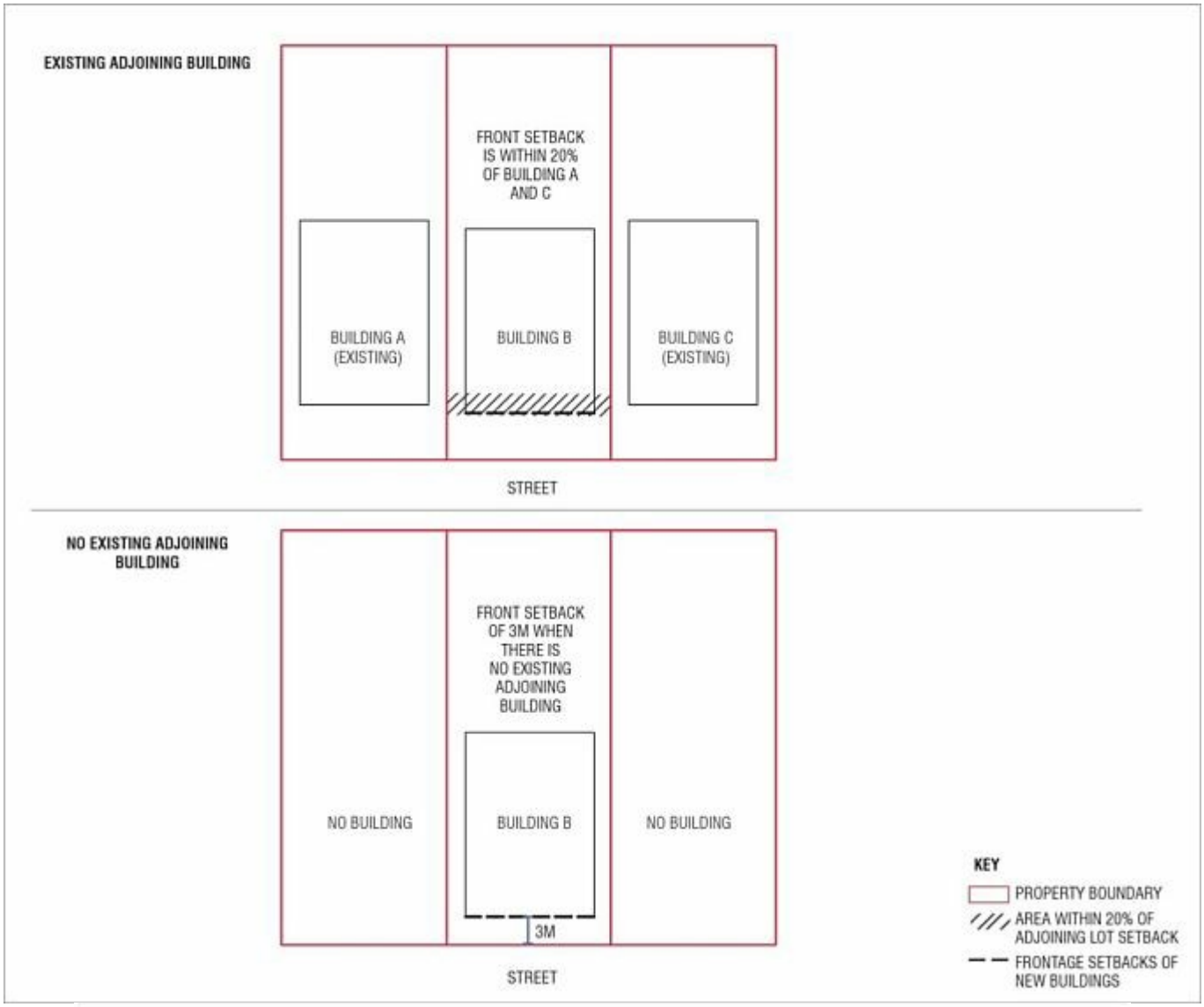
PO11 Waste disposal and servicing areas are screened from public view and do not have adverse amenity impacts on adjoining properties.	No acceptable outcome is nominated.

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development – where a non-residential use	
PO12 Non-residential uses establish only where: (a) compatible with local character and amenity; (b) limited in scale and supporting the day-to-day needs of the local community or as specifically intended for a particular precinct; and (c) not impacting on the role and function of the city's network of centres or more appropriately located in another zone.	No acceptable outcome is nominated. **Editor's note—**Applicants should have regard to Economic impact assessment planning scheme policy SC6.5 for guidance on how to demonstrate compliance with the performance outcome.

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development – where a multiple dwelling, residential care facility, retirement facility or short-term accommodation with a building height of 3 storeys or less	
Built form	
PO13 Building height and scale is proportionate to the size of the premises and the desired low-rise character of the area.	**AO13** Building design achieves: (a) a site cover that does not exceed 65%; and (b) a building height that does not exceed 3 storeys.
PO14 Building design and setbacks: (a) create an attractive, consistent and cohesive scale along the streetscape; (b) maintain appropriate levels of light and solar penetration, air circulation, privacy and amenity for existing and future buildings; and (c) do not prejudice the development of adjoining sites.	**AO14.1** Buildings are set back from street frontages: (a) within 20% of the average front setback of adjoining buildings; or (b) where there are no adjoining buildings, 3m. Figure 6.27 – Building setbacks illustrates.
	AO14.2 The side boundary setback, except for a wall built to the boundary, is a minimum of: (a) 1.5m for a wall up to 4.5m high; (b) 2m for a wall up to 7.5m high; and (c) 2.5m for any part of a wall over 7.5m high. Figure 6.27 – Building setbacks illustrates.
	AO14.3 The rear boundary setback is a minimum of 6m. Figure 6.27 – Building setbacks illustrates.
	AO14.4 A landscape area with a minimum dimension of 1.5m is provided along the full frontage of any road frontage (excluding crossover and pedestrian access only).



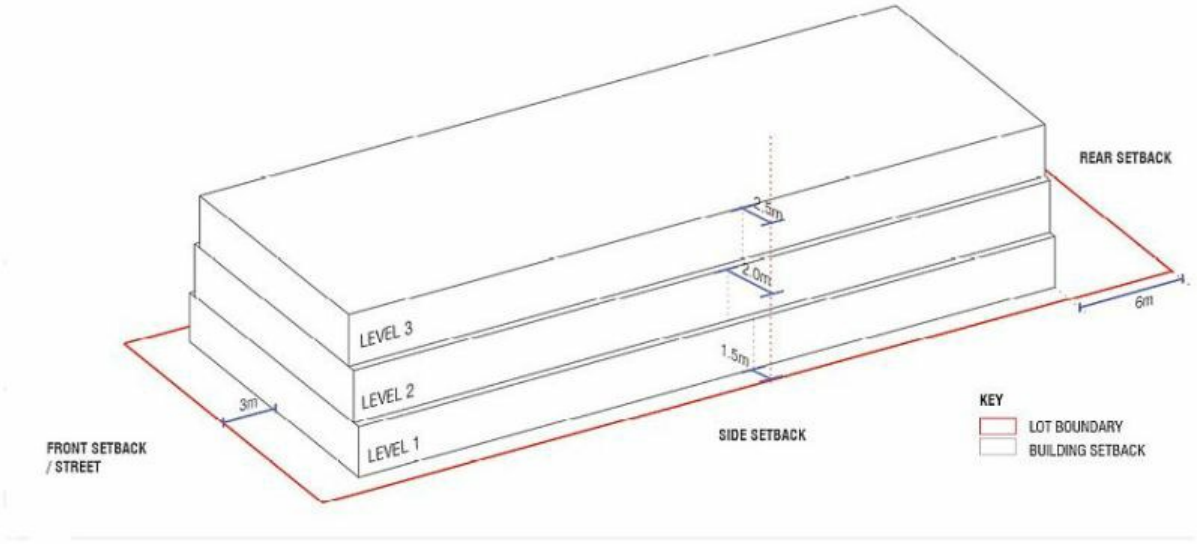


Figure 6.27 – Building setbacks

PO15 Built to boundary walls do not impact on the amenity or privacy of adjoining premises. **Editor's note–**Built to boundary wall heights and lengths may be increased where abutting an existing or proposed built to boundary wall on an adjoining property.	**AO15** Built to boundary walls: (a) are for non-habitable rooms or spaces only; (b) are not located within 1.5m of a habitable room or house on an adjoining site; (c) are not located within the front or rear setback; (d) have a maximum height of 3m; and (e) have a maximum length of 15m.
PO16 Roof form assists in reducing the appearance of building bulk by: (a) articulating individual dwellings; and (b) incorporating variety in design through use of roof pitch, height, gables and skillions.	No acceptable outcome is nominated.
PO17 Development provides private open space that is: (a) well-proportioned, appealing, functional and easily accessible, and promotes outdoor living as an extension of the dwelling; (b) provides a high level of privacy for residents and neighbours; and (c) has sufficient size and shape to meet the needs of a diversity of potential residents.	**AO17.1** For a ground floor dwelling, ground floor private open space is provided with: (a) a minimum area of 25m²; (b) a minimum dimension of 4m; and (c) clear of any utilities such as gas, water tanks or air-conditioning units
	AO17.2 Balconies are provided with a minimum area of 9m² for a 1 bedroom unit or 16m² for a 2 or more bedroom unit, with a minimum dimension of 4m and clear of any air conditioning unit or drying space.
	AO17.3 Where clothes drying areas are provided on private balconies they are screened from public view.
	AO17.4 Private open space is located or screened so it does not directly overlook main living areas or private open space of adjoining dwellings.
PO18 Sufficient communal open space is provided to create flexible spaces suitable for a range of activities.	No acceptable outcome is nominated.
PO19 Communal open space provides facilities including landscaping and shade treatments such as green roofs, green walls or community gardens contribute to the attractiveness of these spaces.	No acceptable outcome is nominated.

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development – where a multiple dwelling, residential care facility, retirement facility or short-term accommodation within a precinct intended for building heights of 4 storeys or more	
Built form	
PO20 Building design creates an enjoyable pedestrian environment and experience through the use of: (a) design elements that promote a sense of human scale at the street level, including use of awnings where appropriate; (b) design that breaks up the ground floor elevation on the principle street frontage into distinct elements; and (c) articulation of the built form above ground floor through use of balconies, recesses and changes in material.	No acceptable outcome is nominated.
PO21 Building design and setbacks: (a) create an attractive, consistent and cohesive scale along the streetscape; (b) maintain appropriate levels of light and solar penetration, air circulation, privacy, landscaping and amenity for existing and future buildings; and (c) do not prejudice the development of adjoining land.	**AO21.1** The design meets the setback requirements outlined by Table 6.2.2.3(b) — Building setbacks Medium density residential zone. Figure 6.28 – Building setbacks illustrates.
	AO21.2 A deep planting landscape area with a minimum width of 1.5m is provided along the full frontage of any road frontage (excluding crossover and pedestrian access). Figure 6.28 – Building setbacks illustrates.
	AO21.3 A deep planting landscape area with a minimum width of 1.5m is provided along the rear site boundary. Figure 6.28 – Building setbacks illustrates.

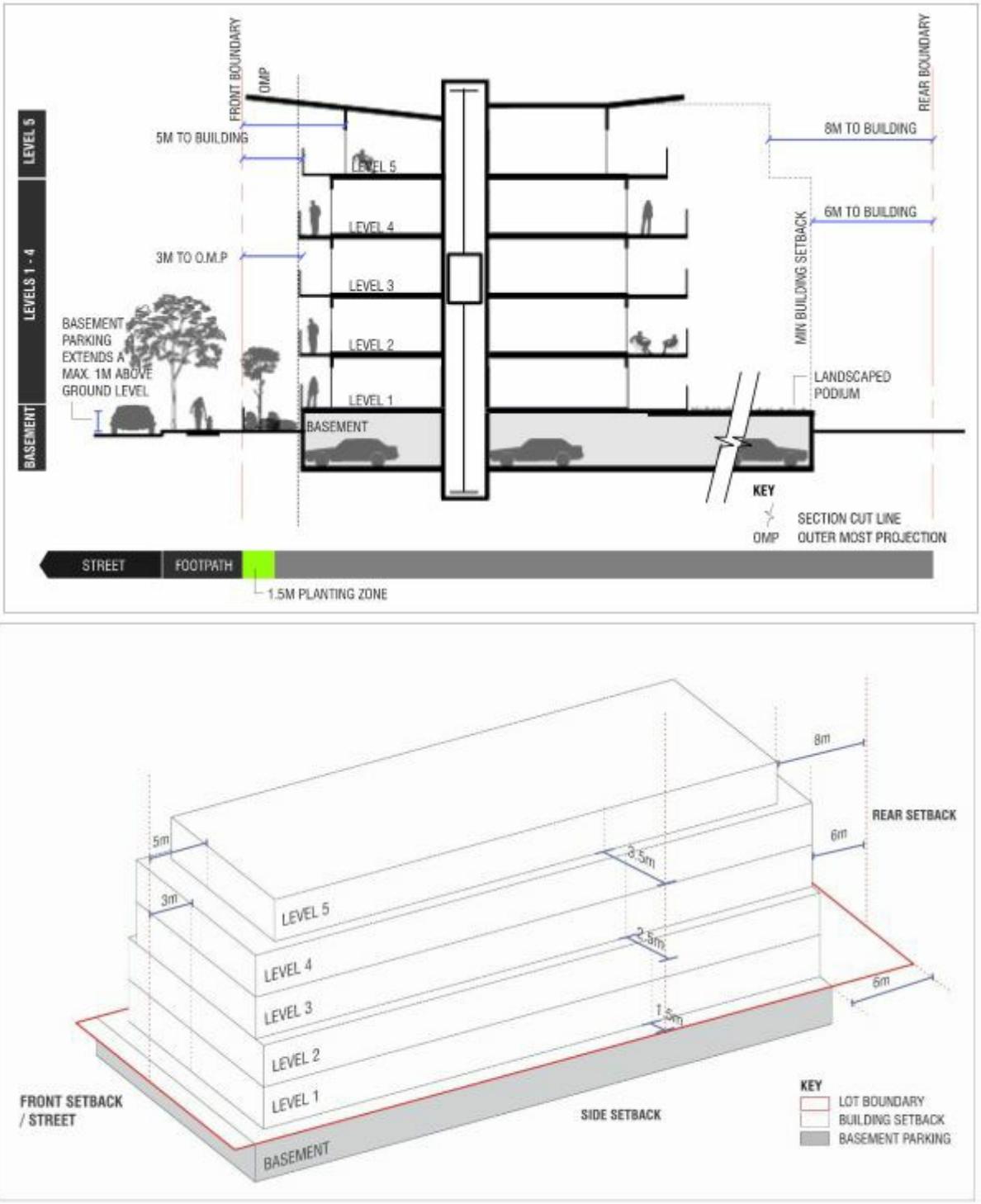


Figure 6.28 – Building setbacks

PO22 Roof forms assist in articulating the facade as a combination of distinct elements integrated with the facade design.	No acceptable outcome is nominated.
PO23 Roof top plant and equipment are contained within roof forms and are screened from the street and from adjoining buildings using a consistent range of non-reflective materials to provide a cohesive design element.	No acceptable outcome is nominated.

PO24 Development provides private open space that is: (a) well-proportioned, appealing and functional and easily accessible, and promotes outdoor living as an extension of the dwelling; (b) provides a high level of privacy for residents and neighbours; and (c) has sufficient size and shape to meet the needs of a diversity of potential residents.	**AO24.1** Balconies are provided with a minimum area of 9m² for a 1 bedroom unit or 16m² for 2 or more bedroom unit, with a minimum dimension of 4m and clear of any air conditioning unit or drying space.
	AO24.2 Where clothes drying areas are provided on private balconies they are screened from public view.
	AO24.3 Private open space is located or screened so it does not directly overlook main living areas or private open space of adjoining dwellings.
PO25 Sufficient communal open space is provided to create flexible spaces suitable for a range of activities and to mitigate the intensity of the built form.	No acceptable outcome is nominated.
PO26 Communal open space provides facilities including seating, shade, flexible spaces suitable for a range of activities. Treatments such as green roofs, green walls or community gardens contribute to the attractiveness of these spaces.	No acceptable outcome is nominated.

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
Additional benchmarks for assessable development in precincts **Note–**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Thuringowa South precinct	
PO27 New road linkages are created in accordance with Figure 6.29 – Thuringowa South precinct concept plan, including an alternative east west link from Riverway Drive to North Beck Drive and to provide a direct link into the Thuringowa Central major centre precinct.	No acceptable outcome is nominated.
PO28 Development creates a compatible interface with the centre activities and facilitates pedestrian and cyclist access to the Thuringowa Central major centre precinct in accordance with Figure 6.29 – Thuringowa South precinct concept plan.	No acceptable outcome is nominated.
PO29 Building height and scale is consistent with the character desired for the precinct. The size of the development site allows for the primary orientation of buildings to the street, and the provision of building setbacks, on-site services and circulation and open space at ground storey.	**AO29.1** Building height does not exceed 5 storeys where fronting Riverway Drive in the area shown on Figure 6.29 – Thuringowa South precinct concept plan, and 3 storeys otherwise.
	AO29.2 Where accommodating a building of more than 3 storeys, development sites have a minimum size of 1,000m2.

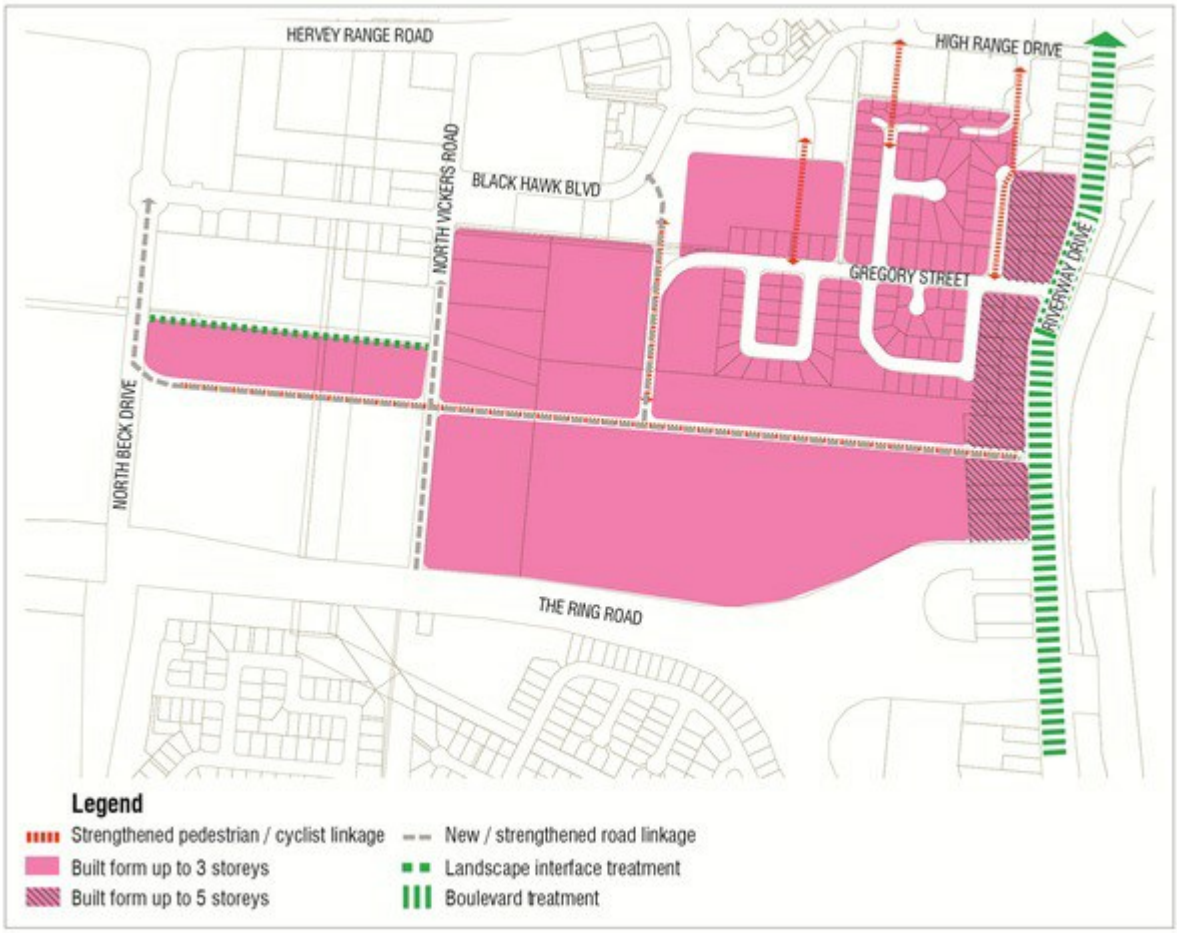


Figure 6.29 – Thuringowa South precinct concept plan

PO30 Development contributes to the boulevard treatment of Riverway Drive, through landscaping and streetscape treatments along the road frontage.	No acceptable outcome is nominated.

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Thuringowa East precinct	
PO31 Development contributes, through street improvements, to the boulevard treatment of Thuringowa Drive, Riverway Drive and Ross River Road.	No acceptable outcome is nominated.
PO32 Building height and scale is consistent with the character desired for the precinct. The size of the development site allows for the primary orientation of buildings to the street, and the provision of building setbacks, on-site services and circulation and open space at ground storey. Built form provides for sensitive transitioning in height and scale to nearby Low density residential zoned land.	**AO32.1** Building height does not exceed 5 storeys in the areas shown on Figure 6.30 – Thuringowa East precinct concept plan, and 3 storeys otherwise.
	AO32.2 Where accommodating a building of more than 3 storeys, development sites have a minimum size of 1,000m^2.

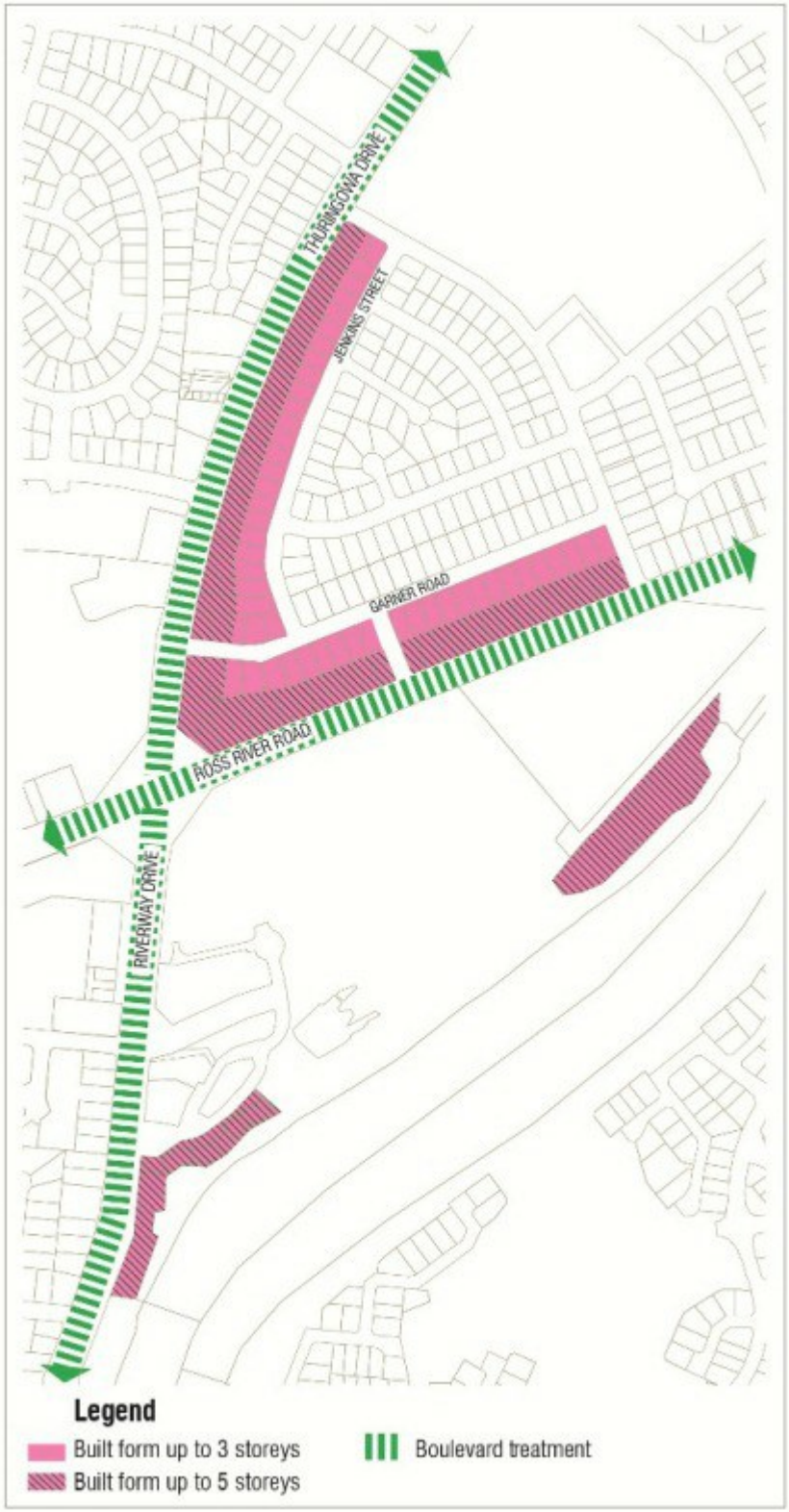


Figure 6.30 – Thuringowa East precinct concept plan

PO33 Access to Ross River Road, Thuringowa Drive and Riverway Drive is consolidated.	**AO33.1** Development sites have a minimum size of 1,000m^2 and contain no more than 1 access driveway.
	AO33.2 Access driveways are provided from rear or side streets rather than Thuringowa Drive or Riverway Drive.
PO34 No new non-residential development is established within the precinct.	No acceptable outcome is nominated.
PO35 Expansion of existing non-residential development is minor in nature and does not significantly increase the intensity of non-residential activity.	**AO35** New gross floor area is only added through internal building work to an existing building.

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Rossiter Park precinct	
PO36 Development achieves a coordinated redevelopment of this precinct into a high quality medium density urban environment which is highly responsive to the amenity offered by Ross River and its parklands through building orientation, intensity of built form and landscaping treatment. Development site planning is undertaken in accordance with Figure 6.31 – Rossiter Park precinct concept plan.	No acceptable outcome is nominated.
PO37 Building height and scale is consistent with the character desired for the precinct. The size of the development site allows for primary orientation of buildings to the street, the provision of building setbacks, on-site services and circulation and open space at ground storey. Development over 3 storeys occurs only on large, amalgamated sites that facilitate well-proportioned buildings permitting primary orientation to the park.	**AO37.1** Building height does not exceed 6 storeys in the area shown on Figure 6.31 – Rossiter Park precinct concept plan, and 3 storeys otherwise.
	AO37.2 Where accommodating a building of more than 3 storeys, development sites have a minimum size of 1,000m^2.
PO38 Development facilitates new street connections and promotes visual and pedestrian connectivity through the precinct to Rossiter Park to the south and Aitkenvale major centre precinct to the north, in accordance with Figure 6.31 – Rossiter Park precinct concept plan.	No acceptable outcome is nominated.

PO39 On frontages shown on Figure 6.31 – Rossiter Park precinct concept plan as having a responsive edge, buildings contribute to the creation of a strong and pedestrian oriented edge to the street, by: (a) having a primary orientation overlooking the street and Rossiter Park; and (b) having facades which contain windows, doors, materials and features which generate visual interest at the street level.	No acceptable outcome is nominated.

Figure 6.31 – Rossiter Park precinct concept plan

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Aitkenvale medium density precinct	
PO40 Building height and scale is consistent with the character desired for the precinct. The size of the development site allows for the primary orientation of buildings to the street, and the provision of building setbacks, on-site services and circulation and open space at ground storey.	**AO40.1** Building height does not exceed 5 storeys.
	AO40.2 Where accommodating a building of more than 3 storeys, development sites have a minimum size of 1,000m^2.
PO41 Pedestrian routes are defined by building streetscape improvements that provide shade and improve pedestrian comfort.	No acceptable outcome is nominated.

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in Aitkenvale village precinct **Note**-Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Aitkenvale village precinct	
PO42 Supermarket and showroom retail uses do not occur in this precinct.	No acceptable outcome is nominated.
PO43 Food and drink outlets are established where they are (a) orientated to the street; (b) incorporate outdoor dining; and (c) are located on the ground floor with accommodation above.	No acceptable outcome is nominated.
PO44 Where incorporating ground floor non-residential use, the design of buildings provides for pedestrian friendly and visually interesting frontages.	**AO44.1** Front setbacks at the ground floor do not exceed 3m.
	AO44.2 Ground floor tenancies where including a non-residential use are articulated through: (a) variation in use of materials (glass, timber, steel, masonry); and (b) a change in plane of a minimum 0.5m for any length of the facade exceeding 10m.
	AO44.3 Ground floor tenancies are designed to be adaptable and flexible in configuration allowing for creation of indoor and outdoor spaces through use of large openings.

PO45 Building height and scale is consistent with the character desired for the precinct. The size of the development site allows for the primary orientation of buildings to the street, and the provision of building setbacks, on-site services and circulation and open space at the ground storey.	**AO45.1** Building height does not exceed 5 storeys.
	AO45.2 Where accommodating a building of more than 3 storeys, development sites have a minimum size of 1,000m^2.
PO46 Where incorporating ground floor non-residential uses, weather protection is provided to usable outdoor spaces at the street frontage.	**AO46** Awnings are provided over outdoor spaces.
PO47 On the frontage shown on Figure 6.32 - Aitkenvale village precinct concept plan as having built form edge, buildings contribute to the creation of a strong and pedestrian-oriented edge to the street, by: (a) creating a generally continuous building alignment; (b) having facades which contain windows, doors, materials and features which generate visual interest at the street level; and (c) incorporating an attractive streetscape and planting theme.	No acceptable outcome is nominated.

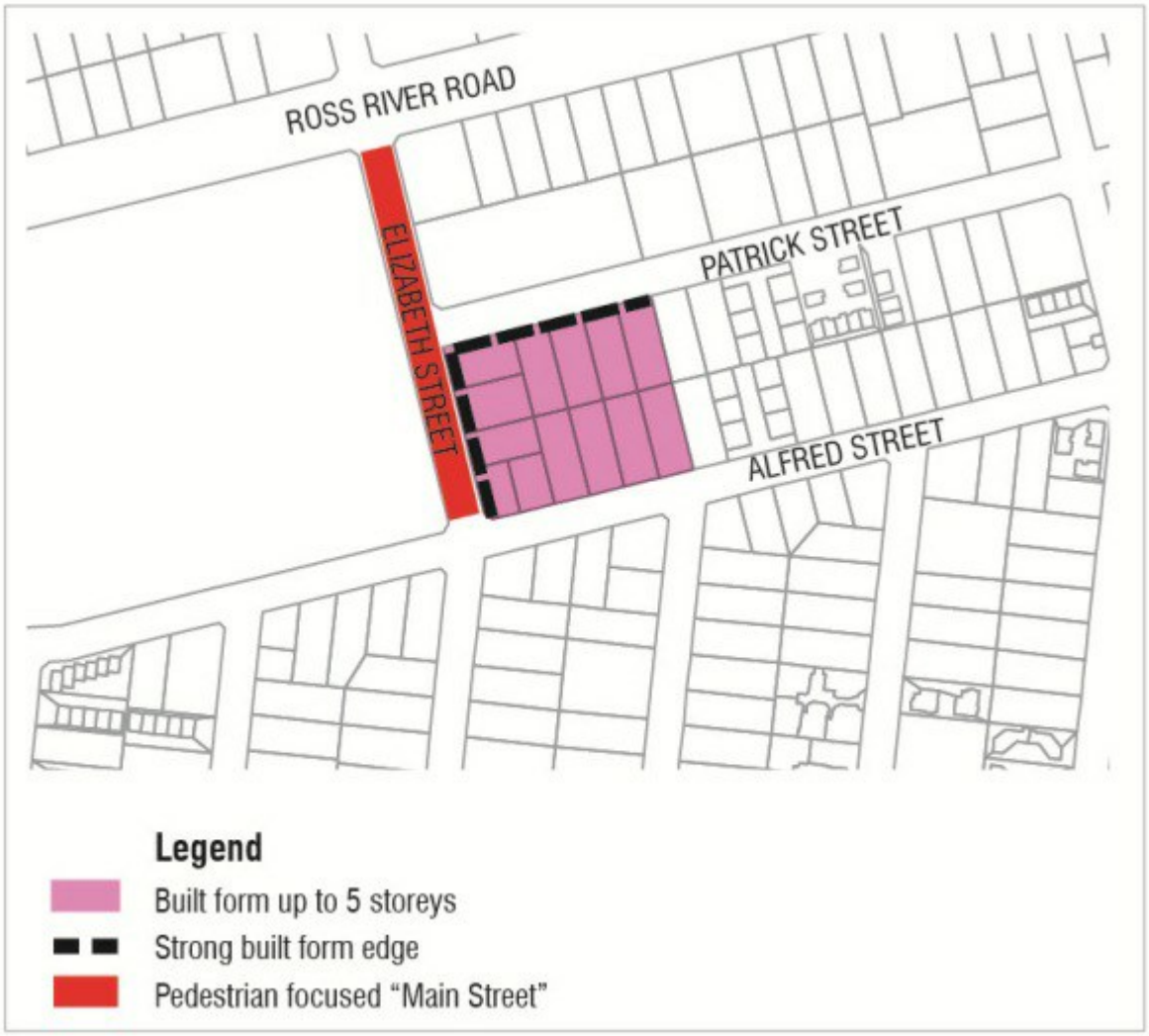


Figure 6.32 Aitkenvale village precinct concept plan

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Hyde Park medium density precinct	
PO48 Building height creates a low to medium-rise environment, and transitions to nearby Low density residential zoned land.	**AO48** Building height does not exceed 3 storeys in the area shown on Figure 6.33 – Hyde Park medium density precinct concept plan, and 5 storeys otherwise.
PO49 Development provides for improvements to the open space corridor such that it provides a major recreational node for the precinct and surrounding area, in a manner generally consistent with Figure 6.33 – Hyde Park medium density precinct concept plan.	No acceptable outcome is nominated.
PO50 Development adjacent to the open space corridor incorporates pedestrian access along the interface, in accordance with Figure 6.33 – Hyde Park medium density precinct concept plan.	No acceptable outcome is nominated.

PO51 Development overlooks and provides for casual surveillance of the open space corridor.	No acceptable outcome is nominated.
PO52 Development facilitates the establishment of a new road linkage connecting Woolcock Street to Dillane Street, in accordance with Figure 6.33 – Hyde Park medium density precinct concept plan. This new road assists in creating an active and attractive interface between the major centre and the Hyde Park medium density precinct.	No acceptable outcome is nominated.
PO53 Development facilitates the establishment of Virgil Street as the major east-west pedestrian thoroughfare connecting across into the Hyde Park major centre and the open space corridor, in accordance with Figure 6.33 – Hyde Park medium density precinct concept plan.	No acceptable outcome is nominated.
PO54 Non-residential uses may establish on the ground floor where fronting Woolcock street and where integrated with residential development in accordance with Figure 6.33 - Hyde Park medium density precinct concept plan.	No acceptable outcome is nominated.
PO55 Where incorporating ground floor non-residential uses, the design of buildings provides for pedestrian-friendly and visually interesting frontages.	**AO55** Ground floor tenancies where including a non-residential use are articulated through: (a) variation in use of materials (glass, timber, steel, masonry); and (b) a change in plane of a minimum of 0.5m for any length of facade exceeding 10m.
PO56 Where incorporating ground floor non-residential uses, weather protection is provided to usable outdoor spaces at the street frontage.	**AO56** Awnings are provided over outdoor spaces.

Figure 6.33 – Hyde Park medium density precinct concept plan

PO57 Development assists in creating a primary pedestrian and cycle pathway and improving the quality of the pedestrian environment along Woolcock Street.	No acceptable outcome is nominated.

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note–**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Kings Road medium density precinct	
PO58 Building height creates a medium-rise environment.	**AO58** Building height does not exceed 5 storeys.
PO59 Residential uses are appropriately buffered from the railway corridor.	No acceptable outcome is nominated.
PO60 Development provides for enhanced public realm and pedestrian connectivity throughout the precinct and connecting to the showground.	No acceptable outcome is nominated.
PO61 Safe pedestrian access is provided for across Kings Road.	No acceptable outcome is nominated.
PO62 Development assists in creating a primary pedestrian and cycle pathway and improving the quality of the pedestrian environment along Kings Road, in accordance with Figure 6.34 – Kings Road medium density precinct concept plan.	No acceptable outcome is nominated.

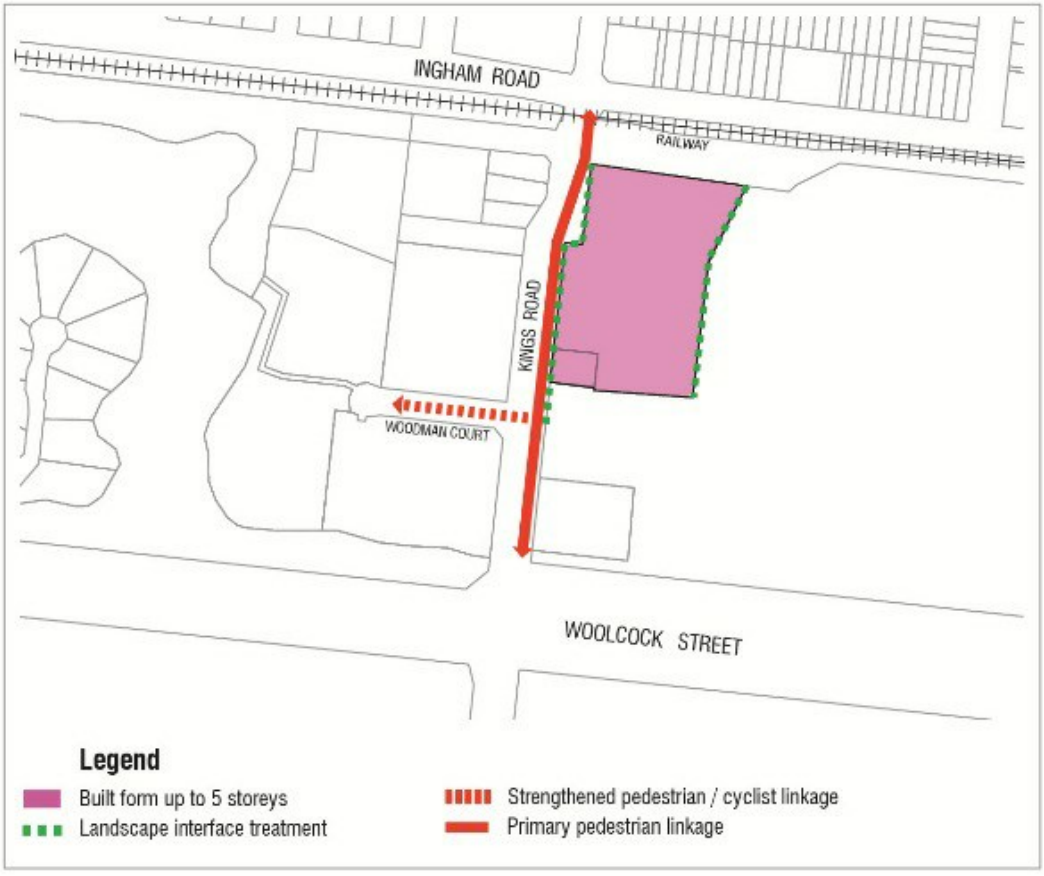


Figure 6.34 – Kings Road medium density precinct concept plan

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note–**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
The Strand precinct	
PO63 Building height and scale is consistent with the character desired for the precinct. The size of the development site allows for the primary orientation of buildings to the street and parkland, and the provision of building setbacks, on-site services and circulation and open space at ground storey.	**AO63.1** Building height does not exceed 5 storeys. Figure 6.35 – The Strand conceptual built form illustrates the desired built form.
	AO63.2 Where accommodating a building of more than 3 storeys, development sites have a minimum size of 1,000m^2.
PO64 Food and drink outlets are established where they are: (a) oriented to the street and parkland; (b) incorporate outdoor dining; and (c) are located on the ground floor with accommodation above. Figure 6.35 – The Strand conceptual built form illustrates the desired design principles.	No acceptable outcome is nominated.
PO65 Where incorporating ground floor non-residential use, the design of buildings provides for pedestrian friendly and visually interesting frontages.	**AO65.1** Front setbacks at the ground floor do not exceed 3m.
	AO65.2 Ground floor tenancies where including a non-residential use are articulated through: (a) variation in use of materials (glass, timber, steel, masonry); and (b) a change in plane of a minimum 0.5m for any length of the facade exceeding 10m.
	AO65.3 Ground floor tenancies are designed to be adaptable and flexible in configuration allowing for creation of indoor and outdoor spaces through use of large openings.
PO66 Where incorporating ground floor non-residential uses, weather protection is provided to usable outdoor spaces at the street frontage. Figure 6.35 – The Strand conceptual built form illustrates the desired design principles.	**AO66** Awnings are provided over outdoor spaces.

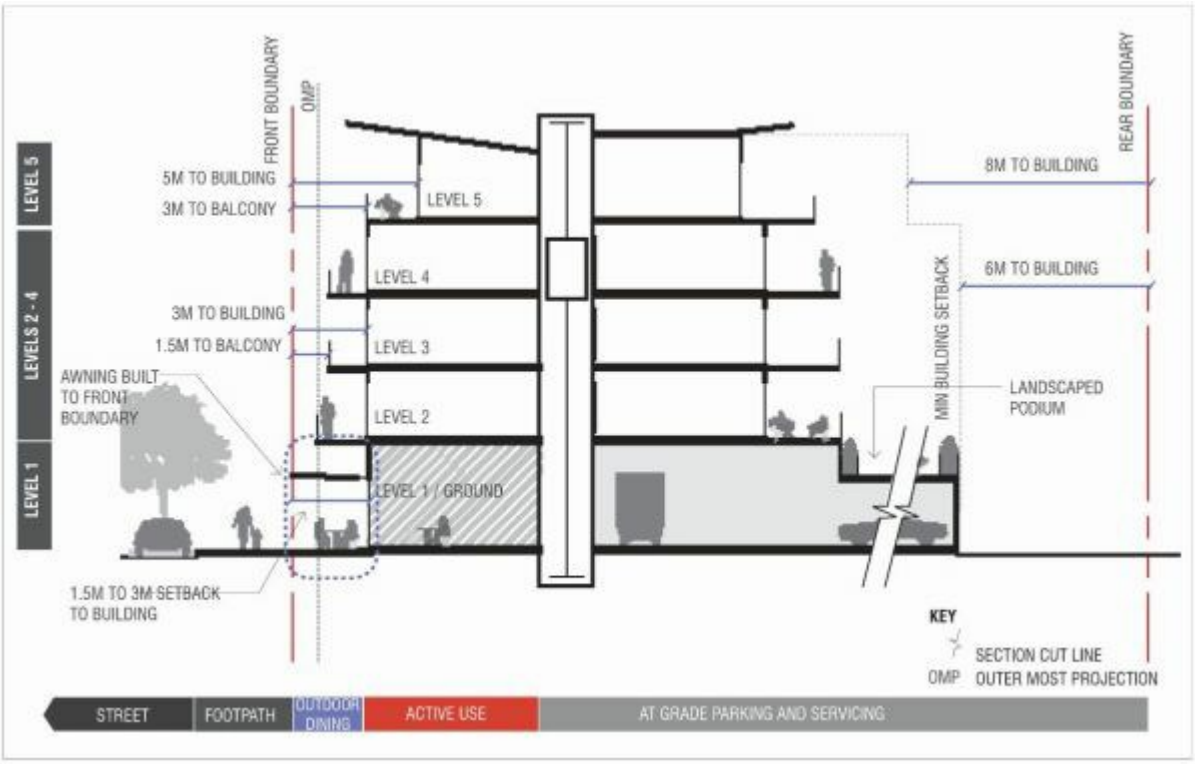


Figure 6.35 – The Strand conceptual built form

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note–**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
North Ward gateway precinct	
PO67 Building height and scale is consistent with the character desired for the precinct and reinforces Landsborough Street as a primary gateway to The Strand. The size of the development site allows for the primary orientation of buildings to the street, and the provision of building setbacks, on-site services and circulation and open space at ground storey. Figure 6.36 – North Ward gateway and villages conceptual built form illustrates.	**AO67.1** Building height does not exceed 8 storeys. **AO67.2** Development sites have a minimum size of 1,000m^2 where buildings of 5 storeys or above are proposed.
PO68 The design of buildings in this precinct provides for an arrival and wayfinding statement by: (a) addressing the street and are located to frame the edge of the street and focus view lines to The Strand; (b) creating an entry aesthetic by defining the street edge with a medium density built form; and (c) incorporating a streetscape and planting theme that creates a boulevard treatment of the street.	No acceptable outcome is nominated.

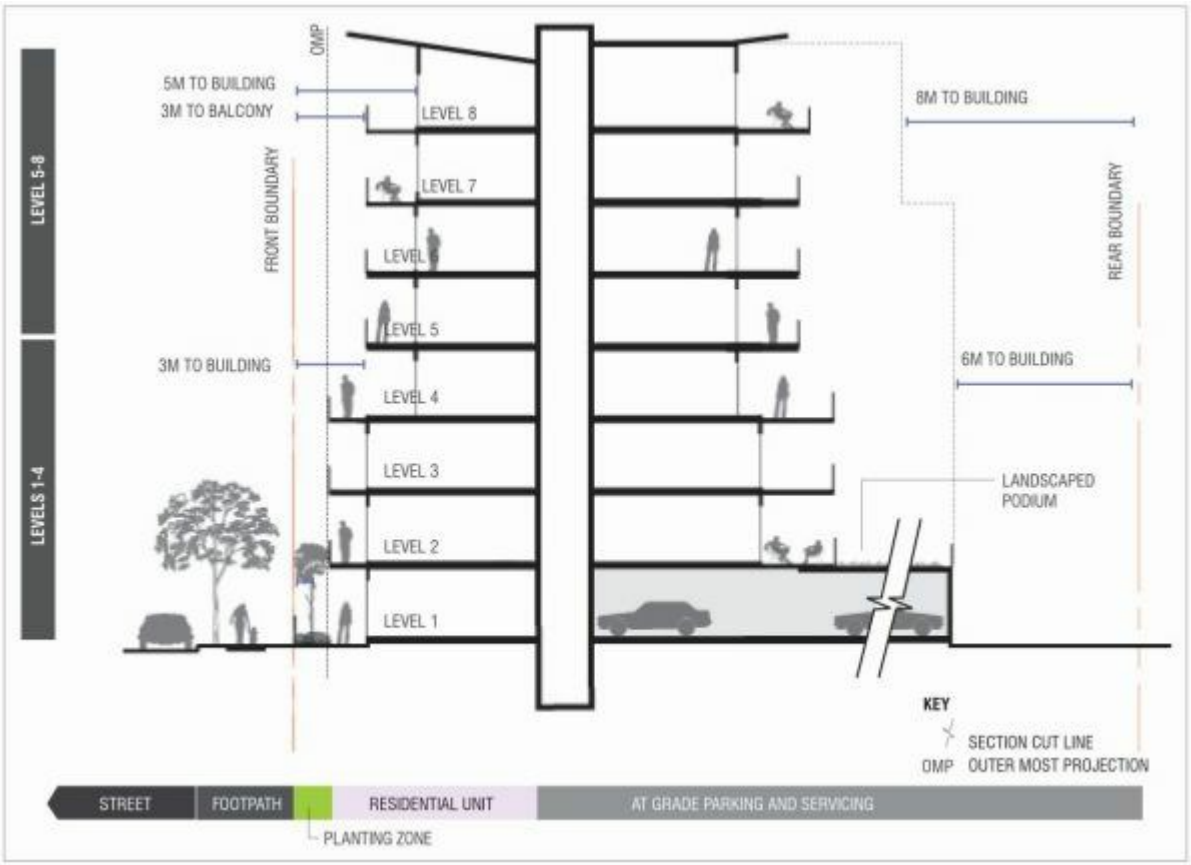


Figure 6.36 – North Ward gateway and villages conceptual built form

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note–**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
North Ward villages precinct	
PO69 Building height and scale is consistent with the character desired for the precinct and reinforces Gregory and Landsborough Streets as the primary activity spines and gateways to The Strand. The size of the development site allows for the primary orientation of buildings to the street, and the provision of building setbacks, on-site services and circulation and open space at ground storey. Figure 6.36 – North Ward gateway and villages conceptual built form.	**AO69.1** Building height does not exceed 8 storeys. **AO69.2** Development sites have a minimum size of 1,000m^2 where buildings of 5 storeys or above are proposed.
PO70 Non-residential uses are established where they are: (a) oriented to the street; (b) incorporate outdoor dining; and (c) are located on the ground floor with accommodation above.	No acceptable outcome is nominated.

PO71 Where incorporating non-residential uses, the design of buildings in this precinct provides for pedestrian friendly and visually interesting frontages.	**AO71.1** Front setbacks at the ground floor do not exceed 3m.
	AO71.2 Ground floor tenancies where including a non-residential use are articulated through: (a) variation in use of materials (glass, timber, steel, masonry); and (b) a change in plane of a minimum 0.5m for any length of the facade exceeding 10m.
	AO71.3 Ground floor tenancies are designed to be adaptable and flexible in configuration allowing for creation of indoor and outdoor spaces through use of large openings.
PO72 Where incorporating ground floor non-residential uses, weather protection is provided to usable outdoor spaces at the street frontage.	**AO72** Awnings are provided over outdoor spaces.
PO73 The design of buildings in this precinct provides for an arrival and wayfinding statement by: (a) focussing view lines to The Strand; (b) creating an entry aesthetic by defining the street edge with a medium density built form; and (c) incorporating a streetscape and planting theme that creates a boulevard treatment of the street. Figure 6.36 – North Ward gateway and villages conceptual built form.	No acceptable outcome is nominated.

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
Additional benchmarks for assessable development in precincts **Note–**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
North Ward medium density precinct	
PO74 Building height and scale is consistent with the character desired for the precinct. The former hospital building remains as the most significant building in the precinct. The size of the development site allows for the primary orientation of buildings to the street, and the provision of building setbacks, onsite services and circulation and open space at ground storey.	**AO74.1** Building height does not exceed 5 storeys other than the existing hospital building which is retained at its present height.
	AO74.2 Where accommodating a building of more than 3 storeys, development sites have a minimum size of 1,000m^2.
PO75 Building layout and design on the former hospital site facilitates a high level of pedestrian and cyclist permeability through the site.	No acceptable outcome is nominated.

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note–**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Magnetic Island medium density precinct	
PO76 Building design and massing is consistent with the low density scale of the locality and articulates individual dwellings.	**AO76** Building height does not exceed 2 storeys and is predominately in the form of single, single unit or multiple pavilions. Figure 6.37 – Magnetic Island indicative built form outcomes illustrates.

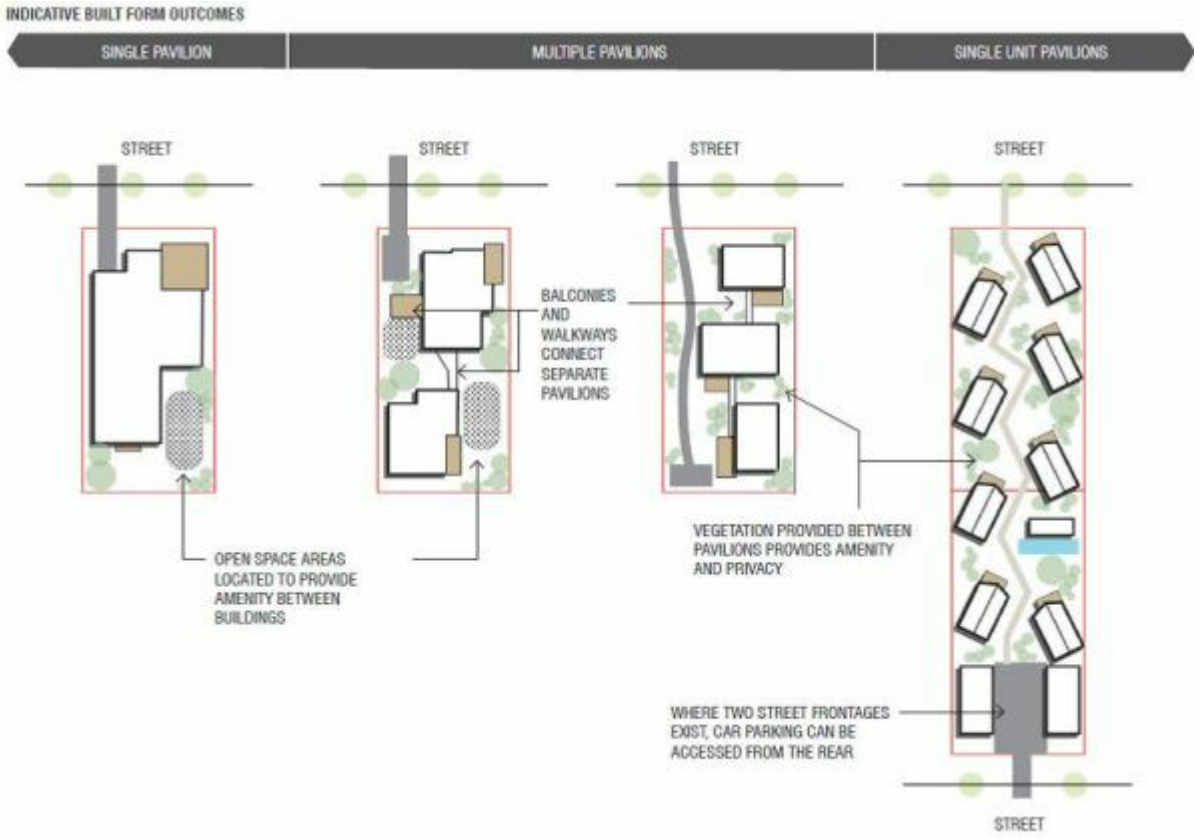
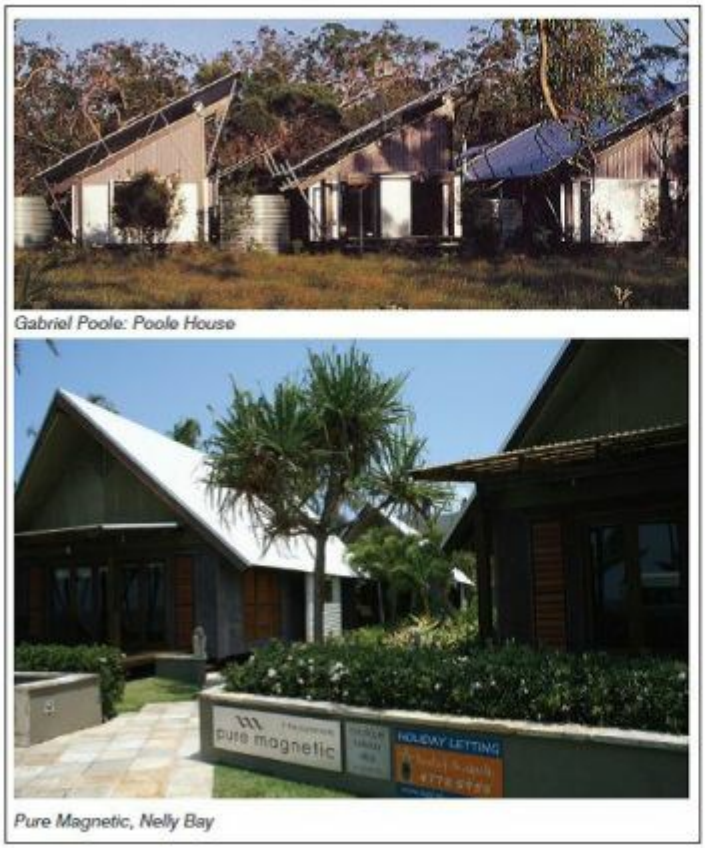


Figure 6.37 – Magnetic Island indicative built form outcomes

PO77 Design and articulation of buildings contribute to the creation of the local tropical character through: (a) use of tropical building design typologies; (b) natural setting of buildings within the landscape; and (c) maximising views to the bay. Figure 6.38 – Examples of the desired tropical building design typologies.	No acceptable outcome is nominated.



Gabriel Poole: Poole House

Pure Magnetic, Nelly Bay

Troppo Architects: Thiel House, Cullen Bay

Balconies and walkways connect individual pavilions and create transition between indoor and outdoor spaces

Figure 6.38 – Examples of the desired tropical building design typologies

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note–**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Picnic Bay precinct	
PO78 Non-residential uses are provided on the ground floor as part of a mixed use development along Granite Street and along the water frontage.	No acceptable outcome is nominated.
PO79 Building design and massing is consistent with the low density scale of the bay and articulates individual dwellings.	**AO79** Building height does not exceed 2 storeys and is predominately in the form of single, single unit or multiple pavilions. Figure 6.37 – Magnetic Island indicative built form outcomes illustrates.

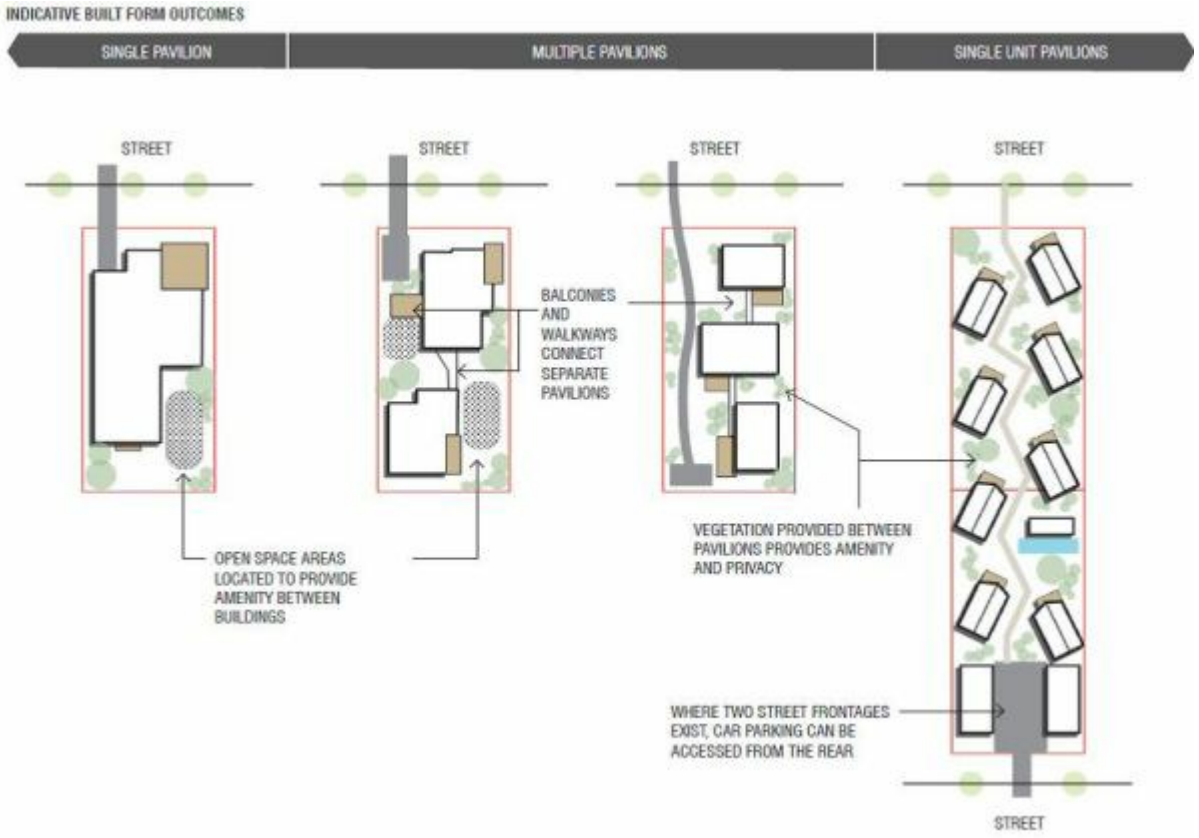
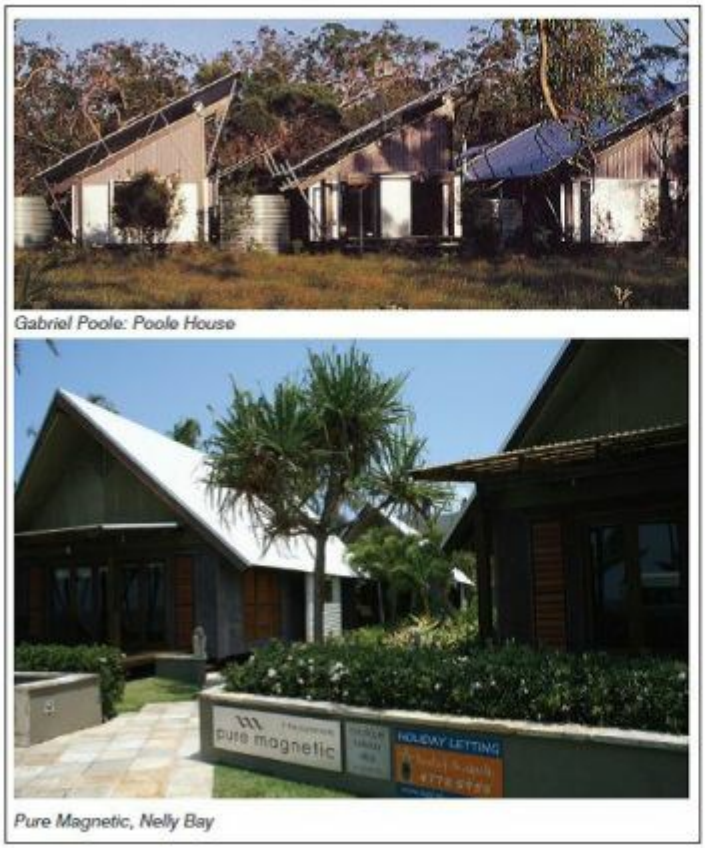


Figure 6.37 – Magnetic Island indicative built form outcomes

PO80 Design and articulation of buildings contribute to the creation of the local tropical character through: (a) use of tropical building design typologies; (b) natural setting of buildings within the landscape; and (c) maximising views to the bay. Figure 6.38 – Examples of the desired tropical building design typologies illustrates.	No acceptable outcome is nominated.



Gabriel Poole: Poole House

Pure Magnetic, Nelly Bay

Troppo Architects: Thiel House, Cullen Bay

Balconies and walkways connect individual pavilions and create transition between indoor and outdoor spaces

Figure 6.38 – Examples of the desired tropical building design typologies

PO81 Where incorporating non-residential uses, the design of buildings in this precinct provides for pedestrian friendly and visually interesting frontages.	**AO81.1** Front setbacks at the ground floor do not exceed 3m.
	AO81.2 Ground floor tenancies where including a non-residential use are articulated through: (a) variation in use of materials (glass, timber, steel, masonry); and (b) a change in plane of a minimum 0.5m for any length of the facade exceeding 10m.
	AO81.3 Ground floor dining tenancies are designed to be adaptable and flexible in configuration allowing for creation of indoor and outdoor spaces through use of large openings.
PO82 Where incorporating ground floor non-residential uses, weather protection via permanent or operable awnings is provided to usable outdoor spaces at the street frontage.	**AO82** Awnings are provided over outdoor spaces.

Table 6.2.2.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note–**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Nelly Bay tourist precinct	
PO83 Non-residential uses are provided on the ground floor as part of a mixed use development and contribute to the creation of a waterfront promenade. Figure 6.39 – Nelly Bay waterfront promenade illustrates	No acceptable outcome is nominated.

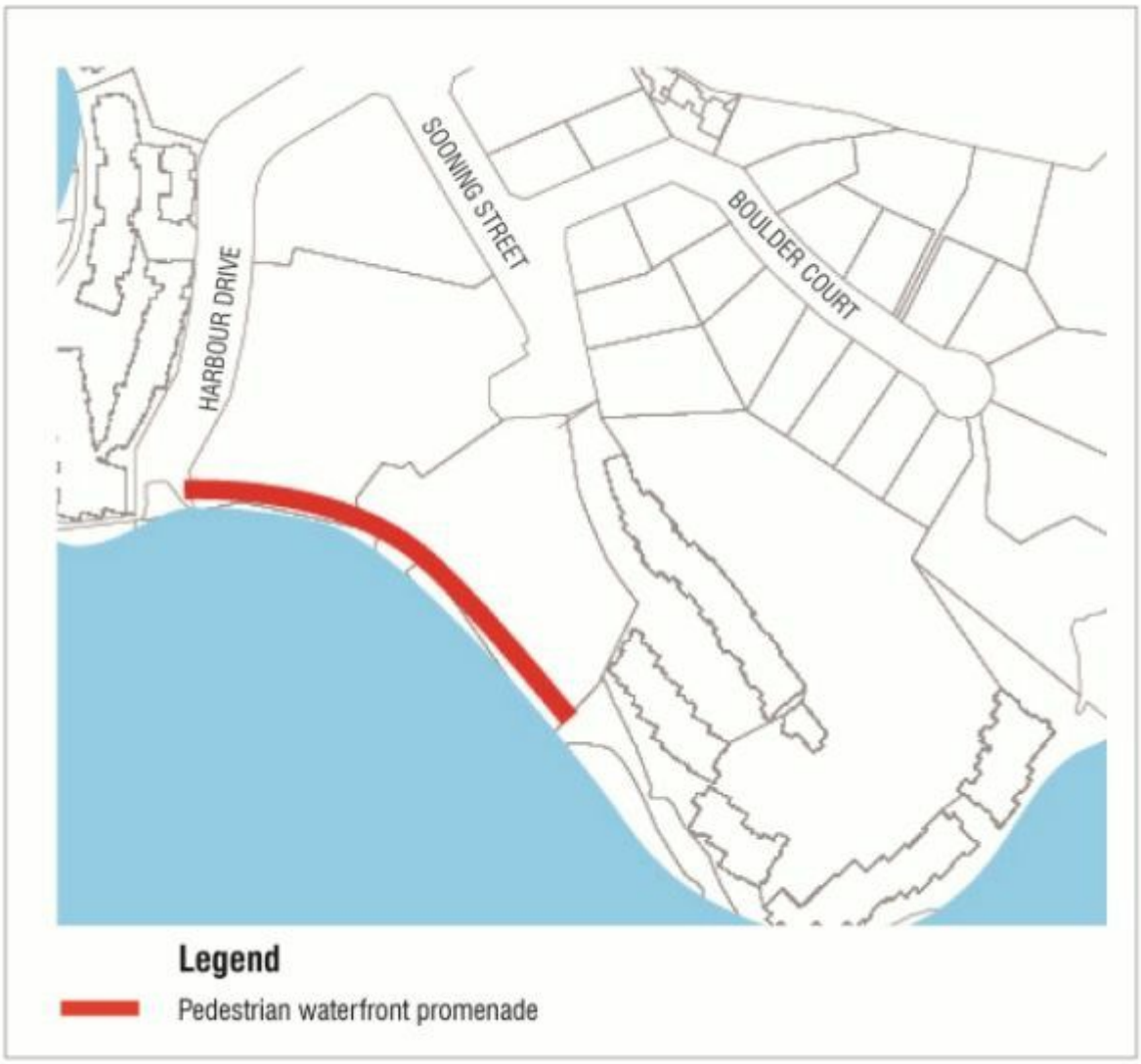


Figure 6.39 – Nelly Bay waterfront promenade

Performance outcomes	Acceptable outcomes
PO84 Tourist based services are located along Harbour Drive.	No acceptable outcome is nominated.
PO85 Building height is of a low to medium-rise scale and building massing is consistent with the low density character of the island.	**AO85.1** Building height does not exceed 4 storeys.
	AO85.2 Development consists of a number of distinct buildings where site frontage exceeds 20m. Figure 6.40 – Indicative building massing illustrates

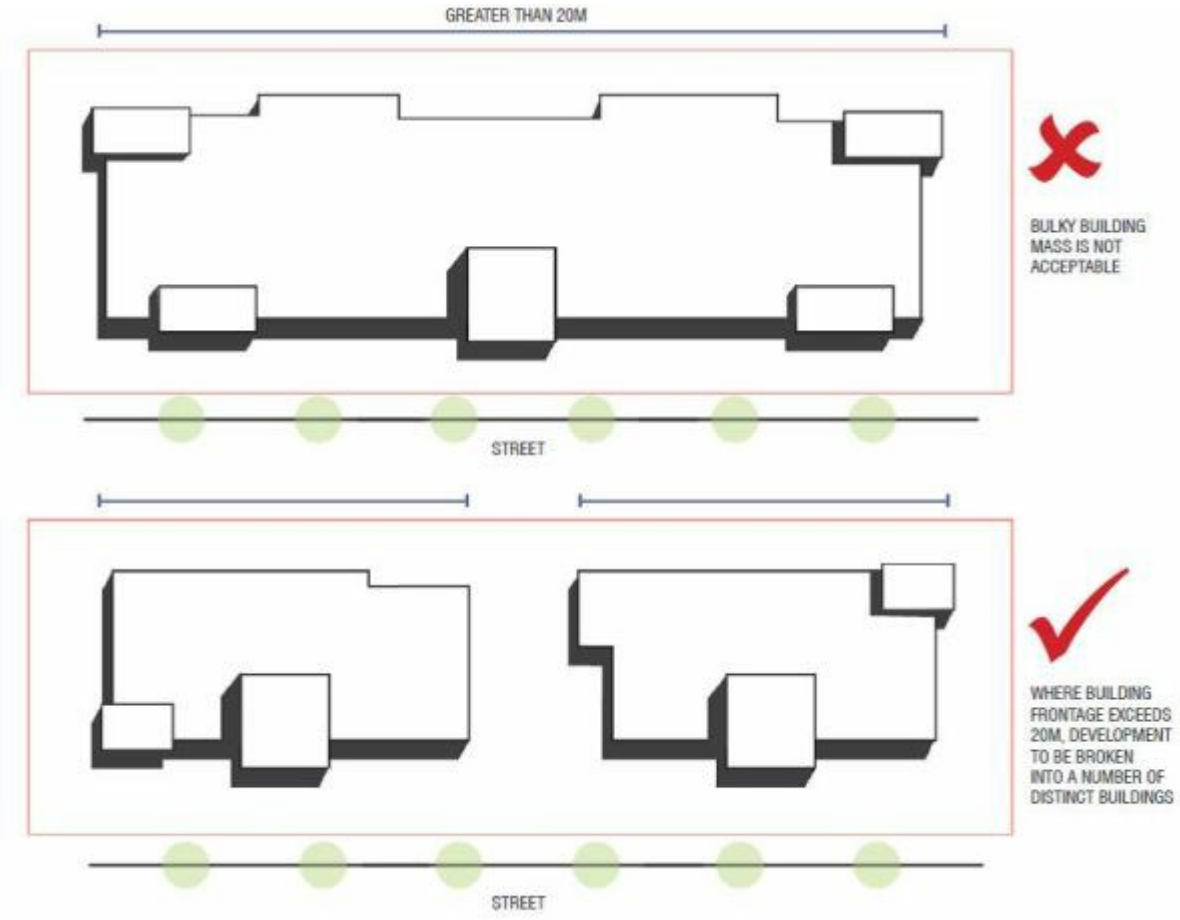


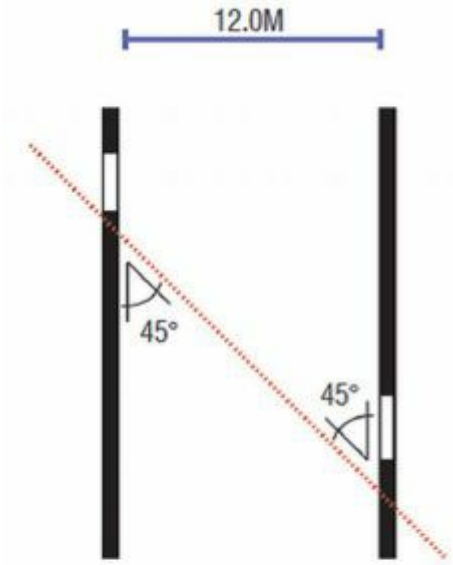
Figure 6.40 – Indicative building massing

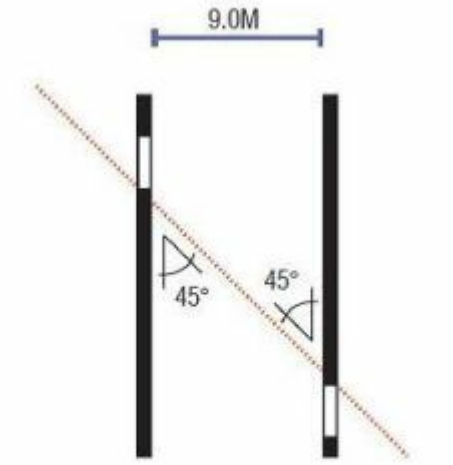
PO86 Design of buildings contribute to the creation of an attractive and safe arrival through maximising views to the bay through use of: (a) balconies, verandas or windows overlooking the bay; and (b) opportunities for indoor and outdoor living spaces.	No acceptable outcome is nominated.
PO87 Where incorporating non-residential uses, the design of buildings in this precinct provides for pedestrian friendly and visually interesting frontages with active ground floors where feasible.	**AO87.1** Front setbacks at the ground floor do not exceed 3m.
	AO87.2 Ground floor tenancies where including a non-residential use are articulated through: (a) variation in use of materials (glass, timber, steel, masonry); and (b) a change in plane of a minimum 0.5m for any length of the facade exceeding 10m.
	AO87.3 Ground floor dining tenancies are designed to be adaptable and flexible in configuration allowing for creation of indoor and outdoor spaces through use of large openings.
PO88 Where incorporating ground floor non-residential uses, weather protection is provided to usable outdoor spaces at the street frontage.	**AO88** Awnings are provided over outdoor spaces.

Table 6.2.2.3(a) - Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
Additional benchmarks for assessable development in precincts **Note**-Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcome takes precedence.	
Wills Street precinct	
PO89 Building height and scale is consistent with the character desired for the precinct. The size of the development site allows for the primary orientation of buildings to the street, and the provision of building setbacks, on-site services and circulation, and open space at ground storey.	**AO89.1** Building height does not exceed 4 storeys.
	AO8.2 Where accommodating a building of more than 3 storeys, development sites have a minimum size of 1,000m².
PO90 Built form provides for sensitive transitioning in height and scale to nearby Character residential zoned land.	No acceptable outcome is nominated.

Table 6.2.2.3(b)-Building setbacks Medium density residential zone

<table>
<tr><th>Level</th><th>Building</th><th>Balconies or outermost projection</th><th>Privacy setbacks for balconies/terraces/windows of habitable rooms</th></tr>
<tr><td colspan="3">Front setbacks</td><td rowspan="15">Development provides a minimum separation distance of:
(a) 12.0m between windows or balconies that are offset by less than 45 degrees; or
 

12.0M SEPARATION BETWEEN WINDOWS AND/OR BALCONIES THAT ARE OFFSET BY LESS THEN 45°
(b) 9.0m between windows or balconies that are offset by 45 degrees or more.
 

9.0M SEPARATION BETWEEN WINDOWS AND/OR BALCONIES THAT ARE OFFSET BY 45° OR MORE</td></tr>
<tr><td>Basement</td><td>1.5m (providing a deep planting zone)</td><td>1.5m</td></tr>
<tr><td>Level 1-4</td><td>3.0m</td><td>1.5m</td></tr>
<tr><td>Level 5 and above</td><td>5.0m</td><td>3.0m</td></tr>
<tr><td colspan="3">Side setbacks</td></tr>
<tr><td>Levels 1-2</td><td colspan="2">1.5m</td></tr>
<tr><td>Levels 3-4</td><td colspan="2">2.5m</td></tr>
<tr><td>Level 5 and above</td><td colspan="2">3.5m</td></tr>
<tr><td colspan="3">Rear setbacks</td></tr>
<tr><td>Basement</td><td rowspan="4">6.0m</td><td>n/a</td></tr>
<tr><td>Level 1</td><td>n/a</td></tr>
<tr><td>Levels 2-4</td><td>4.0m</td></tr>
<tr><td>Level 5 and above</td><td>8.0m</td><td>6.0m</td></tr>
</table>

6.2.3 High density residential zone code

6.2.3.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.2.3.2 Purpose

(1) The purpose of the High density residential zone is to provide for higher density multiple dwellings.

(2) The particular purpose of the code is to:

- (a) optimise opportunities for higher density living close to the city's principal centre, in order to maximise accessibility to services, employment and public transport, promote affordable living and maximise day and night-time vibrancy of the centres;
- (b) maintain a level of residential amenity that is consistent with an inner urban and near centre lifestyle; and
- (c) create well-designed built form and public spaces that are pedestrian friendly and provide opportunities for community interaction.

(3) The purpose of the zone will be achieved through the following overall outcomes:

- (a) development provides for high-rise and high density multiple dwellings and short-term accommodation in locations clustered around or near the principal centre (CBD);
- (b) building height steps down from taller buildings in the Principal centre (CBD) zone, and is generally up to 12 storeys;
- (c) development maintains a high level of residential amenity on the site and in the neighbourhood;
- (d) development is designed to incorporate sustainable practices including maximising energy efficiency, water conservation and public and active transport use;
- (e) development is supported by transport infrastructure which is designed to provide and promote safe and efficient public transport use, walking and cycling; and
- (f) non-residential uses occur where they directly support the day-to-day needs of the immediate residential community, do not unreasonably detract from the residential amenity of the area and are not better located in nearby centres.

(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts:

Palmer Street precinct:

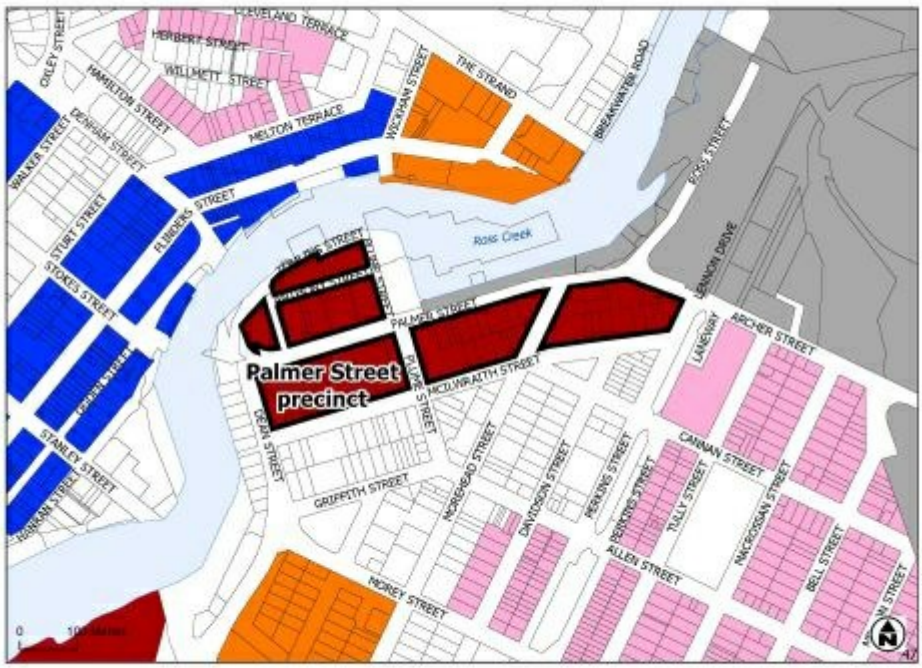
(a) this precinct continues to grow as Townville's primary contemporary entertainment and accommodation destination;

(b) Palmer Street is the continued focus for the establishment of restaurants, cafes and retail at the ground floor within a high quality streetscape;

(c) permanent residential accommodation occurs within this precinct where it does not compromise the function of Palmer Street as an entertainment destination;

(d) the public realm along the Ross Creek waterfront is of a high quality and provides continuous pedestrian access including the linking of the north and south banks by a new pedestrian bridge; and

(e) large-scale offices and other commercial activities are not established within the precinct.



Click here to view high resolution PDF.

Figure 6.41 - Palmer Street precinct

Flinders Street West precinct:

(a) this precinct grows to accommodate high density residential living;

(b) residential accommodation is provided in slender towers and takes advantage of the amenity of Ross Creek and views of Castle Hill, whilst protecting the heritage values of the historic railyards area;

(c) a hub of cultural activities is established within the historic railyards area, including a mix of education and entertainment activities;

(d) high quality public realm in and around the rail buildings is created and utilised for informal and formal performance spaces or events. Dining and local convenience retail may be located at ground storey; and

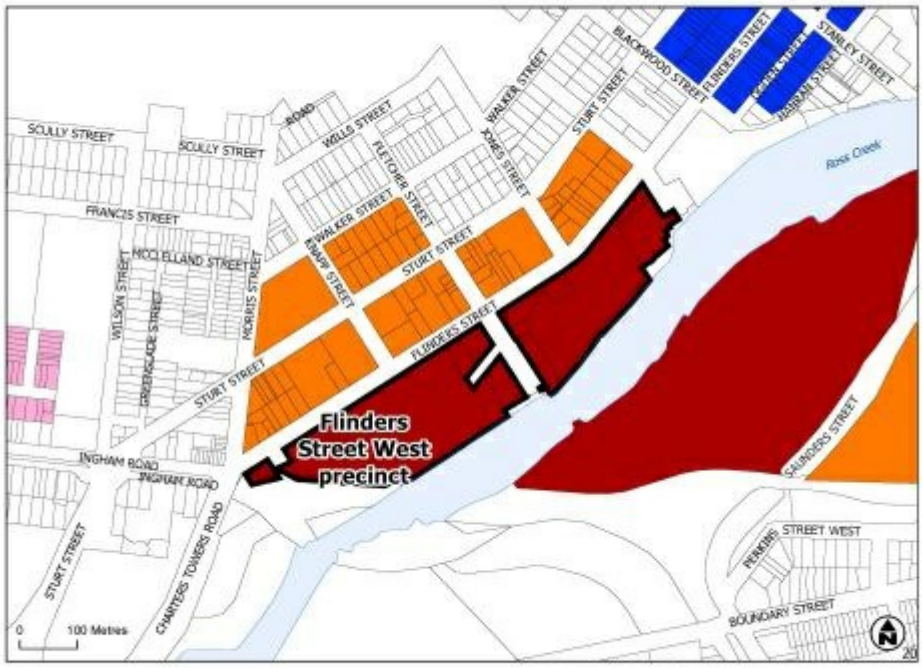
(e) new pedestrian connections are established within the precinct to:

(i) provide a linear connection along the edge of Ross Creek;

(ii) provide new connections to the Railway Estate precinct;

(iii) enhance the connectivity provided by the east west heritage rail path; and

(iv) provide connectivity within the precinct.



Click here to view high resolution PDF.

Figure 6.42 - Flinders Street West precinct

Railway Estate precinct:

(a) development provides a high quality residential environment which capitalises on the precinct's proximity to the principal centre (CBD) and Ross Creek;

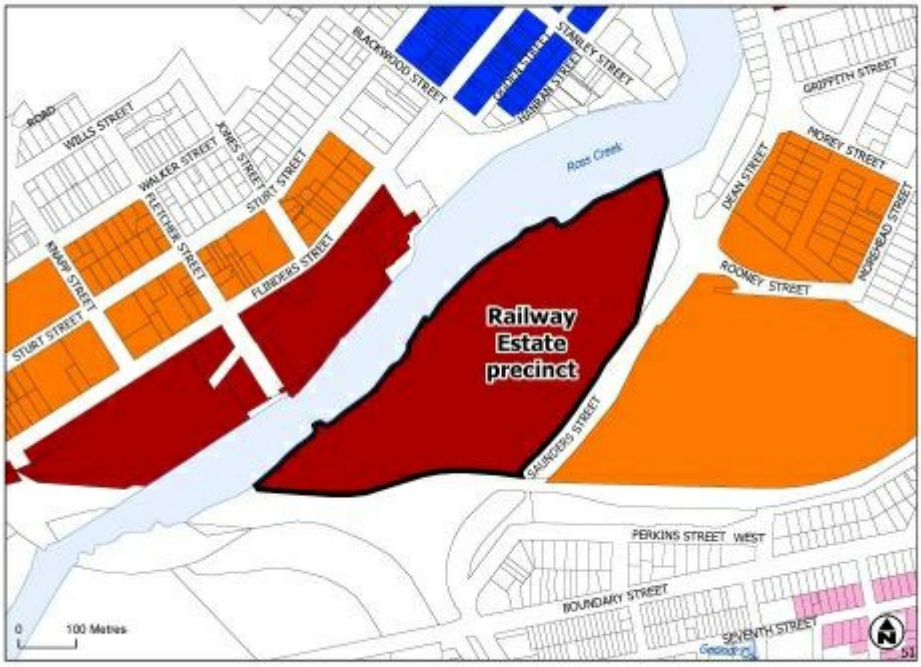
(b) development is predominantly residential in nature set in an attractive urban setting;

(c) a new neighbourhood centre is envisaged within this precinct to service the needs of residents;

(d) a high level of integration with existing and future development in surrounding areas is achieved, having regard to movement networks, open space and recreational facilities and community infrastructure;

(e) movement networks are established to promote walking and cycling and public transport; and

(f) development which is, or has the potential to become, incompatible with future urban development of the area does not occur.



Click here to view high resolution PDF.

Figure 6.43 - Railway Estate precinct

6.2.3.3 Assessment benchmarks

Table 6.2.3.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Home based business	
PO1 The use does not adversely impact on the amenity of the surrounding residential land uses and local character.	**AO1.1** The home based business: (a) is carried out in an existing building or structure; (b) does not use more than 60m² of the gross floor area of the building or structure; (c) involves at least one or more residents of the dwelling house; (d) involves not more than one non-resident employee; (e) where bed and breakfast accommodation does not exceed three bedrooms; (f) does not generate more than 1 heavy vehicle trip per week; **Editor's note—**A heavy vehicle is a vehicle with more than 4.5 tonnes gross vehicle mass. (g) does not generate more than 28 vehicle trips per day by other vehicles, where one trip includes arriving at the site and a second trip is departing the site. These trips are additional to normal domestic trips associated with the dwelling; (h) contains visitor parking within the site; (i) does not involve hiring out of materials, goods, appliances or vehicles; and (j) does not involve the repair or maintenance of vehicles, other than minor maintenance of vehicles used in conjunction of the home business on the site. **Editor's note—**Home based business operators should also refer to signage requirements under Table 5.8.2 -Operational work being placing an advertising device on a premises and Section 9.3.1-Advertising devices code.
	AO1.2 Functional aspects of the use such as service areas, material storage or use activities are not visible from the street.
	AO1.3 Other than where a bed and breakfast or home based child care, the business use does not operate outside the hours of 8am to 5pm Monday to Friday, 8am to 2pm Saturday and does not operate on Sunday.
	AO1.4 Noise levels do not exceed acoustic quality objectives under the Environmental Protection (Noise) Policy 2008.

Table 6.2.3.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Sales office	
PO2 The use does not adversely impact on the amenity of the surrounding residential land uses and local character.	**AO2** Development of the sales office is in place for no more than two years.

Secondary dwelling

Table 6.2.3.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Secondary dwelling	
PO3 Secondary dwellings are: (a) are subordinate, small-scaled dwellings; (b) contribute to a safe and pleasant living environment; and (c) does not cause adverse impacts on adjoining properties.	**AO3** The secondary dwelling: (a) has a GFA, exclusive of a single carport or garage, of not more than 90m^2; and (b) is located not more than 20m from the primary house.

Table 6.2.3.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Amenity	
PO4 Development minimises impacts on surrounding land and provides for an appropriate level of amenity within the site, having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) visual impact; (e) odour and emissions; (f) lighting; (g) access to sunlight; (h) privacy; and (i) outlook.	No acceptable outcome is nominated.
PO5 Landscaping is provided to enhance the appearance of the development, screen unsightly components, create an attractive on-site environment and provide shading.	No acceptable outcome is nominated.

Table 6.2.3.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Crime prevention through environmental design	
PO6 Development facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building design that promotes safety; (c) adequate lighting; (d) appropriate signage and wayfinding; (e) minimisation of entrapment locations; and (f) building entrances, loading and storage areas that are well lit and lockable after hours. **Editor's note—**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.
PO7 Development promotes the safety of residents and visitors, particularly through casual surveillance of the street and public spaces.	**AO7.1** Buildings are designed to have balconies, windows and building openings overlooking streets and other areas which are accessible to the public. Figure 6.44 — Design for casual surveillance illustrates
	AO7.2 Fences or walls along a street frontage have a maximum height of 1.2m where solid, or 1.8m where that portion of the fence above 1.2m high is at least 50% transparent.

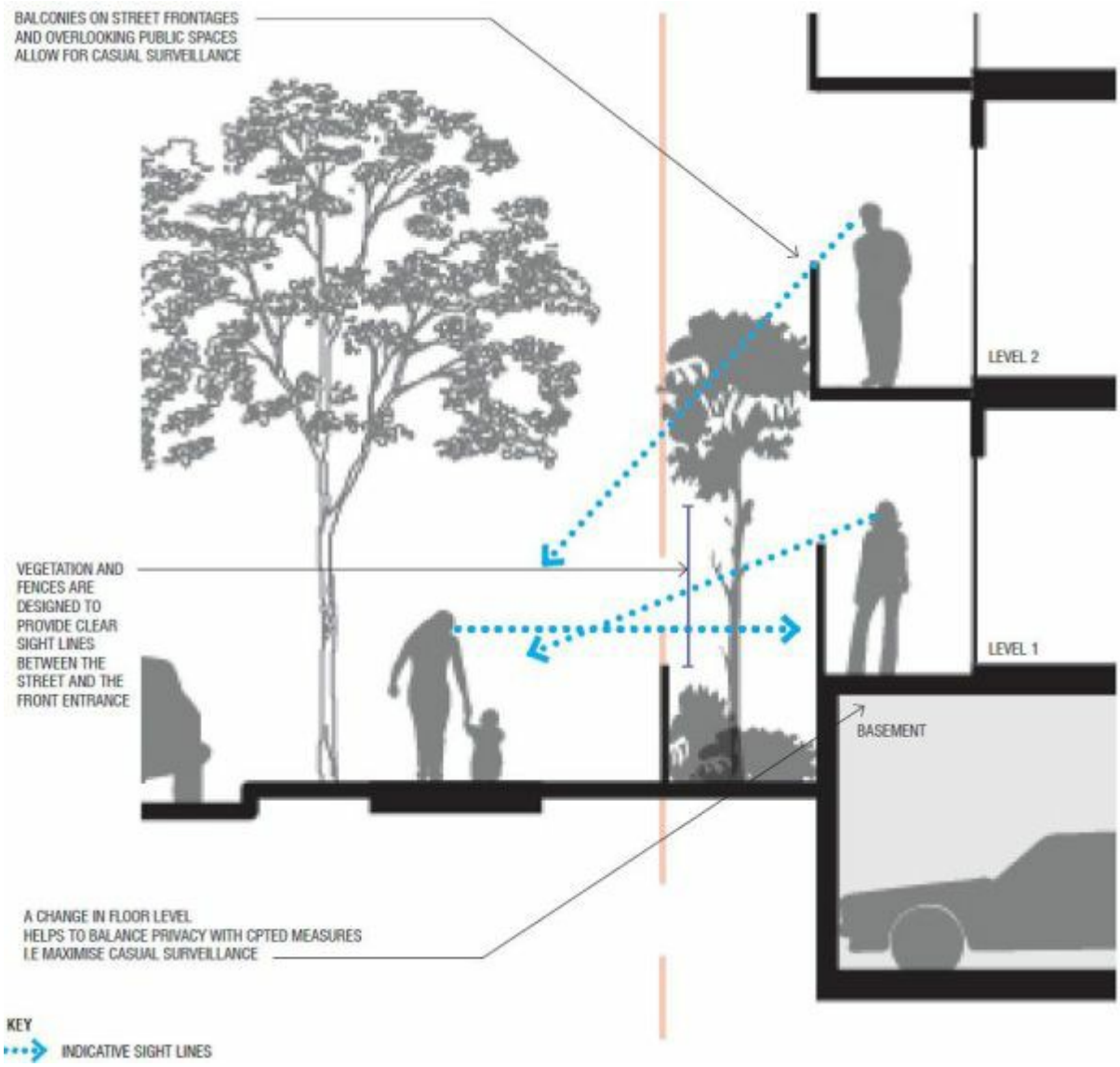


Figure 6.44 – Design for casual surveillance

Table 6.2.3.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Built form	
PO8 Design elements contribute to an interesting and attractive streetscape and building through: (a) the provision of projections and recesses in the façade which reflect changes in internal functions of buildings including circulation; (b) variations in material and building form; (c) modulation in the façade, horizontally or vertically; (d) articulation of building entrances and openings; (e) corner treatments to address both street frontages for a premises on a corner; (f) at lower levels creates human/pedestrian scale experiences; (g) for upper levels, frames streets and public spaces; (h) elements which assist in wayfinding and legibility; and (i) elements which relates to the context including surrounding buildings, parks, streets and open spaces. Figure 6.45 – Building design elements provides indicative guidance.	No acceptable outcome is nominated.

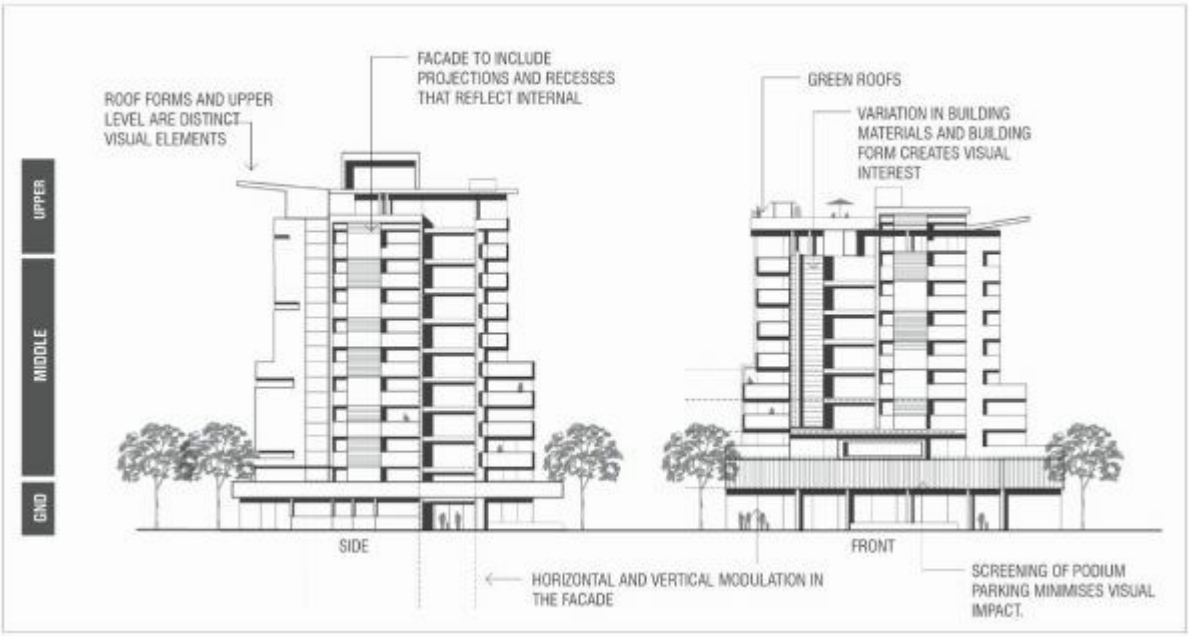


Figure 6.45 – Building design elements

PO9 Air conditioning units are insulated so that adjoining properties are not affected by the noise source, and are not significantly visible from the street.	No acceptable outcome is nominated.
PO10 The overall shape, configuration and placement of buildings create usable outdoor spaces.	No acceptable outcome is nominated.
PO11 Building height and scale, maintains the primacy of the principal centre (CBD) and is consistent with the character desired for the precinct.	**AO11** Building height does not exceed 12 storeys.
PO12 The size of the development site allows for primary orientation of buildings to the street, and the provision of building setbacks, on-site services and circulation and open space at ground storey.	**AO12** Where accommodating a building of 5 storeys or more, development sites have a minimum size of 1,000m^2.
PO13 Building design and setbacks: (a) create an attractive, consistent and cohesive scale along the streetscape; (b) maintain appropriate levels of light and solar penetration, air circulation, privacy and amenity for existing and future buildings; (c) do not prejudice the development or amenity of adjoining land; (d) retain the openness of street vistas, including to the sky, along major elements of the city grid; and (e) transition to lower scale heritage places and precincts.	**AO13** The design meets the setback requirements outlined by Table 6.2.3.3(b) - Building setbacks High density residential zone unless varied by a relevant precinct.
PO14 Built to boundary walls do not impact on the amenity or privacy of adjoining premises. **Editor's note—**Built to boundary wall heights and lengths may be increased where abutting an existing or proposed built to boundary wall on an adjoining property.	**AO14** Built to boundary walls: (a) are for non-habitable rooms or spaces only; (b) are not located within 1.5m of a habitable room on an adjoining site; (c) have a maximum height of 3m; and (d) have a maximum length of 15m.
PO15 Buildings are designed to achieve good solar access by: (a) minimising the extent of shadows on usable private open space or public spaces; and (b) maintaining access to sunlight for habitable rooms within adjoining premises.	No acceptable outcome is nominated.
PO16 Building caps and rooftops contribute to the: (a) architectural design of the building; and (b) the creation of an attractive roofscape.	No acceptable outcome is nominated.

PO17 Roof top levels incorporate open space or recreational spaces for the users of the building or are significantly dedicated to 'green roof' vegetation.	No acceptable outcome is nominated.
PO18 Development provides private open space that is: (a) well-proportioned, appealing, functional and easily accessible, and promotes outdoor living as an extension of the dwelling; (b) provides a high level of privacy for residents and neighbours; and (c) has sufficient size and shape to meet the needs of a diversity of potential residents.	**AO18.1** Balconies are provided with a minimum area of 9m² for 1 bedroom unit or 16m² for 2 or more bedroom unit, with a minimum dimension 4m and clear of any air conditioning unit or drying space.
	AO18.2 Where clothes drying areas are provided on private balconies they are screened from public view.
	AO18.3 Private open space is located or screened so it does not directly overlook main living areas or private open space of adjoining dwellings.
PO19 Sufficient communal open space is provided to create flexible spaces suitable for a range of activities.	**AO18** No acceptable outcome is nominated.
PO20 Communal open space provides facilities including seating, shade, flexible spaces suitable for a range of activities. Treatments such as green roofs, green walls or community gardens contribute to the attractiveness of these spaces.	No acceptable outcome is nominated.
PO21 Where incorporating ground floor non-residential use, the design of buildings provides for pedestrian-friendly and visually interesting frontages.	**AO21.1** Ground floor tenancies where including a non-residential use are articulated through: (a) variation in use of materials (glass, timber, steel, masonry); and (b) a change in plane of a minimum of 0.5m for any length of the facade exceeding 10m.
	AO21.2 Ground floor tenancies are designed to be adaptable and flexible in configuration allowing for creation of indoor and outdoor spaces through use of large openings.
PO22 Where incorporating ground floor non-residential use, weather protection is provided to usable outdoor spaces at the street frontage.	**AO22** Awnings are provided over outdoor spaces.

Table 6.2.3.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
For assessable development	
Parking and servicing	
PO23 Parking facilities are located to be concealed from public view to ensure an attractive streetscape. Figure 6.46 — Concealment of parking structures.	No acceptable outcome is nominated.

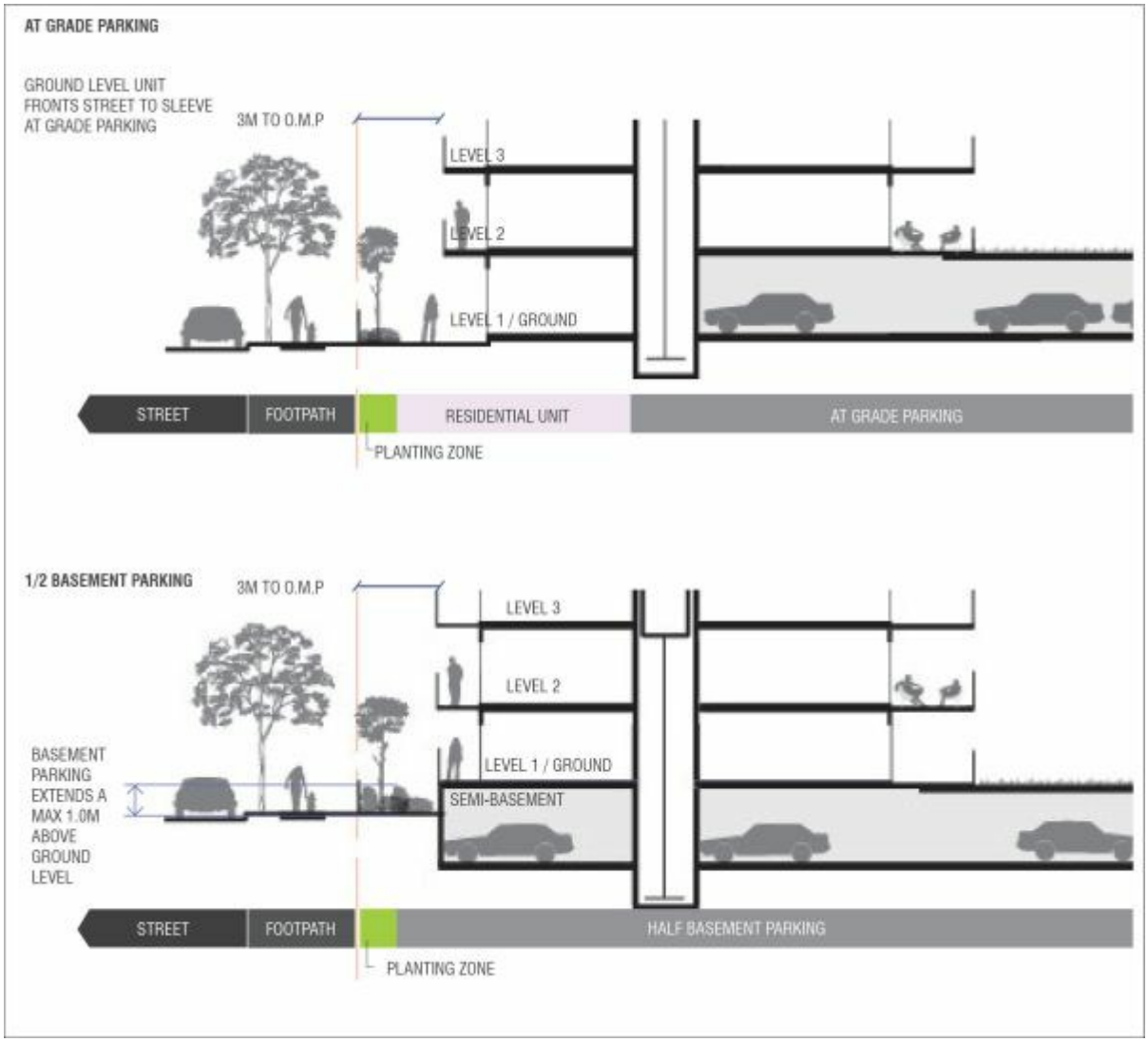


Figure 6.46 – Concealment of parking structures

PO24 Waste disposal and servicing areas are screened from public view and do not have adverse amenity impacts on adjoining properties.	No acceptable outcome is nominated.

Table 6.2.3.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development — where a non-residential use	
PO25 Non-residential uses establish only where: (a) compatible with local character and amenity; (b) limited in scale and supporting the day-to-day needs of the local community or as specifically intended for a particular precinct; and (c) not impacting on the role and function of the city's network of centres or more appropriately located in another zone.	No acceptable outcome is nominated. **Editor's note—**Applicants should have regard to Economic impact assessment planning scheme policy SC6.5 for guidance on how to demonstrate compliance with this performance outcome.

Table 6.2.3.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Palmer Street precinct	
PO26 Building height transitions down to create a low-rise interface with the Ross Creek Marina.	**AO26** Building height is in accordance with Figure 6.47 — Palmer Street precinct concept plan.
PO27 The design of buildings contributes to the creation of an interesting and attractive streetscape along Palmer Street by: (a) creating an entry aesthetic which defines the street edge with a high density built form; and (b) incorporating a streetscape and planting theme that creates a boulevard treatment of the street.	No acceptable outcome is nominated.
PO28 Development facilitates or supports primarily high density short-term or permanent accommodation uses.	No acceptable outcome is nominated.
PO29 An open space and pedestrian network is provided in accordance with Figure 6.47 — Palmer Street precinct concept plan which: (a) opens up opportunities for residents and visitors to view Ross Creek; and (b) creates quality walkable pathways along the creek edge in an attractive landscaped environment.	No acceptable outcome is nominated.
PO30 A new public space is provided along the Ross Creek frontage in accordance with Figure 6.47 — Palmer Street precinct concept plan which: (a) reduces the impact of traffic or service areas on pedestrians; (b) furnishes the space to provide a range of opportunities for sitting and social interaction; (c) connects the open space in the west with the yacht club in the east; and (d) provides an attractive environment for buildings to front.	No acceptable outcome is nominated.

PO31 On frontages shown on Figure 6.47 — Palmer Street precinct concept plan as having a built form edge, buildings contribute to the creation of a strong and pedestrian oriented edge to the street, by: (a) being built to the street frontage at the ground storey; (b) creating a generally continuous building alignment; (c) providing awnings over the footpaths; and (d) having facades which contain windows, doors, materials and features which generate visual interest at the street level.	No acceptable outcome is nominated.
PO32 Dining, entertainment and tourist oriented uses occur at ground storey within development identified on the Figure 6.47 — Palmer Street precinct concept plan as active frontage.	No acceptable outcome is nominated.

Figure 6.47 - Palmer Street precinct concept plan

PO33 Buildings contribute to the creation of an attractive and activated edge to Ross Creek by having facades which contain windows, doors, materials and features which generate visual interest.	No acceptable outcome is nominated.

Table 6.2.3.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Flinders Street West precinct	
PO34 Building height transitions down from the principal centre (CBD) interface to lower rise buildings around the historic railyards and surrounding neighbourhoods.	**AO34** Building height is in accordance with Figure 6.48 — Flinders Street West precinct concept plan.
PO35 Development primarily facilitates or supports high density accommodation uses.	No acceptable outcome is nominated.
PO36 Non-residential uses occur at ground storey and may include small-scale offices, retail, community uses and dining where on an active frontage identified on the Figure 6.48 — Flinders Street West precinct concept plan.	No acceptable outcome is nominated.
PO37 Heritage buildings within the historic railyards are refurbished and reused for educational, cultural and community uses.	No acceptable outcome is nominated.
PO38 The ground floor of all non-heritage buildings within the historic railyards are used for educational, cultural and community uses or complementary activities.	No acceptable outcome is nominated.
PO39 An open space and pedestrian network is provided in accordance with Figure 6.48 — Flinders Street West precinct concept plan. Central access within the precinct is designed to be a pedestrian focused shared zone, ensuring that while vehicle access is available pedestrian accessibility is prioritised.	No acceptable outcome is nominated.
PO40 New development or redevelopment within the historic railyards protects heritage values and provides high quality public realm including: (a) informal and formal performance spaces; and (b) spaces for public events or gatherings.	No acceptable outcome is nominated.

PO41 New public spaces are provided in accordance with Figure 6.48 — Flinders Street West precinct concept plan which: (a) create quality walkable connections to public walkways on the river; (b) reduce the impact of traffic or service areas on pedestrians; (c) furnish the space to provide a range of opportunities for sitting and social interaction; and (d) provide an attractive environment for adjoining buildings to front.	No acceptable outcome is nominated.
PO42 On frontages shown on Figure 6.48 — Flinders Street West precinct concept plan as having a built frontage, buildings contribute to the creation of a strong and pedestrian oriented edge to Ross Creek and the street, by: (a) creating a generally continuous building alignment; (b) providing awnings over the footpaths; and (c) having facades which contain windows, doors, materials and features which generate visual interest at the street level.	No acceptable outcome is nominated.
PO43 Where shown as “built frontage” on Figure 6.48 – Flinders Street West precinct concept plan buildings contribute to the creation of an attractive and activated edge to Ross Creek and road frontage by having facades which contain windows, doors, materials and features which generate visual interest.	No acceptable outcome is nominated.

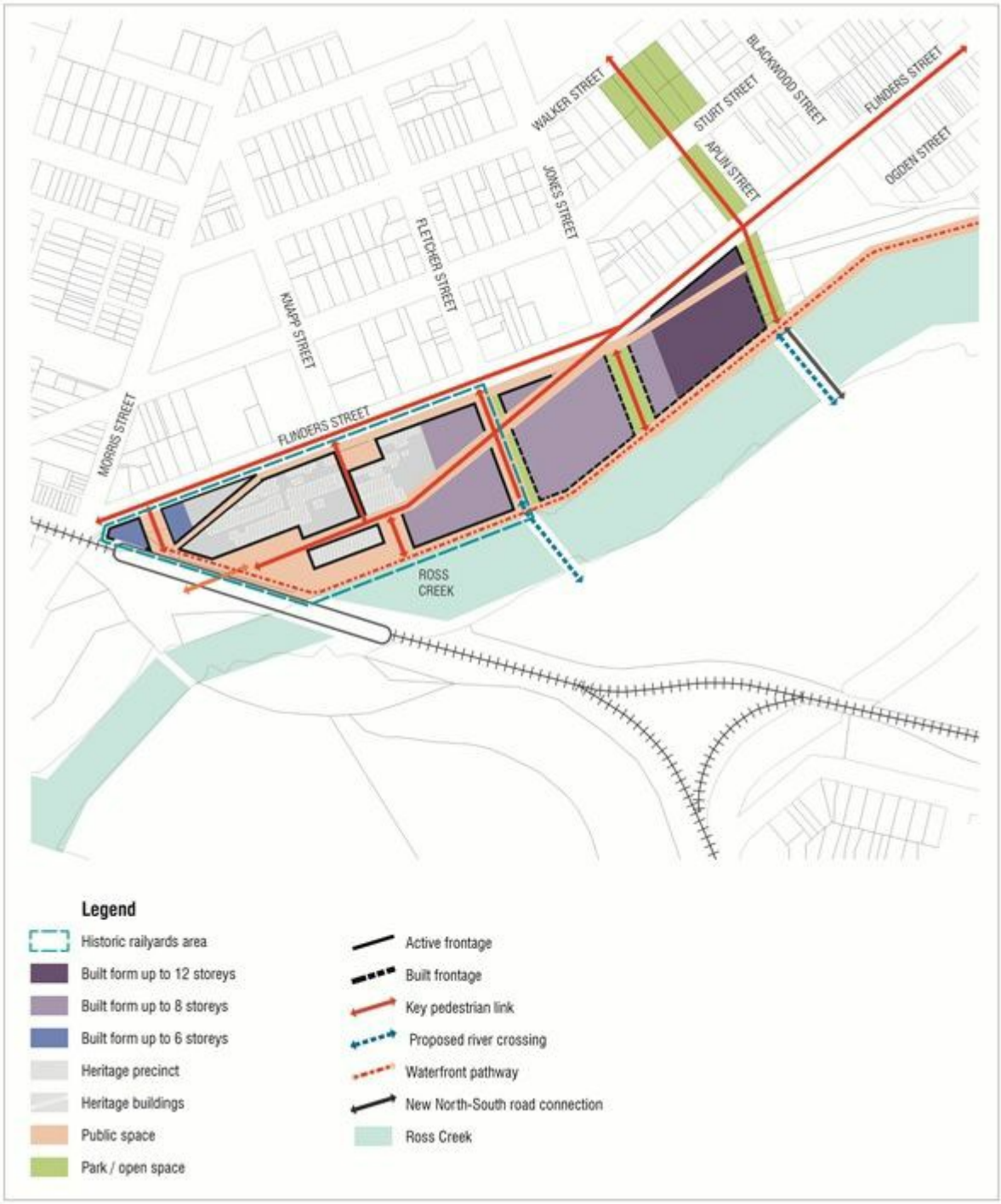


Figure 6.48 - Flinders Street West precinct concept plan

Table 6.2.3.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Railway Estate precinct	
PO44 Development primarily facilitates or supports high density accommodation uses.	No acceptable outcome is nominated.
PO45 A new neighbourhood level centre may establish within the precinct in accordance with Figure 6.49 — Railway Estate precinct concept plan. The new centre is designed to create: (a) a coherent and integrated built form, public realm and circulation networks; (b) central, accessible and attractive public spaces for people to congregate and interact; (c) continuity of streetscape and landscape characteristics; (d) pedestrian friendly and visually interesting frontages to streets and public spaces; and (e) active primary frontages with car parking areas sleeved by buildings.	No acceptable outcome is nominated.
PO46 Development does not compromise or compete with the principal centre (CBD) or successful functioning of other centres in the network.	No acceptable outcome is nominated.
PO47 High level pedestrian and cyclist permeability is achieved, and primary elements of an open space, street and pedestrian network are provided in accordance with Figure 6.49 — Railway Estate precinct concept plan.	No acceptable outcome is nominated.

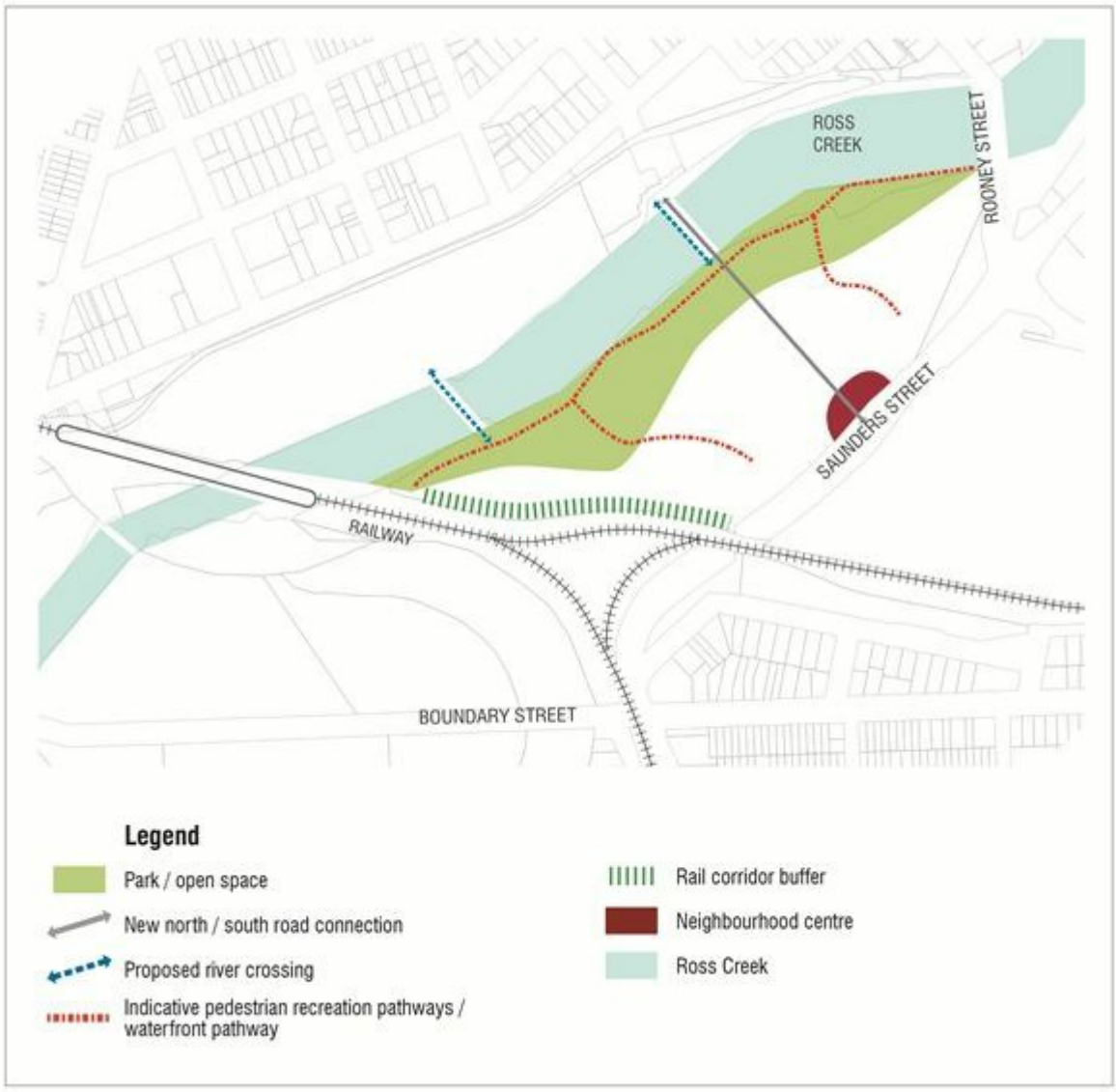
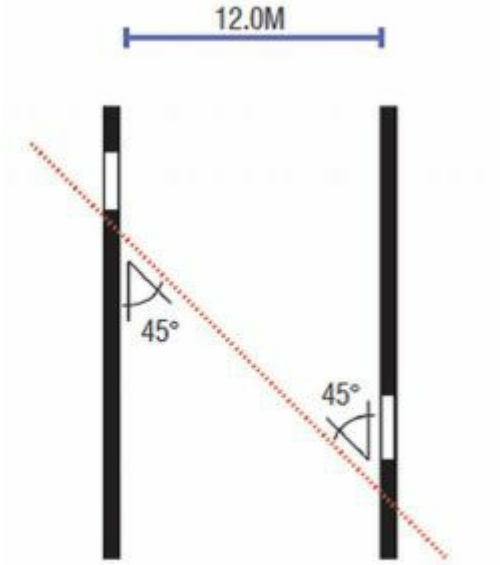
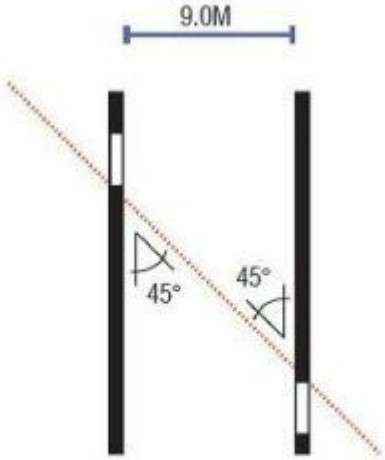


Figure 6.49 - Railway Estate precinct concept plan

PO48 New development provides high quality public realm including: (a) informal and formal performance spaces; (b) spaces for public events or gatherings; and (c) the creation of an attractive and activated edge to Ross Creek.	No acceptable outcome is nominated.
PO49 Development is attractively buffered from the railway, to achieve an acceptable level of residential amenity.	No acceptable outcome is nominated.

Table 6.2.3.3(b)—Building setbacks High density residential zone

<table>
<tr><th>Level</th><th>Building</th><th>Balconies or outermost projection</th><th>Privacy setbacks for balconies/terraces/windows of habitable rooms</th></tr>
<tr><td colspan="3">Front setbacks</td><td rowspan="12">Development provides a minimum separation distance of:
(a) 12.0m between windows or balconies that are offset by less than 45 degrees; or
 

12.0M SEPARATION BETWEEN WINDOWS AND/OR BALCONIES THAT ARE OFFSET BY LESS THEN 45°
(b) 9.0m between windows or balconies that are offset by 45 degrees or more.
 

9.0M SEPARATION BETWEEN WINDOWS AND/OR BALCONIES THAT ARE OFFSET BY 45° OR MORE</td></tr>
<tr><td>Basement</td><td>0m</td><td>n/a</td></tr>
<tr><td>Level 1-4</td><td>3.0m</td><td>1.5m</td></tr>
<tr><td>Level 5 and above</td><td>5.0m</td><td>3.0m</td></tr>
<tr><td colspan="3">Side setbacks</td></tr>
<tr><td>Levels 1-2</td><td colspan="2">1.5m or 0m where the adjoining building is built to boundary.</td></tr>
<tr><td>Levels 3-4</td><td colspan="2">2.5m or 0m where the adjoining building is built to boundary.</td></tr>
<tr><td>Level 5 and above</td><td colspan="2">3.5m</td></tr>
<tr><td colspan="3">Rear setbacks</td></tr>
<tr><td>Basement</td><td rowspan="3">6.0m or 0m where the adjoining building is built to boundary.</td><td>n/a</td></tr>
<tr><td>Level 1</td><td>n/a</td></tr>
<tr><td>Levels 2-4</td><td>4.0m</td></tr>
<tr><td>Level 5 and above</td><td>6.0m</td><td>6.0m</td></tr>
</table>

6.2.4 Rural residential zone code

6.2.4.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.2.4.2 Purpose

(1) The purpose of the Rural residential zone code is to provide for residential development on large lots where the intensity of residential development is dispersed.

(2) The particular purpose of the code is to:

- (a) provide for semi-rural lifestyles in which the primary use is dwelling houses on large lots which may have limited access to infrastructure and services;
- (b) provide for some subordinate, and generally domestic scale, rural activities and home based business to occur;
- (c) ensure development maintains the character and amenity of the rural residential locality; and
- (d) ensure any intensification of impacts on nearby ecological values or natural resources is avoided.

(3) The purpose of the zone will be achieved through the following overall outcomes:

- (a) residential development occurs in the form of dwelling houses, to the general exclusion of other more intensive residential uses;
- (b) reconfiguration creates large lots which support a semi-rural lifestyle and avoid intensification of impacts on on-site and on nearby ecological values, natural resources or rural activities;
- (c) lot sizes are sufficient to ensure the protection of environmental values and water quality objectives;
- (d) further expansion of existing rural residential areas does not occur beyond those areas zoned for this purpose;
- (e) home businesses occur to an extent that does not unduly diminish the semi-rural residential amenity, having regard to noise, odour, dust, traffic and other impacts;
- (f) roadside stalls and other sales of produce produced on the site are of a limited scale that is consistent with the semi-rural lifestyle;
- (g) non-residential uses occur within the zone where they primarily support the day-to-day needs of the immediate residential community and do not unreasonably detract from the residential amenity of the area;
- (h) development is buffered from nearby rural land such that the productive use of the rural land is not constrained;
- (i) residential development is protected from the impacts of nearby industrial activities, transport corridors and infrastructure installations and major facilities such as Department of Defence landholdings;
- (j) the natural bushland setting and village character of Balgal Beach and the Magnetic Island townships are maintained. Tourism accommodation in these communities is of a house compatible scale; and
- (k) development does not diminish water quality and does not intensify impacts on other environmental values including remaining areas of ecological significance within the zone.

6.2.4.3 Assessment benchmarks

Table 6.2.4.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Home based business	
PO1 The use does not adversely impact on the amenity of the surrounding residential land uses and local character.	**AO1.1** The home based business: (a) is carried out in an existing building or structure (excluding truck parking); (b) does not use more than 60m² of the gross floor area of the building or structure; (c) involves at least one or more residents of the dwelling house; (d) involves not more than two non-resident employees; (e) where bed and breakfast or farm stay accommodation does not exceed three bedrooms; (f) does not generate more than 1 heavy vehicle trip per week; **Editor's note—**A heavy vehicle is a vehicle with more than 4.5 tonnes gross vehicle mass. (g) does not generate more than 28 vehicle trips per day by other vehicles, where one trip includes arriving at the site and a second trip is departing the site. These trips are additional to normal domestic trips associated with the dwelling; (h) contains visitor parking within the site; (i) does not involve hiring out of materials, goods, appliances or vehicles; and (j) does not involve the repair or maintenance of vehicles, other than minor maintenance of vehicles used in conjunction of the home business on the site. **Editor's note—**Home based business operators should also refer to signage requirements under Table 5.8.2 - Operational work being placing an advertising device on a premises and Section 9.3.1-Advertising devices code.
	AO1.2 Functional aspects of the use such as service areas, material storage or use activities are not visible from the street.
	AO1.3 Other than where a bed and breakfast, farm stay or home based childcare, the business use does not operate outside the hours of 8am to 5pm Monday to Friday, 8am to 2pm Saturday and does not operate on Sunday.
	AO1.4 Noise levels do not exceed acoustic quality objectives under the Environmental Protection (Noise) Policy 2008.

PO2 Heavy vehicle parking: (a) has a direct nexus with a home based business or rural use carried out on the site; and (b) does not adversely affect the amenity of neighbouring properties. **Editor's note—**A heavy vehicle is a vehicle with more than 4.5 tonnes gross vehicle mass.	**AO2.1** Not more than one heavy vehicle is parked on the site. **AO2.2** While on-site, vehicles: (a) are not left idling for more than 5 minutes at any one time; and (b) do not have a refrigeration unit running.

Table 6.2.4.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Roadside stall	
PO3 Roadside stalls are small in scale and do not impact negatively upon the amenity, character or safety of the locality and the safety and efficiency of roads.	**AO3.1** Any structure used for the sale of goods or produce is limited to 20m^2 gross floor area.
	AO3.2 Access to the structure is via the primary property access point.
	AO3.3 Produce or goods sold is grown, made or produced on the land on which the road side stall is erected.

Table 6.2.4.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Sales office	
PO4 The use does not adversely impact on the amenity of the surrounding land uses and local character.	**AO4** Development of the sales office is in place for no more than two years.

Table 6.2.4.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Secondary dwelling	
PO5 Secondary dwellings are: (a) are subordinate, small-scaled dwellings; (b) contribute to a safe and pleasant living environment; and (c) does not cause adverse impacts on adjoining properties.	**AO5** The secondary dwelling has a GFA, exclusive of a single carport or garage, of not more than 90m^2.

Table 6.2.4.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Animal keeping and cropping	

PO6 Animal keeping and cropping do not adversely impact on the amenity of the surrounding residential land uses and local character.	**AO6.1** Non-residential buildings, animal enclosures, storage facilities and waste disposal areas are set back 50m from any dwelling on an adjoining or nearby site.
	AO6.2 The height of non-residential buildings or facilities does not exceed 2 storeys or 8.5m above ground level, whichever is the lesser.
	AO6.3 Cropping does not involve chemical spraying unless a 40m wide vegetated buffer is provided on the site between the crops which are being sprayed and adjoining land.

Table 6.2.4.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development - where a non-residential or tourist accommodation use	
PO7 Non-residential uses established only where: (a) compatible with local character and amenity; (b) limited in scale and supporting the day-to-day needs of the local community; and (c) not more appropriately located in another zone.	No acceptable outcome is nominated. **Editor's note—**Applicants should have regard to Economic impact assessment planning scheme policy no. SC6.5 for guidance on how to demonstrate compliance with this performance outcome.
PO8 Tourism accommodation within Balgal Beach and the Magnetic Island townships is compatible with the village character of these communities.	No acceptable outcome is nominated.

Table 6.2.4.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Built form	
PO9 Development is consistent with the height and scale of surrounding buildings and includes features that contribute to an attractive streetscape.	No acceptable outcome is nominated.

Table 6.2.4.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Amenity	

PO10 Development minimises impacts on surrounding land and provides for an appropriate level of amenity within the site, having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) visual impact; (e) odour and emissions; (f) lighting; (g) privacy; and (h) outlook.	No acceptable outcome is nominated.
PO11 Landscaping is provided to contribute positively to the city image, particularly along major roads.	No acceptable outcome is nominated.
PO12 Development does not compromise the ongoing productive use of nearby rural land.	No acceptable outcome is nominated.
PO13 Development for the purposes of a sensitive use within 500m of land included in the High impact industry zone or Special purpose zone, or within 250m of land in the Medium impact industry zone: (a) achieves indoor noise levels consistent with the objectives set out in the Environmental Protection (Noise) Policy 2008; (b) achieves air quality levels consistent with the objectives set out in the Environmental Protection (Air) Policy 2008 and the relevant national standard; and (c) does not experience offensive odours.	No acceptable outcome is nominated.

Table 6.2.4.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Protection of natural values	

PO14 The site layout, size and design responds sensitively to on-site and surrounding topography, drainage patterns and ecological values by: (a) minimising earthworks; (b) maximising retention of natural drainage patterns; (c) ensuring existing drainage capacity is not reduced; (d) maximising the retention of existing vegetation; (e) providing buffers to protect the ecological functions of waterways; and (f) protecting environmental values and water quality objectives of receiving waters. **Editor's note—**The environmental values and water quality objectives are established under the Environmental Protection Policy (2009). For Townsville, they are specified in the Ross River Basin Environmental Values and Water Quality Objectives 2012 and Black River Basin Environmental Values and Water Quality Objectives (2012).	No acceptable outcome is nominated.

6.2.5 Character residential zone code

6.2.5.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.2.5.2 Purpose

(1) The purpose of the Character residential zone code is to provide for a particular character of a predominantly residential area.

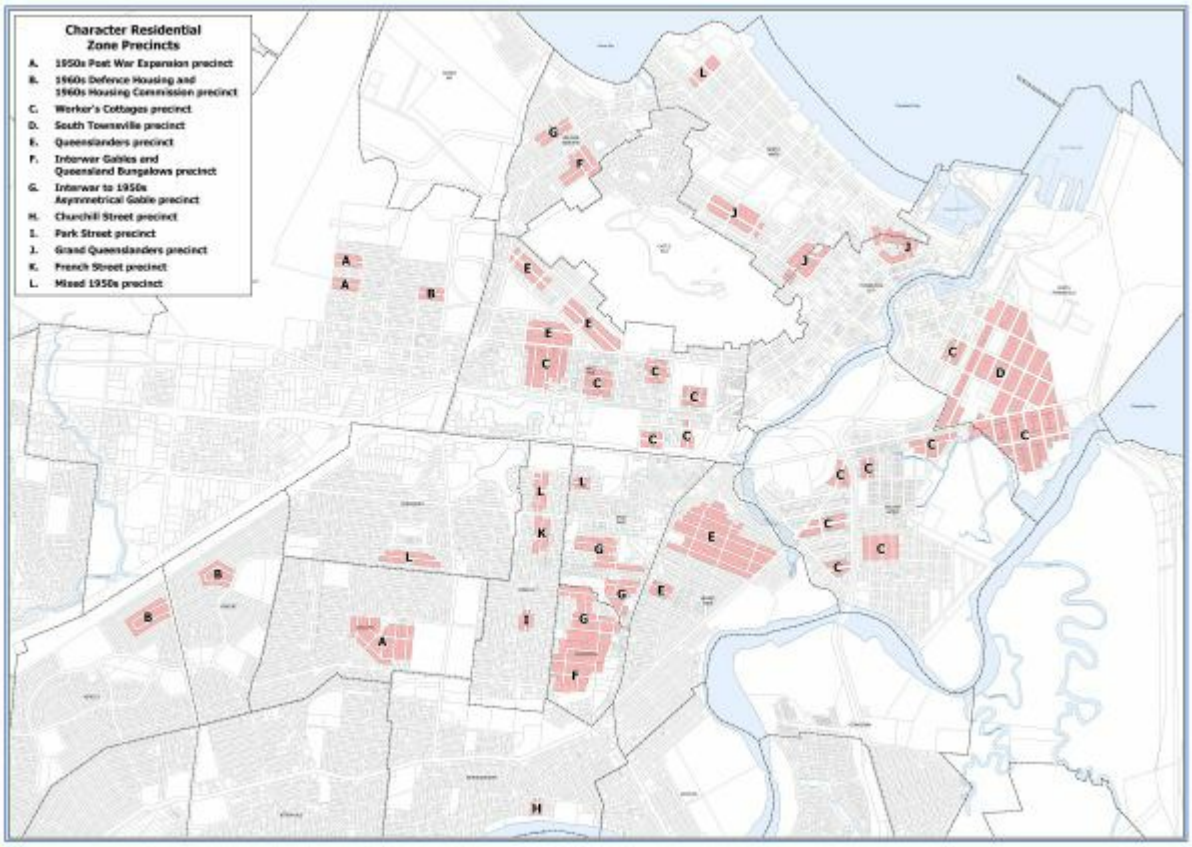
(2) The particular purpose of the code is to:

- (a) protect traditional character and streetscape values of the Character residential zone code by:
  - (i) preventing relocation off the site and demolition of contributing character buildings; and
  - (ii) ensuring the design of any new development is compatible with the places of character value within the zone.
- (b) primarily accommodate dwelling houses and ensure new development is sympathetic to the established character of the street or locality;
- (c) maintain a high level of residential amenity;
- (d) achieve accessible, well serviced and well-designed communities; and
- (e) maintain the low-rise and lower density character of Townsville's suburbs.

(3) The purpose of the zone will be achieved through the following overall outcomes:

- (a) contributing character buildings are protected and retained so they continue to contribute to the traditional character and amenity of the street and neighbourhood;
- (b) new development is limited to that which does not diminish the vernacular architectural character of houses or the traditional streetscape character;
- (c) new development incorporates design elements that are compatible with the established character;
- (d) reconfiguration of lots does not diminish the traditional streetscape character;
- (e) carports and garages do not dominate the frontage and are subservient to contributing character buildings;
- (f) dwelling houses are predominately low-rise, but may be low set or high set;
- (g) development maintains a high level of residential amenity on the site and in the precinct;
- (h) residential development is protected from the impacts of nearby industrial activities, transport corridors and infrastructure installations and major facilities such as the Port of Townsville, Townsville Airport and Department of Defence landholdings; and
- (i) non-residential uses only occur within the zone where they primarily support the day-to-day needs of the immediate residential community, do not unreasonably detract from the residential amenity, and are not better located in nearby centres.

Editor's note—The term "low set" refers to a building elevated 900mm or less. "High set" refers to buildings generally elevated 2,000mm above ground level.



Click here to view PDF high resolution map.

Figure 6.50 - Character residential zone precincts

(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts:

1950s Post War Expansion precinct:

(a) this precinct consists mostly of compact, low set dwelling houses typical of the Queensland Housing Commission in the 1950s;

(b) buildings within this precinct have a low-set appearance and scale consistent with the predominant character of the precinct;

(c) built form maintains the existing setting and rhythm of the streetscape;

(d) the roof profile and overhang of buildings is consistent with that of contributing character buildings; and

(e) window scale and proportions of buildings are sympathetic to the predominant character of the precinct.

1960s Defence Housing and 1960s Housing Commission precinct:

(a) this precinct consists mostly of intact Defence housing and Queensland Housing Commission design homes of the 1960s;

(b) buildings within this precinct are elevated, generally high set, and light weight, ventilated design features, and maintains regularity of form and street presentation;

(c) the roof profile and overhang of buildings is consistent with that of contributing character buildings;

(d) window scale and proportions of buildings are sympathetic to the predominant character of the precinct; and

(e) enclosing the ground floor of a contributing character building does not have an adverse impact on the character of the building.

Worker's Cottages precinct:

(a) this precinct consists of low and high set Queensland worker's cottages and bungalows, constructed of lightweight materials;

(b) the consistent character of worker's cottages and interwar houses constructed of lightweight materials is maintained;

(c) buildings in this precinct have open facades which address the street and are consistent with the predominant front façade profile that contributes to the precinct's character;

(d) building floor level height in new development is consistent with adjoining contributing character buildings;

(e) enclosing the ground floor of a contributing character building does not have an adverse impact on the character of the building;

(f) the roof profile of buildings is consistent with that of contributing character buildings; and

(g) window scale and proportions of buildings are sympathetic to the predominant character of the precinct.

South Townsville precinct:

(a) this precinct contains predominantly low set Queensland worker's cottages and a large portion of non-residential facilities that are key attributes to the precinct's character;

(b) building floor level height in new development is consistent with adjoining contributing character buildings;

(c) enclosing the ground floor of a character building does not have an adverse impact on the character of the building;

(d) the roof profile of buildings is consistent with that of contributing character buildings;

(e) the front façade of buildings is consistent with the predominant front façade profiles of contributing character buildings and does not result in blank facades or facades with small openings;

(f) window scale and proportions of buildings are sympathetic to the predominant character of the precinct; and

(g) additions, alterations and adaptive reuse of existing non-residential contributing character buildings maintains the legibility of the historic use and is sympathetic to the prevailing residential character of the precinct.

Queenslanders precinct:

(a) this precinct consists of low and high set Queensland workers' cottages and bungalows;

(b) the consistent character of Queensland workers' cottages and interwar houses constructed of lightweight materials is maintained;

(c) building floor level height in new development is consistent with adjoining contributing character buildings;

(d) enclosing the ground floor of a contributing character building does not have an adverse impact on the character of the building;

(e) the roof profile of buildings is consistent with that of contributing character buildings;

(f) buildings have a verandah to the front façade which addresses the street and development does not result in blank facades or facades with small openings; and

(g) the subdivision pattern of the precinct is maintained.

Interwar Gables and Queensland Bungalows precinct:

(a) this precinct predominately consists of inter-war high-set dwelling houses and villa style residences with large workers' bungalows which have significant street presence;

(b) building floor level height in new development is consistent with adjoining contributing character buildings;

(c) enclosing the ground floor of a contributing character building does not have an adverse impact on the character of the building;

(d) the roof profile of buildings is consistent with that of contributing character buildings;

(e) the front facade of buildings is consistent with the predominant front facade profiles of contributing character buildings;

(f) window scale and proportions of buildings are sympathetic to the predominant character of the precinct;

(g) the front facade of buildings addresses and retains street presence; and

(h) the subdivision pattern of the precinct is maintained.

Interwar to 1950s Asymmetrical Gable precinct:

(a) the precinct consists of a mix of Queensland bungalows and inter-war designs;

(b) building floor level height in new development is consistent with adjoining contributing character buildings;

(c) enclosing the ground floor of a contributing character building does not have an adverse impact on the character of the building;

(d) the roof profile of buildings is consistent with that of contributing character buildings;

(e) window scale and proportions of buildings are sympathetic to the predominant character of the precinct;

(f) the front facade of buildings is consistent with the predominant front facade profiles of contributing character buildings; and

(g) the subdivision pattern of the precinct is maintained.

Churchill Street precinct:

(a) this precinct contains predominantly older detached, lightweight, post-war dwelling houses, displaying pre-war design elements;

(b) dwelling houses in this precinct are elevated and generally high set;

(c) building floor level height in new development is consistent with adjoining contributing character buildings;

(d) enclosing the ground floor of a contributing character building does not have an adverse impact on the character of the building;

(e) buildings within this precinct retain or enhance the setting and rhythm of the streetscape;

(f) the roof profile and overhang of buildings is consistent with that of contributing character buildings; and

(g) window scale and proportions of buildings are sympathetic to the predominant character of the precinct.

Park Street precinct:

(a) this precinct contains a mix of high and low set designs from the inter-war period;

(b) building floor level height in new development is consistent with adjoining contributing character buildings;

(c) enclosing the ground floor of a contributing character building does not have an adverse impact on the character of the building;

(d) buildings in this precinct retain or enhance the setting and rhythm of the streetscape;

(e) the roof profile and overhang of buildings is consistent with that of contributing character buildings;

(f) window scale and proportions of buildings are sympathetic to the predominant character of the precinct; and

(g) the front facade of buildings is consistent with the predominant front facade profiles of contributing character buildings.

Grand Queenslanders precinct:

(a) this precinct which contains Stanton Hill and Melton Hill, consists of large Queenslanders and other inter-war traditional timber buildings which have an iconic townscape appearance;

(b) building floor level height in new development is consistent with adjoining contributing character buildings;

(c) enclosing the ground floor of a contributing character building does not have an adverse impact on the character of the building;

(d) the roof profile of buildings is consistent with that of contributing character buildings; and

(e) the front facade of buildings is consistent with the predominant front facade profiles of contributing character buildings.

French Street precinct:

(a) this precinct consists of large inter-war gabled Queenslander dwelling houses;

(b) dwelling houses in this precinct are elevated and generally high set;

(c) building floor level height in new development is consistent with adjoining contributing character buildings;

(d) enclosing the ground floor of a contributing character building does not have an adverse impact on the character of the building;

(e) development maintains the uniformity and consistency of dwelling design style, setting and the rhythm of the streetscape;

(f) the roof profile and overhang of buildings is consistent with that of contributing character buildings;

(g) the front facade of buildings is consistent with the predominant front facade profiles of contributing character buildings; and

(h) window scale and proportions of buildings are sympathetic to the predominant character of the precinct.

Mixed 1950s precinct:

(a) the precinct contains older timber dwelling houses and gabled, inter-war and post-war designs;

(b) building floor level height in new development is consistent with adjoining contributing character buildings;

(c) enclosing the ground floor of a contributing character building does not have an adverse impact on the character of the building;

(d) the roof profile and overhang of buildings is consistent with that of contributing character buildings;

(e) window scale and proportions of buildings are sympathetic to the predominant character of the precinct;

and

(f) the front facade of buildings is consistent with the predominant front facade profiles of contributing character buildings.

6.2.5.3 Assessment benchmarks

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Home based business	
PO1 The use does not adversely impact on the amenity of the surrounding residential land uses and local character.	**AO1.1** The home based business: (a) is carried out in an existing building or structure; (b) does not use more than 60m² of the gross floor area of the building or structure; (c) involves at least one or more residents of the dwelling house; (d) involves not more than one non-resident employee; (e) where bed and breakfast accommodation does not exceed three bedrooms; (f) does not generate more than 1 heavy vehicle trip per week; **Editor's note—**A heavy vehicle is a vehicle with more than 4.5 tonnes gross vehicle mass. (g) does not generate more than 28 vehicle trips per day by other vehicles, where one trip includes arriving at the site and a second trip is departing the site. These trips are additional to normal domestic trips associated with the dwelling; (h) contains visitor parking within the site; (i) does not involve hiring out of materials, goods, appliances or vehicles; and (j) does not involve the repair or maintenance of vehicles, other than minor maintenance of vehicles used in conjunction of the home business on the site. **Editor's note—**Home based business operators should also refer to signage requirements under Table 5.8.2 - Operational work being placing an advertising device on a premises and Section 9.3.1-Advertising devices code.
	AO1.2 Functional aspects of the use such as service areas, material storage or use activities are not visible from the street.

	AO1.3 Other than where a bed and breakfast or home based childcare the business use does not operate outside the hours of 8am to 5pm Monday to Friday, 8am to 2pm Saturday and does not operate on Sunday.
	AO1.4 Noise levels do not exceed acoustic quality objectives under the Environmental Protection (Noise) Policy 2008.
PO2 Commercial vehicle parking: (a) has a direct nexus with a home based business carried out on the site; and (b) does not adversely affect the amenity of neighbouring properties.	**AO2.1** Not more than one commercial vehicle is parked on the site.
	AO2.2 While on-site, vehicles; (a) are not left idling for more than 5 minutes at any one time; and (b) do not have a refrigeration unit running.
	AO2.3 Any commercial vehicle does not exceed 4.5 tonnes gross vehicle mass and is housed behind the building line.

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Secondary dwelling	
PO3 Secondary dwellings are: (a) are subordinate, small-scaled dwellings; (b) contribute to a safe and pleasant living environment; and (c) does not cause adverse impacts on adjoining properties.	**AO1.1** The secondary dwelling: (a) has a GFA, exclusive of a single carport or garage, of not more than 90m^2; and (b) is located not more than 20m from the primary house

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
For assessable development	
Amenity	

PO4 Development minimises impacts on surrounding land and provides for an appropriate level of amenity within the site, having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) visual impact; (e) odour and emissions; (f) lighting; (g) access to sunlight; (h) privacy; and (i) outlook.	No acceptable outcome is nominated.
PO5 Development for the purposes of a sensitive use within 500m of land included in the High impact industry zone or Special purpose zone, or within 250m of land in the Medium impact industry zone: (a) achieves indoor noise levels consistent with the objectives set out in the Environmental Protection (Noise) Policy 2008; (b) achieves air quality levels consistent with the objectives set out in the Environmental Protection (Air) Policy 2008 and the relevant national standard; and (c) does not experience offensive odours.	No acceptable outcome is nominated.

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note–This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	**Acceptable outcomes**
For assessable development	
Crime prevention through environmental design	
PO6 Development facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building design that promotes safety; (c) adequate lighting; (d) appropriate signage and way finding; (e) minimisation of entrapment locations; and (f) building entrances, loading and storage areas that are well lit and lockable after hours. **Editor's note–**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.

PO7 Development minimises impacts on remaining areas of ecological significance within the zone.	No acceptable outcome is nominated.

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note–This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
For assessable development	
Demolition and removal	
PO8 The removal, relocation or a partial or total demolition of a contributing character building only occurs if it can be demonstrated that the: (a) total or partial loss of the building will not contribute to the loss of the character values; (b) total or partial loss of the building will not impact on the rhythm of the streetscape; or (c) the building or part proposed for demolition is not capable of structural repair.	No acceptable outcome is nominated. **Editor's note–**An impact statement produced by a suitably qualified professional may be required to demonstrate that there is no adverse impact on the character of the precinct due to the loss of the place, or a suitably qualified professional provides a report on the buildings condition, demonstrating that the place is not capable of repair. **Editor's note–**Applicants should have regard to the Character Residential planning scheme policy no. SC6.2 for guidance on how to write an impact statement.

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note–This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
For assessable development	
Carports and garages	
PO9 When viewed from a street, ancillary buildings such as carports and garages: (a) do not visually dominate the streetscape character; (b) are subservient to existing buildings on the site; (c) do not detract from the character or appearance of the contributing character buildings; and (d) are consistent with the established rhythm of the streetscape.	**AO9** Class 10a structures such as carports, garages: (a) are set back an equal or greater distance from the street as the main building; (b) have a maximum width not exceeding 3m; (c) do not have a garage door or solid face presented to the street; (d) are detached or semi-detached structures with minimum carport roof gap to the building face of 0.6m (as shown in Figure 6.51 – Appropriate carport or garage type and roof gap); (e) have a roof pitch which matches the main building's predominant roof pitch or has a roof pitch no greater than 3 degrees (as shown in Figure 6.52 - Appropriate roof pitch of a carport or garage); (f) have their highest point lower or equal to the gutter/facia level of the main building (as shown in Figure 6.53 - Appropriate height relative to the main building); and (g) are built using materials that complement the existing dwelling (as shown in Figure 6.54 - Appropriate complementary building materials).

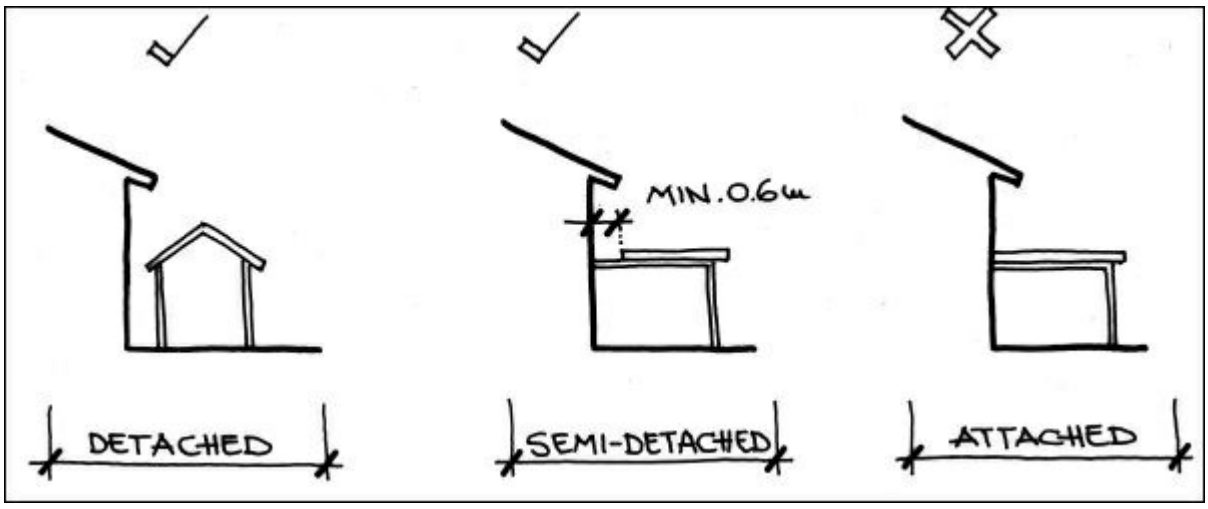


Figure 6.51 - Appropriate carport or garage type and roof gap

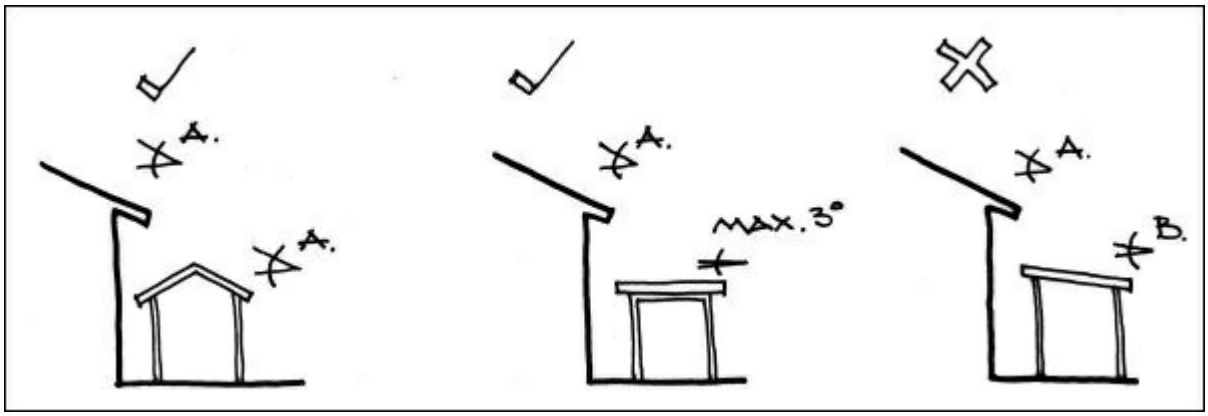


Figure 6.52 - Appropriate roof pitch of a carport or garage

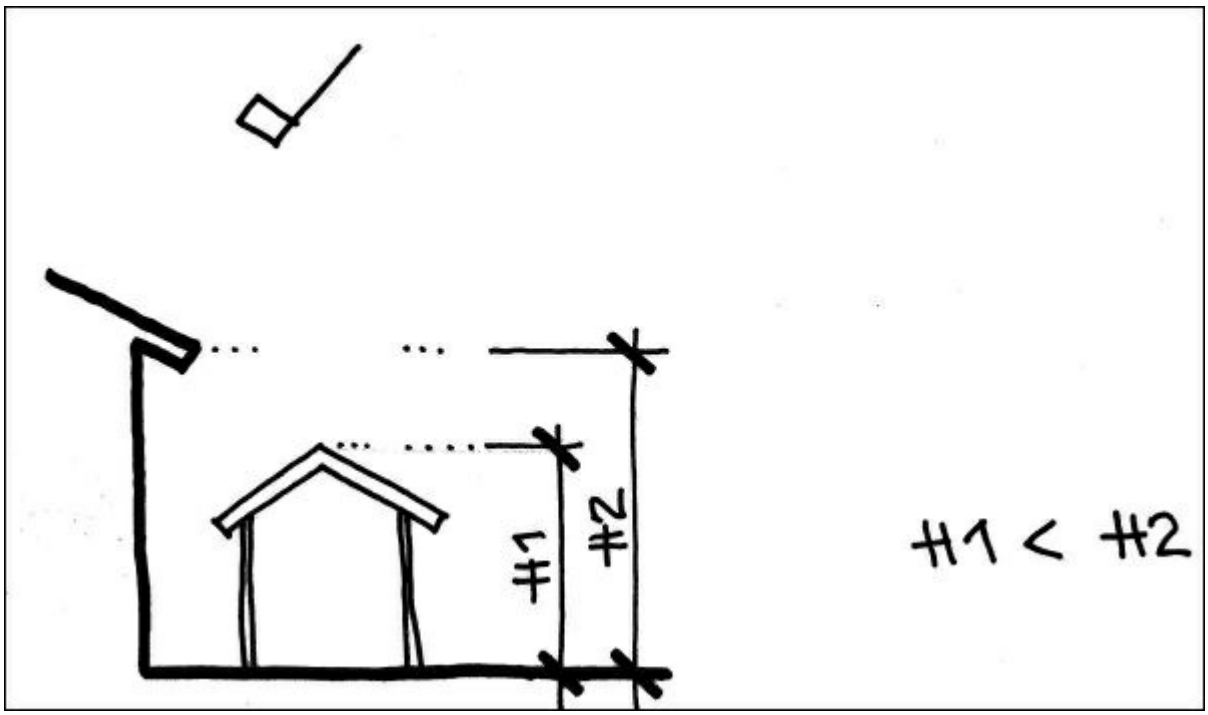


Figure 6.53 - Appropriate height relative to the main building

Figure 6.54 - Appropriate complementary building materials

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
For assessable development - where a non-residential use	
PO10 Non-residential uses establish only where: (a) compatible with local character and amenity; (b) limited in scale and supporting the day-to-day needs of the local community; and (c) not impacting on the role and function of the city's network of centres or more appropriately located in another zone.	No acceptable outcome is nominated. **Editor's note—**Applicants should have regard to the Economic impact assessment planning scheme policy no SC6.5 for guidance on how to demonstrate compliance with this performance outcome.
PO11 Development is of a house compatible scale.	**AO11.1** The use only involves minor building work. OR
	AO11.2 Where a new building is proposed: (a) buildings and other structures do not exceed 8.5m or 2 storeys in building height, whichever is the lesser; (b) the building does not exceed 250m² in gross floor area; (c) site cover does not exceed 60%; and (d) the maximum length of any wall is 12m.

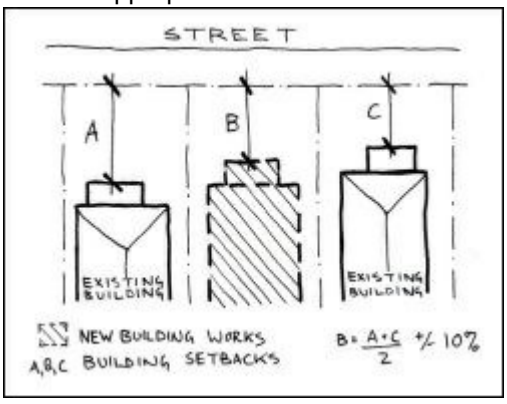
Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

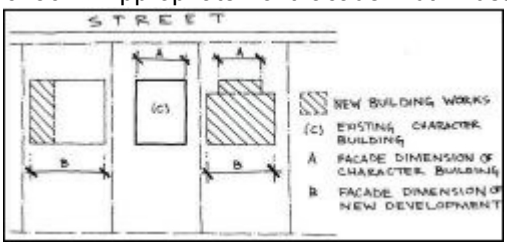
Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

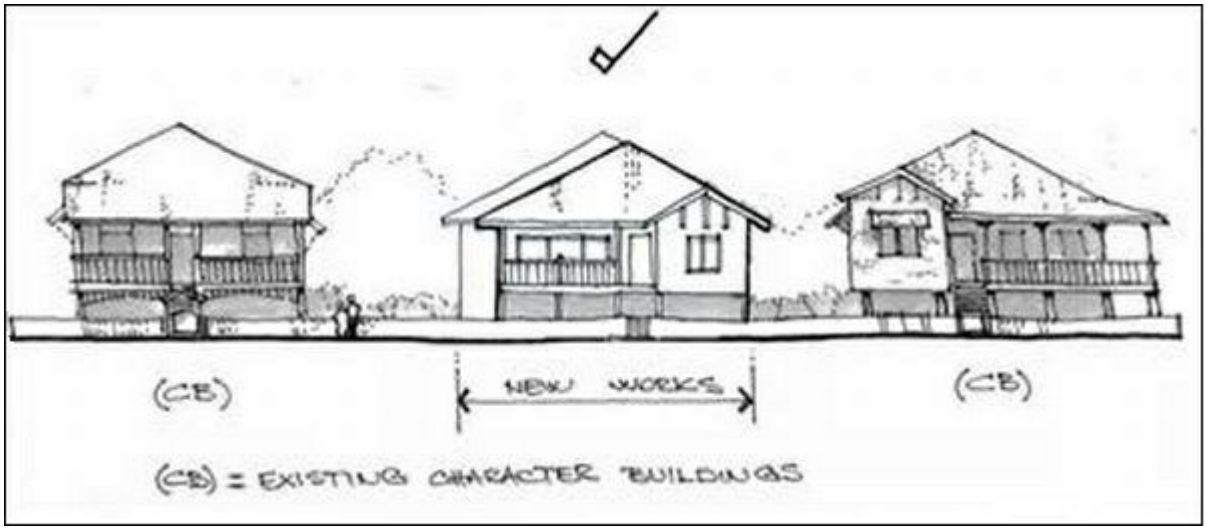
Performance outcomes	Acceptable outcomes
For assessable development	
Reconfiguring a lot	
PO12 Reconfiguration of lots is consistent with the predominant subdivision pattern of the precinct.	No acceptable outcome is nominated. **Editor's note—**Applicants should have regard to the Character residential planning scheme policy no. SC6.2 for guidance on how to demonstrate compliance with this performance outcome.

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
For assessable development — where a new building, relocation of a contributing character building within the site or extension or alteration to an existing contributing character building	
PO13 Building height is consistent to adjoining contributing character buildings.	**AO13.1** Development does not involve raising or lowering a dwelling by more than 1m.
	AO13.2 Unless otherwise stated for a particular precinct, buildings and structures do not exceed 8.5m or 2 storeys in building height, whichever is the lesser.
PO14 The existing setting and rhythm of the streetscape is retained and enhanced.	**AO14.1** Buildings and extensions are setback from street frontages within 10% of the average front setback of adjoining contributing character buildings. Figure 6.55 — Appropriate front setbacks illustrates.  **Figure 6.55 — Appropriate front setbacks**

	AO14.2 Unless otherwise stated for a particular precinct, the front facade width of the building is the same as the front facade width of the adjoining contributing character buildings, to a minimum depth of 3m. Figure 6. 56 — Appropriate front facade width illustrates.  **Figure 6.56 — Appropriate front facade width**
PO15 Buildings maintain the regularity of building form and street presentation. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no. SC6.2 for guidance on how to demonstrate compliance with this performance outcome. Figure 6.57 — Street presentation provides indicative guidance.	No acceptable outcome is nominated.



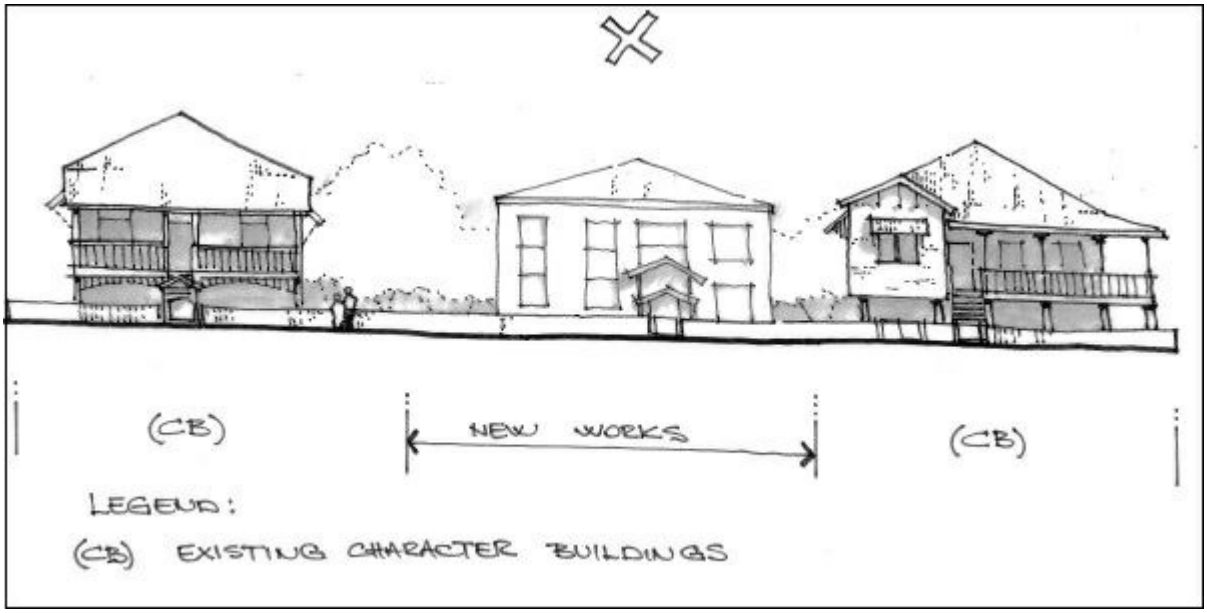


Figure 6.57 – Street presentation

PO16 Buildings use materials that have a lightweight appearance, and assist in reducing building bulk and form. **Editor's note—**Applicants should have regard to the Character planning scheme policy no. SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO16.1** Walls are clad with lightweight materials with an expressed surface profile.
	AO16.2 Roofs are clad with corrugated iron.
	AO16.3 Windows are timber framed or have the appearance of being timber.

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
1950s Post War Expansion precinct	
PO17 Buildings have a low-set appearance and scale consistent with the predominant character of the precinct.	**AO17.1** Building height does not exceed 1 storey.
	AO17.2 Dwelling houses have elevated floor levels between 600mm to 750mm above ground level.
PO18 The existing setting and rhythm of the streetscape is retained and enhanced.	**AO18** The front facade width is 8m to 11m wide, to a minimum depth of 3m. Figure 6.58 - 1950s Post War Expansion precinct (Parsons street) illustrates. **Figure 6.58 - 1950s Post War Expansion precinct (Parsons Street)**
PO19 The roof profile is consistent with the predominant roof profile of dwellings that contribute to the precinct's character. **Editor' note—**Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how todemonstrate compliance with this performance outcome.	**AO19** The roof profile is: (a) hipped with a 15 degree to 22.5 degree pitch; or (b) hipped with a 15 degree to 22.5 degree pitch incorporating a hipped or gabled projection towards the street.

PO20 The roof overhang is consistent with the predominant roof overhang of contributing character buildings. **Editor' note—**Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO20** Roof overhangs are: (a) 600mm wide; and (b) gable end overhangs are 300mm to 400mm wide.
PO21 Window scale and proportions are sympathetic to the predominant character of the precinct. **Editor's note—**Applicants should have regard to the Character residential planning scheme policy no. SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO21** Windows are half-height with 2, 3, or 4 vertically proportioned frames, where the frame height is greater than its width by a 3:1 ratio. Figure 6.59 - Half-height vertically proportioned frames in the 1950s Post War Expansion precinct (Kent street) illustrates. **Figure 6.59 - Half-height vertically proportioned frames in the 1950s Post War Expansion precinct (Kent Street)**

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
1960s Defence Housing and 1960s Housing Commission precinct	
PO22 The roof profile is consistent with the predominant roof profile of the contributing character buildings. **Editor' note—**Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO22** The roof profile is simple gabled or simple hipped with a 10 degree to 15 degree roof pitch.
PO23 The roof overhang is consistent with the predominant roof overhang of the contributing character buildings. **Editor' note—**Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO23** Roof overhangs are 750mm to 900mm wide.
PO24 Window scale and proportions are sympathetic to the predominant contributing character of the precinct. **Editor's note—**Applicants should have regard to the Character residential planning scheme policy no. SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	No acceptable outcome is nominated.
PO25 Enclosing the ground floor storey of a building does not have an adverse impact on the character of the building and ensures the original fabric of the building is identifiable.	**AO25** Development on any ground floor storey is: (a) semi-enclosed with timber battens from view; and (b) aligned with the upper levels walls. Figure 6.60 - Appropriate enclosure to the ground floor in the 1960s Defence Housing and 1960s Housing Commission precinct (Pixley Street) illustrates. **Figure 6.60 — Appropriate enclosure to the ground floor in the 1960s Defence Housing and 1960s Housing Commission precinct (Pixley Street)**

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Worker's Cottages precinct	
PO26 Building height and building floor level height are consistent to adjoining contributing character buildings.	**AO26** Dwelling houses: (a) have a floor level minimum of 700mm above ground level; or (b) are 2 storeys.
PO27 The front facade includes a verandah consistent with the predominant front facade profile of the contributing character buildings.	**AO27.1** The front facade includes an open or semi-enclosed front verandah for a minimum 60% width of the front facade; OR **AO27.2** Enclosed verandahs are articulated with openings such as windows, louvers or screens, continuously across 60% or more of the front facade of the dwelling and wrap around one or both sides of the front facade for a minimum of 2m and the enclosure is capable of being reversed. Figure 6.61 - A front verandah in the Worker's Cottages precinct (Castling Street) illustrates. **Figure 6.61 — A front verandah in the Worker's Cottages precinct (Castling Street)**

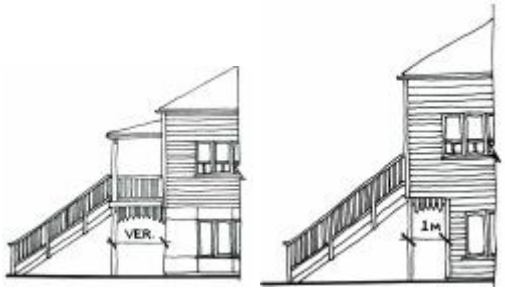
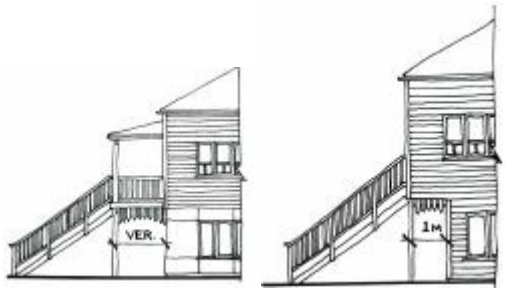
PO28 Enclosing the ground floor storey of a building does not have an adverse impact on the character of the building and ensures the original fabric of the building is identifiable.	**AO28** Development on any ground floor storey includes a valance, and: (a) is set back the full depth of all open or enclosed verandahs; or (b) is set back 1m from the upper level of an exterior wall where there is no verandah. Figure 6.62 - Appropriate enclosures to the ground floor illustrates.  **Figure 6.62 — Appropriate enclosures to the ground floor**
PO29 The roof profile is consistent with the predominant roof profile of the contributing character buildings. **Editor's note—**Applicants should have regard to the Character residential planning scheme policy no. SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO29.1** The roof profile is simple hipped or pyramid with a 15 degree to 25 degree roof pitch.
	AO29.2 Verandahs are contained under the main roof form, or roofed separately with skillion or gently curved roofs.
PO30 Window scale and proportions, and window hoods and awnings are sympathetic to the predominant character of the precinct. **Editor' note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO30.1** The windows are half-height with vertically proportioned frames, where the frame height is greater than its width by a 3:1 ratio.
	AO30.2 Where windows are not sheltered by a verandah or roof overhang (which has a minimum overhang of 600mm), window hoods are provided.

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
South Townsville precinct	
PO31 Building height and building floor level height are consistent to adjoining contributing character buildings. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO31** Dwelling houses: (a) have a floor level minimum of 700mm above ground level; or (b) are 2 storeys.
PO32 The front facade is articulated with openings consistent with the predominant front facade profile of the contributing character buildings. **Editor's note—**Applicants should have regard to the Character residential planning scheme policy no. SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO32.1** The front façade includes an open or semi-enclosed front verandah, at a minimum 60% width of the front facade. OR **AO32.2** Enclosed verandahs are articulated with openings such as windows, louvers or screens, continuously across 60% or more of the front facade of the dwelling and wrap around one or both sides of the front facade for a minimum of 2m and the enclosure is capable of being reversed.
	AO32.3 Where the front facade exceeds 8.5m in width, the front verandah wraps around one or both sides of the dwelling house.
PO33 Enclosing the ground floor storey of a building does not have an adverse impact on the character of the building and ensures the original fabric of the building is identifiable.	**AO33** Development on any ground floor storey includes a valance, and: (a) is set back the full depth of all open or enclosed verandahs; or (b) is set back 1m from the upper level of an exterior wall where there is no verandah; Figure 6.63 - appropriate enclosures to the ground floor illustrates.  **Figure 6.63 — Appropriate enclosures to the ground floor**

PO34 The roof profile is consistent with the predominant roof profile of the contributing character buildings. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO34.1** The roof profile is: (a) simple hipped or pyramid with a 15 degree to 25 degree roof pitch; or (b) side gabled with a 15 degree to 25 degree roof pitch.
	AO34.2 Verandahs are contained under the main roof form, or roofed separately with skillion or gently curved roofs.
PO35 Window scale and proportions and window hoods or awnings are sympathetic to the dominant character of the precinct. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO35.1** The windows are half-height with vertically proportioned frames, where the frame height is greater than its width by a 3:1 ratio.
	AO35.2 Where windows are not sheltered by a verandah or roof overhang (which has a minimum overhang of 600mm), window hoods are provided. Figure 6.64 - vertically proportioned frames with window hoods in the South Townsville precinct (Bell Street) illustrates. **Figure 6.64 — Vertically proportioned frames with window hoods in the South Townsville precinct (Bell Street)**
PO36 Additions, alterations and adaptive reuse of existing contributing non-residential character buildings maintain the legibility of the historic use and are sympathetic to the prevailing residential character of the precinct.	No acceptable outcome is nominated. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Queenslanders precinct	
PO37 Building height and building floor level height are consistent to adjoining contributing character buildings.	**AO37** Dwelling houses: (a) have a floor level minimum of 700mm above ground level; or (b) are 2 storeys.
PO38 The front facade includes a verandah consistent with the predominant front facade profile of contributing character buildings. **Editor's note—**Applicants should have regard to the Character residential planning scheme policy no. SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO38.1** The front facade includes an open or semi-enclosed front verandah across, at a minimum 60% width of the front facade.
	AO38.2 Where the front facade exceeds 9m in width the front verandah wraps around one or both sides of the dwelling house. Figure 6.65 - A front verandah that wraps around both sides in the Queenslanders precinct (Ackers Street) illustrates. **Figure 6.65 — A front verandah that wraps around both sides in the Queenslanders precinct (Ackers Street)**

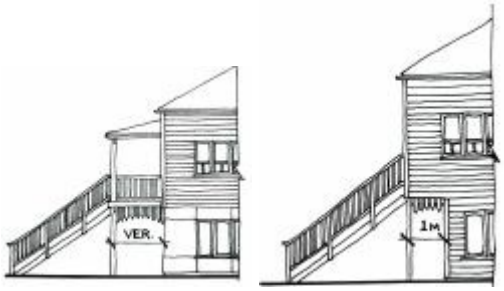
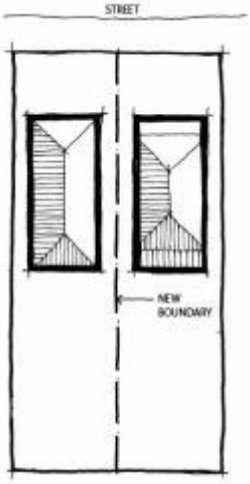
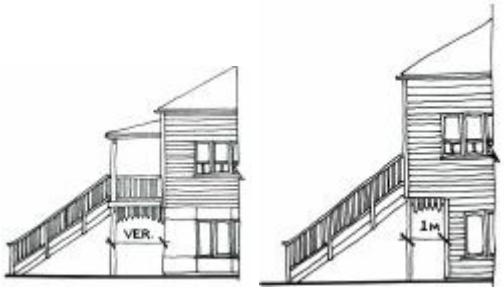
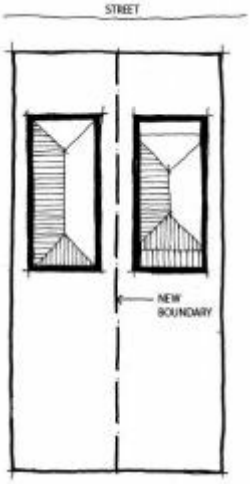
PO39 Enclosing the ground floor storey of a building does not have an adverse impact on the character of the building and ensures the original fabric of the building is identifiable.	**AO39** Development on any ground floor storey includes a valance, and: (a) is set back the full depth of all open or enclosed verandahs; or (b) is set back 1m from the upper level of an exterior wall where there is no verandah. Figure 6.66 - Appropriate enclosures to the ground floor illustrates.  **Figure 6.66 — Appropriate enclosures to the ground floor**
PO40 Reconfiguration of a lot maintains the existing layout, streetscape character and subdivision pattern of the precinct and is consistent with the established rhythm of the streetscape. **Editor's note—**This Performance outcome varies from Performance outcome 28 in Section 9.3.4 Reconfiguring a lot code and does take precedence.	**AO40** The side boundary of the new lot maintains the existing side boundary depth. Figure 6.67 - Lot design illustrates.  **Figure 6.67 - Lot design**
PO41 The roof profile is consistent with the predominant roof profile of contributing character buildings. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO41.1** The roof profile of new building works is a simple hipped or pyramid main roof with a 17.5 degree to 27.5 degree roof pitch. **AO41.2** Verandahs are contained under the main roof form, or roofed separately with a skillion roof.

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Interwar Gables and Queensland Bungalows precinct	
PO42 Building height and building floor level height are consistent to adjoining contributing character buildings.	**AO42** Dwelling houses: (a) have a floor level minimum of 700mm above ground level; or (b) are 2 storeys.
PO43 The front facade is articulated with openings consistent with the predominant front facade profile of contributing character buildings. **Editor's note—**Applicants should have regard to the Character residential planning scheme policy no. SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO43** The front facade includes: (a) an open front verandah; or (b) an enclosed or semi-enclosed front verandah with window, louvres or screens continuous across the front facade of the dwelling. Figure 6.68 - A front verandah in the Interwar Gables and Queensland Bungalows precinct (McKillop Street) illustrates. Figure 6.69 - An enclosed front verandah with continuous windows across the front facade in the Interwar Gables and Queensland Bungalows precinct (Chapman Street) illustrates. **Figure 6.68 — A front verandah in the Interwar Gables and Queensland Bungalows precinct (McKillop Street)** **Figure 6.69 — An enclosed front verandah with continuous windows across the front facade in the Interwar Gables and Queensland Bungalows precinct (Chapman Street)**

PO44 Enclosing the ground floor storey of a building does not have an adverse impact on the character of the building and ensures the original fabric of the building is identifiable.	**AO44** Development on any ground floor storey includes a valance and: (a) is set back the full depth of all open or enclosed verandahs; or (b) is set back 1m from the upper level of an exterior wall where there is no verandah. Figure 6.70 - Appropriate enclosures to the ground floor illustrates.  **Figure 6.70 — Appropriate enclosures to the ground floor**
PO45 Reconfiguration of a lot maintains the existing layout, streetscape character and subdivision pattern of the precinct and is consistent with the established rhythm of the streetscape. **Editor's note—**This Performance outcome varies from Performance outcome 28 in Section 9.3.4 Reconfiguring a lot code and does take precedence.	**AO45** The side boundary of the new lot maintains the existing side boundary depth. Figure 6.71 - Lot design illustrates.  **Figure 6.71 - Lot design**
PO46 The roof profile is consistent with the predominant roof profile of contributing character buildings. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO46.1** The roof profile is: (a) simple hipped or pyramid, roofed with asymmetrical gable projections with a 22.5 degree to 27.5 degree roof pitch; or (b) gable fronted with asymmetrical gable projections with a 17.5 degree to 22.5 degree roof pitch.
	AO46.2 The primary roof form extends over the entire floor plan, including any front or side verandahs.

PO47 Window scale and proportions are sympathetic to the predominant contributing character of the precinct. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO47.1** Windows are half-height with vertically proportioned frames, where the frame height is greater than its width by a 3:1 ratio.
	AO47.2 Windows below front gabled roofs: (a) are located symmetrically under the apex gable; and (b) have a minimum of two vertically proportioned frames or have bay windows. Figure 6.72 - Half-height vertically proportioned window located symmetrically under gable in the Interwar Gables and Queensland Bungalows precinct (Lawson Street) illustrates. **Figure 6.72 — Half-height vertically proportioned window located symmetrically under gable in the Interwar Gables and Queensland Bungalows precinct (Lawson Street)**

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Interwar to 1950s Asymmetrical Gable precinct	
PO48 Building height and building floor level height are consistent to adjoining contributing character buildings.	**AO48** Dwelling houses: (a) have a floor level minimum of 700mm above ground level; or (b) are 2 storeys.

PO49 The front facade profile is articulated consistent with the predominant front façade profile of contributing character buildings. **Editor's note—**Applicants should have regard to the Character residential planning scheme policy no. SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO49** The front facade includes: (a) asymmetrical projecting building forms, or steps in plan, a minimum of 1.2m in depth; or (b) open or semi-enclosed front verandah across the full width of the building. Figure 6.73 — Asymmetrical projecting building forms for a minimum 1.2m in depth (Burton Street) illustrates. **Figure 6.73 — Asymmetrical projecting building forms for a minimum 1.2m in depth (Burton Street)**
PO50 Enclosing the ground floor storey of a building does not have an adverse impact on the character of the building and ensures the original fabric of the building is identifiable.	**AO50** Development on any ground floor storey includes a valance, and: (a) is set back the full depth of all open or enclosed verandahs; or (b) is set back 1m from the upper level of an exterior wall where there is no verandah. Figure 6.74 - Appropriate enclosures to the ground floor illustrates. **Figure 6.74 - Appropriate enclosures to the ground floor**

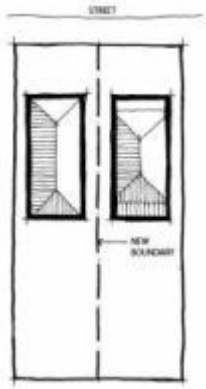
PO51 Reconfiguration of a lot maintains the existing layout, streetscape character and subdivision pattern of the precinct and is consistent with the established rhythm of the streetscape. **Editor's note—**This Performance outcome varies from Performance outcome 28 in Section 9.3.4 Reconfiguring a lot code and does take precedence.	**AO51** The side boundary of the new lot maintains the existing side boundary depth. Figure 6.75 - Lot design illustrates.  **Figure 6.75 - Lot design**
PO52 The roof profile is consistent with the predominant roof profile of contributing character buildings. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO52.1** The roof form is: (a) simple hipped or pyramid with a 22.5 degree to 30 degree roof pitch with asymmetrical gable projections; or (b) gable fronted with a 17.5 degree to 22.5 degree roof pitch with asymmetrical gable projections. **AO52.2** Where front verandahs are included, they are contained under the main roof form.
PO53 Window scale and proportions are sympathetic to the predominant contributing character of the precinct. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO53.1** Windows have a minimum of 3 vertically proportioned frames, where the frame height is greater than its width by a 3:1 ratio. **AO53.2** Windows below front gabled roofs: (a) are located symmetrically under the apex gable; and (b) have a minimum of two vertically proportioned frames or have bay windows. Figure 6.76 - Symmetrically located bay windows under gable (Hooper Street) illustrates. **Figure 6.76 — Symmetrically located bay windows under gable (Hooper Street)**

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

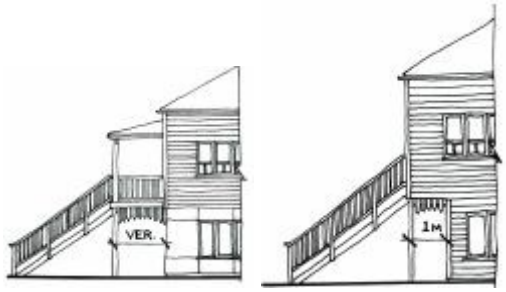
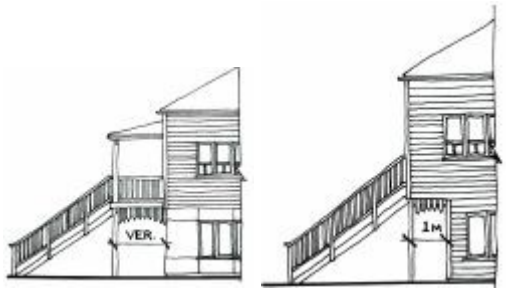
Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Churchill Street precinct	
PO54 Building height and building floor level height are consistent to adjoining contributing character buildings.	No acceptable outcome nominated.
PO55 The existing setting and rhythm of the streetscape is retained and enhanced.	**AO55** The front facade width is 11.5m to 13.5m wide.
PO56 Enclosing the ground floor storey of a building does not have an adverse impact on the character of the building and ensures the original fabric of the building is identifiable.	**AO56** Development on any ground floor storey includes a valance, and: (a) is set back the full depth of all open or enclosed verandahs; or (b) is set back 1m from the upper level of an exterior wall where there is no verandah. Figure 6.77 - Appropriate enclosures to the ground floor illustrates.  **Figure 6.77 — Appropriate enclosures to the ground floor**
PO57 The roof profile is consistent with the predominant roof profile of contributing character buildings. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO57** The roof pitch is between 15 degree to 20 degree.
PO58 The roof overhang is consistent with the predominant roof overhang of contributing character buildings. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO58** Roof overhangs are 450mm to 750mm wide.
PO59 Window scale and proportions are sympathetic to the predominant contributing character of the precinct. **Editor's note—**Applicants should have regard to the Character residential planning scheme policy no. SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO59** Windows are half height with a minimum of 3 vertically proportioned frames, where the frame height is greater than its width by a 3:1 ratio.

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Park Street precinct	
PO60 Building height and building floor level height are consistent to adjoining contributing character buildings.	**AO60** Dwelling houses: (a) have a floor level minimum of 700mm above ground level; or (b) are 2 storeys.
PO61 The front facade openings are consistent with the predominant front facade profile of contributing character buildings. **Editor's note—**Applicants should have regard to the Character residential planning scheme policy no. SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO61.1** The front facade includes: (a) a front verandah; or (b) a bay window.
	AO61.2 Enclosed verandahs are articulated with openings such as windows, louvers or screens, continuously across the full width of the verandah.
PO62 Enclosing the ground floor storey of a building does not have an adverse impact on the character of the building and ensures the original fabric of the building is identifiable.	**AO62** Development on any ground floor storey includes a valance, and: (a) is set back the full depth of all open or enclosed verandahs; or (b) is set back 1m from the upper level of an exterior wall where there is no verandah. Figure 6.78 - Appropriate enclosures to the ground floor illustrates.  **Figure 6.78 — Appropriate enclosures to the ground floor**
PO63 The existing setting and rhythm of the streetscape is retained and enhanced.	**AO63** The front facade width is 9m to 12.5m wide.
PO64 The roof profile is consistent with the predominant roof profile of contributing character buildings. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO64** The roof pitch is between 15 degree to 30 degree.

PO65 The roof overhang is consistent with the dominant roof overhang of contributing character buildings. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO65** Roof overhangs are 400mm to 600mm wide.
PO66 Window scale and proportions are sympathetic to the predominant contributing character of the precinct. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO66** Windows are half height with a minimum of 3 vertically proportioned frames, where the window height is greater than its width by a 3:1 ratio.

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—this code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Grand Queenslanders precinct	
PO67 Building height and building floor level height are consistent to adjoining contributing character buildings.	**AO67** Dwelling houses: (a) have a floor level a minimum of 700mm above ground level; or (b) are 2 storeys.
PO68 The front facade profile is articulated with openings consistent with the predominant front facade profile of contributing character buildings. **Editor's note—**applicants should have regard to the Character residential planning scheme policy no. SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO68.1** The front facade includes an open or semi-enclosed front verandah for the full width of the building and extends around at a minimum, down 2m one or both sides. OR **AO68.2** Enclosed verandahs are articulated with openings such as windows, louvers or screens, continuously across the full width of the verandah. Figure 6.79 - An open front verandah for the full width of the front facade; including removable blinds (Alexandra Street) illustrates. **Figure 6.79 — An open front verandah for the full width of the front facade; including removable blinds (Alexandra Street)**

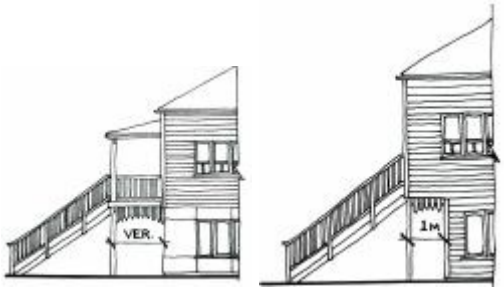
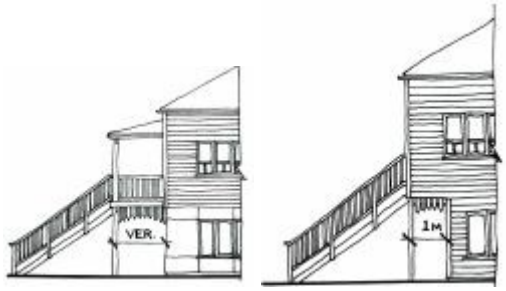
PO69 Enclosing the ground floor storey of a building does not have an adverse impact on the character of the building and ensures the original fabric of the building is identifiable.	**AO69** Development on any ground floor storey includes a valance, and: (a) is set back the full depth of all open or enclosed verandahs; or (b) is set back 1m from the upper level of an exterior wall where there is no verandah. Figure 6.80 - Appropriate enclosures to the ground floor illustrates.  **Figure 6.80 — Appropriate enclosures to the ground floor**
PO70 The roof profile is consistent with the predominant roof profile of contributing character buildings. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO70.1** The roof profile is simple hipped or pyramid main roof, with a 17.5 degree to 27.5 degree roof pitch.
	AO70.2 Verandahs are contained under the main roof form, or roofed separately with a skillion roof.

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

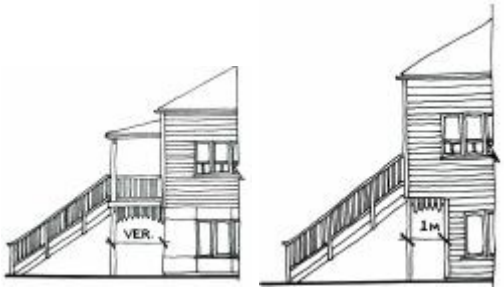
Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
French Street precinct	
PO71 Building height and building floor level height are consistent to adjoining contributing character buildings.	**AO71** Dwelling houses have a floor level minimum of 2m above ground level or is 2 storeys.
PO72 The front facade is articulated consistent with the predominant front facade of contributing character buildings. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO72** The front facade includes asymmetrical projecting building forms or steps in plan, a minimum of 1.2m in depth.
PO73 Enclosing the ground floor storey of a building does not have an adverse impact on the character of the building and ensures the original fabric of the building is identifiable.	**AO73** Development on any ground floor storey includes a valance, and: (a) is set back the full depth of all open or enclosed verandahs; or (b) is set back 1m from the upper level of an exterior wall where there is no verandah. Figure 6.81 - Appropriate enclosures to the ground floor.  **Figure 6.81 — Appropriate enclosures to the ground floor**
PO74 The existing setting and rhythm of the streetscape is retained and enhanced.	**AO74** The front facade width is 10m to 12m wide.
PO75 The roof profile is consistent with the predominant roof profile of contributing character buildings. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO75** Roof form is 17.5 degree in pitch and is simple hipped or pyramid and includes asymmetrical gable fronted projections.
PO76 The roof overhang is consistent with the predominant roof overhang of contributing character buildings. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO76** Roof overhangs are: (a) a minimum of 400mm wide; and (b) with gable end overhangs a minimum of 200mm wide.

PO77 Window scale and proportions are sympathetic to the predominant contributing character of the precinct. **Editor's note—**Applicants should have regard to the Character residential planning scheme policy no. SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO77.1** Windows have a minimum of 3 vertically proportioned frames. Where the frame height is greater than its width by a 3:1 ratio.
	AO77.2 Windows below front gabled roofs: (a) are located symmetrically under the apex gable; and (b) have a minimum of 2 vertically proportioned frames or have bay windows. Figure 6.82 - Symmetrically located windows under gable (French Street) illustrates. **Figure 6.82 — Symmetrically located windows under gable (French Street)**

Table 6.2.5.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—This code contains alternative provisions for dwelling houses and dual occupancies to those set out in the Queensland Development Code (MP 1.1, MP 1.2 and MP 1.3), for the purposes of section 33 of the *Building Act 1975*.

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Mixed 1950s precinct	
PO78 Building height and building floor level height are consistent to adjoining contributing character buildings.	**AO78** Dwelling houses: (a) have a floor level minimum of 700mm above ground level; or (b) are 2 storeys.
PO79 The front facade is articulated consistent with the predominant front facade of contributing character buildings. **Editor's note—**Applicants should have regard to the Character residential planning scheme policy no. SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO79** The front facade includes asymmetrical projecting building forms; or steps in plan, a minimum of 1.2m in depth. Figure 6.83 - Asymmetrical projecting building forms a minimum 1.2m in depth (Goodwin Street) illustrates. **Figure 6.83 — Asymmetrical projecting building forms a minimum 1.2m in depth (Goodwin Street)**

PO80 Enclosing the ground floor storey of a building does not have an adverse impact on the character of the building and ensures the original fabric of the building is identifiable.	**AO80** Development on any ground floor storey includes a valance, and: (a) is set back the full depth of all open or enclosed verandahs; or (b) is set back 1m from the upper level of an exterior wall where there is no verandah. Figure 6.84 - Appropriate enclosures to the ground floor illustrates.  **Figure 6.84 —Appropriate enclosures to the ground floor**
PO81 The roof profile is consistent with the predominant roof profile of contributing character buildings. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO81** The roof profile is: (a) hipped with a 15 degree to 20 degree pitch; or (b) simple hipped or pyramid with asymmetrical gable projections with a 17.5 degree to 22.5 degree roof pitch.
PO82 The roof overhang is consistent with the predominant roof overhang of contributing character buildings. **Editor's note**—Applicants should have regard to the Character residential planning scheme policy no SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	**AO82** Roof overhangs are 400mm to 600mm wide.
PO83 Window scale and proportions are sympathetic to the predominant character of the precinct. **Editor's note—**Applicants should have regard to the Character residential planning scheme policy no. SC6.2 for guidance on how to demonstrate compliance with this performance outcome.	No acceptable outcome is nominated.

6.3 Centre zones category

6.3.1 Neighbourhood centre zone code

6.3.1.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.3.1.2 Purpose

(1) The purpose of the Neighbourhood centre zone code is to provide for a small mix of land uses to service residential neighbourhoods.

It includes small-scale convenience shopping, professional offices, community services and other uses that directly support the immediate community.

(2) The particular purpose of the code is to provide for a network of centres that are readily accessible, integrated and well-designed, form vibrant focal points for the community, and provide a mix and range of services and facilities that are appropriate to their respective function and catchments. This promotes the efficient provision of services and contributes to the quality of life, character and identity of communities.

(3) The purpose of the zone will be achieved through the following overall outcomes:

- (a) neighbourhood centres contain a generally limited range of retail, commercial and community-related activities which are focused on meeting the basic, day-to-day convenience needs of a surrounding neighbourhood within a walkable catchment. Neighbourhood centre catchments are in the order of 1,500 households;
- (b) neighbourhood centres are located as an integral part of residential communities. Wherever possible they are co-located with other local facilities such as child care centres, parks or community uses;
- (c) centres do not compromise the intended role or successful functioning of higher order centres or each other;
- (d) residential development may occur within the centres, primarily where integrated in a mixed use development;
- (e) the built form and layout of a centre reinforces its integration with the local neighbourhood and creates a safe and pleasant community meeting place;
- (f) centres create a pedestrian-focussed frontage, activated by shop fronts, awnings and kerbside activities. Buildings are low-rise and smaller scale in nature;
- (g) the design of centres gives priority to improved accessibility by walking and cycling; and
- (h) centres are designed and operated to avoid adverse impacts on the amenity of surrounding residential neighbourhoods.

6.3.1.3 Assessment benchmarks

Table 6.3.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
PO1 Hours of operation are consistent with maintaining a reasonable level of amenity for nearby land in a residential zone.	**AO1** Hours of operation are limited to 6am to 10pm.
PO2 Where provided, outdoor lighting does not adversely affect the amenity of adjoining properties or create a traffic hazard on adjacent roads.	**AO2.1** Light emanating from any source complies with *Australian Standard AS4282 Control of the Obtrusive Effects of Outdoor Lighting*.
	AO2.2 Outdoor lighting is provided in accordance with *Australian Standard AS 1158.1.1 – Road Lighting – Vehicular Traffic (Category V) Lighting – Performance and Installation Design Requirement*.
PO3 Residential uses within the centre do not interrupt the continuity of the streetscape or the active, pedestrian focus of the street frontage.	**AO3** Any residential uses are located above or behind ground storey retail, commercial or community uses.
PO4 Residential uses within the centre are provided with a reasonable level of privacy.	**AO4.1** Windows, balconies, and terraces of a dwelling unit are screened where overlooking a habitable room or private open space of another dwelling within 9m.
	AO4.2 Screening is a solid translucent screen or perforated panels or trellises which have a maximum of 50% openings.
PO5 Residential uses within the centre are provided with a reasonable level of private outdoor living space.	**AO5** Dwellings are provided with private open space or a balcony directly accessible from a habitable room with: (a) a minimum area of 9m^2; and (b) a minimum dimension of 3m; and (c) clear of any utilities such as gas, water tanks or air conditioning units.

Table 6.3.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Built form	
PO6 Buildings are low-rise and are designed to break down the facade into finer-scaled components.	**AO6.1** All buildings and structures do not exceed 2 storeys or 8.5m in building height, whichever is the lesser.
	AO6.2 Buildings provide for tenancies fronting the street frontage which have a maximum width of 10m.
PO7 A strong sense of enclosure and definition of pedestrian space is created along street frontages, with buildings designed to provide visual interest, foster social interaction and create a safe and pleasant pedestrian-focussed environment.	**AO7.1** Buildings are built to the street frontage and provide an awning over the full width of the footpath.
	AO7.2 On-site car parking is provided to the side or the rear of buildings or below ground level, and is not located at the street frontage.
	AO7.3 Entrances to buildings face the street.
	AO7.4 Where buildings are located on a corner site, the main entrance faces the principal street or the corner.
	AO7.5 At the ground storey, a minimum of 65% of building frontage is provided as predominantly transparent windows or glazed doors and a maximum of 35% as solid facade.
	AO7.6 Clear windows are provided at ground storey and where provided, grille or translucent security screens are used rather than solid shutters, screens or roller-doors.

Table 6.3.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Community uses, community care centres, clubs	
PO8 Adequate lockable storage space is provided on-site to meet the needs of users.	**AO8** At least one (1) lockable storage space is provided of at least 4m^2 for each room or area that can be hired out or used by community organisations or the public.

Table 6.3.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Role and function	
PO9 Development is consistent with the intended role, scale and character of the neighbourhood centre and does not compromise the intended role or successful functioning of other centres.	**AO9** The combined area of all existing and proposed shops, shopping centres, offices, service industries, health care services and food and drink outlets within the centre do not exceed a total gross leasable area of 1,000m^2. For other uses, no acceptable outcome is nominated. **Editor's note—**Applicants should have regard to Economic impact assessment planning scheme policy SC6.5 for guidance on how to demonstrate compliance with this performance outcome.
PO10 Showrooms are not established in the neighbourhood centre.	No acceptable outcome is nominated.
PO11 Development facilitates opportunities for appropriate co-location of community-related activities or facilities to the extent practical.	No acceptable outcome is nominated.

Table 6.3.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Amenity	
PO12 Development minimises impacts on surrounding land and provides for an appropriate level of amenity within the centre, having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) visual impact; (e) signage; (f) odour and emissions; (g) lighting; (h) access to sunlight; (i) privacy; and (j) outlook.	No acceptable outcome is nominated.
PO13 Streetscape treatments are provided to enhance amenity and to contribute positively to the city image, particularly along major roads and streets.	No acceptable outcome is nominated.

PO14 On-site landscaping is provided to: (a) enhance the appearance of the development, particularly in parking and service areas and in public spaces; (b) contribute to pedestrian comfort through shade; and (c) screen servicing components.	No acceptable outcome is nominated.
PO15 Development is designed and located so that adverse impacts on privacy and amenity on nearby land in a residential zone are minimised.	**AO15.1** Buildings are set back 2m from any boundary shared with a residential zone, or half the height of that part of the building, whichever is the greater.
	AO15.2.1 A 1.8m high solid screen fence is provided along all boundaries shared with a residential zone, and **AO15.2.2** A landscaped buffer with a minimum width of 2m and consisting of dense screen planting is provided along all boundaries shared with a residential zone.
	AO15.3 Windows that have a direct view into an adjoining residential use are provided with fixed screening that is a maximum of 50% transparent to obscure views and maintain privacy for residents.
PO16 Refuse storage areas, loading/unloading and other service or storage areas are screened from view from the street and adjoining land.	**AO16** Refuse storage areas loading/unloading and other service or storage areas are located to the rear or side of a building and are screened from view by a 1.8m high solid fence.

Table 6.3.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
For assessable development	
Crime prevention through environmental design	
PO17 Development facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building design that promotes safety; (c) adequate lighting; (d) appropriate signage and wayfinding; (e) minimisation of entrapment locations; and (f) building entrances, loading and storage areas that are well lit and lockable after hours. **Editor's note—**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.

Table 6.3.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Accessibility	
PO18 Convenient and legible connections are provided for pedestrians and cyclists to the site, particularly having regard to linkages with existing and proposed public transport infrastructure, the open space network, centres and other community-related activities.	No acceptable outcome is nominated.

6.3.2 Local centre zone code

6.3.2.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment for the Local centre zone.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.3.2.2 Purpose

(1) The purpose of the Local centre zone code is to provide for a limited range of land uses and activities to service local needs. It includes local shopping, local employment nodes, commercial, cafes and dining, entertainment, community services and residential development where it can integrate and enhance the fabric of the activity centre, but it is not the predominant use.

(2) The particular purpose of the code is to provide for a network of centres that are readily accessible, integrated and well-designed, form vibrant focal points for the community, and provide a mix and range of services and facilities that are appropriate to their respective function and catchments. This promotes efficient provision of services and contributes to the quality of life, character and identity of communities.

(3) The purpose of the zone will be achieved through the following overall outcomes:

- (a) local centres provide a range of retail, commercial and community activities that are focused on grocery shopping and local service needs of their surrounding catchments. They may include a single full-line supermarket and a small range of specialty shops, food and drink outlets, personal services and local offices;
- (b) local centres provide a significant focal point for the surrounding community. Wherever possible they are co-located with or include other local facilities such as child care centres, parks or community uses;
- (c) centres do not compromise the intended role or successful functioning of higher order centres or other local centres. Local centre catchments are in the order of 3,000 to 5,000 households;
- (d) residential development may occur within the centres, primarily where integrated in a mixed use development;
- (e) the built form and layout of a centre creates a safe and pleasant community meeting place. Centres create pedestrian-focussed public spaces and street frontages, activated by shop fronts, awnings and kerbside activities;
- (f) buildings are low-rise and create a sensitive transition in scale from the surrounding neighbourhood;
- (g) the design of centres gives priority to improved accessibility by walking and cycling;
- (h) centres are designed and operated to avoid adverse impacts on the amenity of surrounding residential neighbourhoods; and
- (i) opportunities for energy efficiency through built form are maximised.

(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts:

Rising Sun local centre precinct:

(a) development facilitates the consolidation of local centre uses in the area bounded by Ross River Road, Cross Street, and Bowen Road;

(b) built form, public space and streetscape treatments in this area contribute to a distinct character for the local centre, in particular on the frontages of Ross River Road, Cross Street, and Bowen Road; and

(c) development of this precinct facilitates a consolidation of vehicular access points.

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Figure 6.85 - Rising Sun local centre precinct

North Ward local centre precinct:

(a) development reinforces the character of this centre as a mixed use café and dining hub, with residential or tourist accommodation uses, in addition to its local service role;

(b) built form, public space and streetscape treatments in this area contribute to an integrated character for the centre, with a focus on the frontage of Gregory Street; and

(c) built form creates a higher-medium rise environment (up to 8 storeys in building height) along Gregory Street, transitioning down to medium rise (up to 5 storeys) behind.

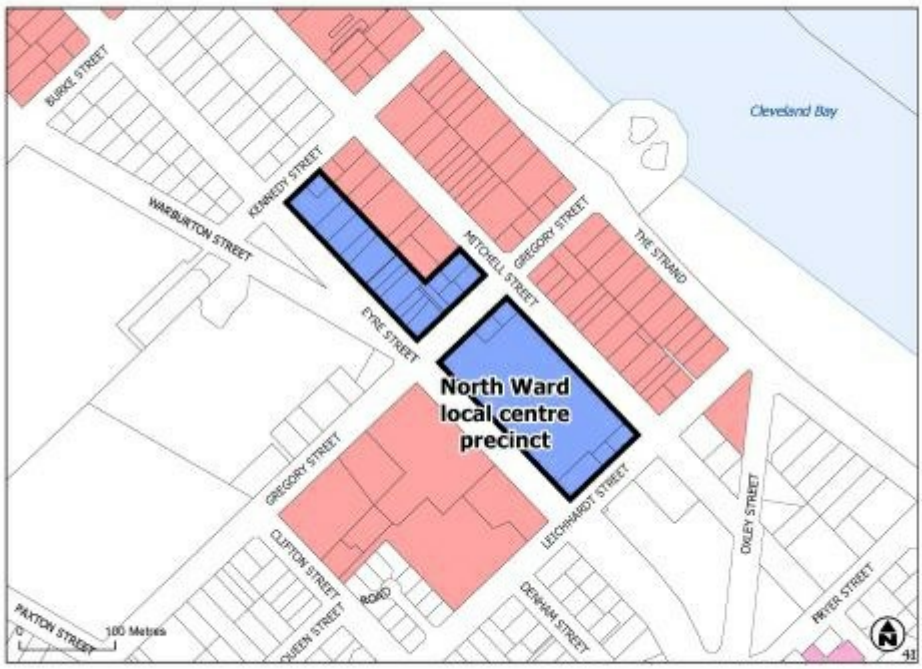

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Figure 6.86 - North Ward local centre precinct

6.3.2.3 Assessment benchmarks

Table 6.3.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
PO1 Hours of operation are consistent with maintaining a reasonable level of amenity for nearby land in a residential zone.	**AO1** Hours of operation are limited to 6am to 10pm.
PO2 Where provided, outdoor lighting does not adversely affect the amenity of adjoining properties or create a traffic hazard on adjacent roads.	**AO2.1** Light emanating from any source complies with *Australian Standard AS 4282 Control of the Obtrusive Effects of Outdoor Lighting*.
	AO2.2 Outdoor lighting is provided in accordance with *Australian Standard AS 1158.1.1 –Road Lighting – Vehicular Traffic (Category V) Lighting – Performance and Installation Design Requirements*.
PO3 Residential uses within the centre do not interrupt the continuity of the streetscape or the active, pedestrian focus of the street frontage.	**AO3** Any residential uses are located above or behind ground storey retail, commercial or community uses.
PO4 Residential uses within the centre are provided with a reasonable level of privacy.	**AO4.1** Windows, balconies, and terraces of a dwelling unit are screened where overlooking a habitable room or private open space of another dwelling within 9m.
	AO4.2 Screening is a solid translucent screen or perforated panels or trellises which have a maximum of 50% openings.
PO5 Residential uses within the centre are provided with a reasonable level of private outdoor living space.	**AO5** Dwellings are provided with private open space or a balcony directly accessible from a habitable room with: (a) a minimum area of 9m^2; and (b) a minimum dimension of 3m; and (c) clear of any utilities such as gas, water tanks or air conditioning units.

Table 6.3.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Built form	
PO6 Buildings are low-rise and are designed to break down the facade into finer scaled components, avoiding large expanses of blank walls.	**AO6.1** All buildings and structures do not exceed 2 storeys or 8.5m in building height, whichever is the lesser.
	AO6.2 Buildings provide for tenancies fronting the street frontage which have a maximum width of 10m.

PO7 A strong sense of enclosure and definition of pedestrian space is created along street frontages, with buildings designed to provide visual interest, foster social interaction and create a safe and pleasant pedestrian-focussed environment.	**AO7.1** Buildings are built to the street frontage and provide an awning over the full width of the footpath.
	AO7.2 Parking is provided to the side or the rear of buildings or below ground level, and is not located along the street frontage.
	AO7.3 Entrances to buildings face the street and any public space to which the building has frontage.
	AO7.4 Where buildings are located on a corner site, the main entrance faces the principal street or the corner.
	AO7.5 At the ground storey, a minimum of 65% of building frontage is provided as predominantly transparent windows or glazed doors and a maximum of 35% as solid facade.

Table 6.3.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
For assessable development	
Community uses, community care centres, clubs	
PO8 Adequate lockable storage space is provided on-site to meet the needs of users.	**AO8** At least one (1) lockable storage space of at least 4m^2 is provided for each room or area that can be hired out or used by community organisations or the public.

Table 6.3.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
For assessable development	
Role and function	
PO9 Development is consistent with the intended role, scale and character of the local centre and does not compromise the intended role or successful functioning of other local or higher order centres.	No acceptable outcome is nominated. **Editor's note—**Applicants should have regard to Economic impact assessment planning scheme policy SC6.5 for guidance on how to demonstrate compliance with this performance outcome.
PO10 Showrooms are not established in the local centre.	No acceptable outcome is nominated.
PO11 Development facilitates opportunities for appropriate co-location of community-related activities or facilities to the extent practical.	No acceptable outcome is nominated.

Table 6.3.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Centre design and built form	
PO12 The design of the centre provides for: (a) a coherent and integrated built form, public realm and circulation networks; (b) central, accessible and attractive public spaces for the people to congregate and interact; (c) continuity of streetscape and landscape characteristics; (d) pedestrian-friendly and visually interesting frontages to street and public spaces; (e) optimum energy efficiency; (f) connectivity of pedestrian and cyclist paths and spaces internal and external to the centre; and (g) sensitive transitioning to surrounding land and uses. **Editor's note–**Applicants may be requested to prepare a centre design master plan to demonstrate compliance with this performance outcome.	No acceptable outcome is nominated.
PO13 Building caps and rooftops create an attractive roofscape and screen plant and equipment.	No acceptable outcome is nominated.
PO14 Streetscape treatments are provided at the street frontage to create a visually cohesive precinct and enhance pedestrian amenity.	No acceptable outcome is nominated.

Table 6.3.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Crime prevention through environmental design	
PO15 Development facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building design that promotes safety; (c) adequate lighting; (d) appropriate signage and wayfinding; (e) minimisation of entrapment locations; and (f) building entrances, loading and storage areas that are well lit and lockable after hours. **Editor's note—**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.

Table 6.3.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Accessibility	
PO16 Convenient and legible connections are provided for pedestrians and cyclists to the site, particularly having regard to linkages with existing and proposed public transport infrastructure, the open space network, centres and other community-related activities.	No acceptable outcome is nominated.

Table 6.3.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Amenity	
PO17 Development minimises impacts on surrounding land and provides for an appropriate level of amenity within the centre, having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) visual impact; (e) signage; (f) odour and emissions; (g) lighting; (h) access to sunlight; (i) privacy; and (j) outlook.	No acceptable outcome is nominated.
PO18 Development is located, designed and operated so that adverse impacts on privacy and amenity on nearby land in a residential zone are minimised.	**AO18.1** Buildings are set back 3m from any boundary shared with a residential zone, or half the height of the part of the building, whichever is the greater.
	AO18.2.1 A 1.8m high solid screen fence is provided along all boundaries shared with a residential zone. AND **AO18.2.2** A landscaped buffer with a minimum width of 3m and consisting of dense screen planting is provided along all boundaries shared with a residential zone.
	AO18.3 Windows that have a direct view into an adjoining residential use are provided with fixed screening that is a maximum of 50% transparent to obscure views and maintain privacy for residents.

PO19 Refuse storage areas, loading/unloading and other service or storage areas are screened from view from the street and adjoining land.	**AO19** Refuse storage areas loading/unloading and other service or storage areas are located to the rear or side of a building and are screened from view by a 1.8m high solid fence.
PO20 On-site landscaping is provided to: (a) enhance the appearance of the development, particularly in parking and service areas and in public spaces; (b) contribute to pedestrian comfort through shade; and (c) screen servicing components.	No acceptable outcome is nominated.

Table 6.3.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Rising Sun local centre precinct	
PO21 Development is consistent with Figure 6.87 — Rising Sun local centre precinct concept plan, including an internal public space and parking area that is framed by buildings with an active edge.	No acceptable outcome is nominated.
PO22 Frontages shown on Figure 6.87 — Rising Sun local centre precinct concept plan as having active edges, contain: (a) primary building entrances; (b) awnings to provide shade for pedestrians; (c) significant use of glazing or transparent materials; and (d) uses which promote a high level of pedestrian movement and interaction.	No acceptable outcome is nominated.
PO23 Frontages shown on Figure 6.87 — Rising Sun local centre precinct concept plan as having built form edge are well-defined by a continuous building façade built to the street edge, awnings and significant use of glazing.	No acceptable outcome is nominated.

Figure 6.87 – Rising Sun local centre precinct concept plan

PO24 Development contributes to the boulevard treatment of Ross River Road and Bowen Road through landscaping and streetscape treatments along the road frontage in accordance with Figure 6.87 - Rising Sun local centre precinct concept plan.	No acceptable outcome is nominated.
PO25 Vehicular access to the site is constrained to one single point of entry from Ross River Road and Bowen Road in accordance with Figure 6.87 - Rising Sun local centre precinct concept plan.	No acceptable outcome is nominated.
PO26 Development at the intersection of Ross River Road and Bowen Road creates a landmark gateway to the Rising Sun Local Centre. Built form, landscape and streetscape treatment at this intersection reinforces a gateway statement in accordance with Figure 6.87 - Rising Sun local centre precinct concept plan.	No acceptable outcome is nominated.

PO27 Built form, landscape and streetscape treatment at the corner of Ross River Road and Bowen Road, creates a gateway to the Rising Sun local centre.	No acceptable outcome is nominated.

Table 6.3.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
North Ward local centre precinct	
PO28 Building height and scale is consistent with the character desired for the precinct and reinforces Gregory Street as the primary activity spine and gateway to The Strand.	**AO28** Building height does not exceed 8 storeys where fronting Gregory Street or 5 storeys otherwise.
PO29 Development primarily consists of retail, commercial and dining activities at ground level and residential or tourist accommodation above.	No acceptable outcome is nominated.
PO30 Development is consistent with Figure 6.88 — North Ward local centre precinct concept plan.	No acceptable outcome is nominated.
PO31 Development provides for an internal public space and parking area that is framed by buildings with an active edge within the block bounded by Gregory, Mitchell, Leichardt and Eyre Streets, in accordance with Figure 6.88 — North Ward local centre precinct concept plan.	No acceptable outcome is nominated.
PO32 Development at the intersection of Gregory Street and Eyre Street creates a landmark gateway to the North Ward local centre. Built form, landscape and streetscape treatment at this intersection reinforces a gateway statement.	No acceptable outcome is nominated.
PO33 Frontages shown on Figure 6.88 — North Ward local centre precinct concept plan as having active edges, contain: (a) primary building entrances; (b) awnings to provide shade for pedestrians; (c) significant use of glazing or transparent materials; and (d) uses which promote a high level of pedestrian movement and interaction.	No acceptable outcome is nominated.
PO34 Frontages shown on Figure 6.88 — North Ward local centre precinct concept plan as having a built form edge are well-defined by a continuous building facade built to the street edge, awnings and significant use of glazing.	No acceptable outcome is nominated.

Figure 6.88 – North Ward local centre precinct concept plan

PO35 Development contributes to the boulevard treatment of Eyre Street and the integration of the Gregory Street village environment through landscaping and streetscape treatments.	No acceptable outcome is nominated.

6.3.3 District centre zone code

6.3.3.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.3.3.2 Purpose

(1) The purpose of the District centre zone code is to provide for a mix of uses and activities. It includes a concentration of land uses including retail, commercial, residential, offices, administrative and health services, community, entertainment and recreational facilities capable of servicing a district.

(2) The particular purpose of the code is to provide for a network of centres that are readily accessible, integrated and well-designed, form vibrant focal points for the community, and provide a mix and range of services and facilities that are appropriate to their respective function and catchments. This promotes efficient provision of services and contributes to the quality of life, character and identity of communities.

(3) The purpose of the zone will be achieved through the following overall outcomes:

(a) district centres provide a community focus for weekly or fortnightly shopping trips and a range of services, and include Idalia, Deeragun, Rasmussen, Annandale and a future centre at Shaw. Retail functions are anchored by major supermarkets with a wide range of speciality shops; however, these centres operate as multifunctional community hubs. They contain a range of district level personal and community services such as community centres and health and fitness facilities;

Editor's note—the centre in Shaw is within the Emerging community zone. It is planned within the Greater Ascot area.

(b) centres do not compromise the intended role or successful functioning of higher order centres or other district centres. District centre catchments are in the order of 5,000 to 8,000 households. They do not contain discount department stores;

(c) the mix of uses promotes a vibrant centre which includes medium density residential development and active day and night-time uses;

(d) showrooms may occur within the district centres, but are generally located and designed so that they do not detract from the intended built form, pedestrian focus and accessibility of the district centres;

(e) district centres provide a major focal point for their catchment communities. The built form and layout of a centre creates a safe and pleasant community meeting place. Centres create pedestrian-focussed public spaces and street fronts, kerbside activities, awnings and landscape and streetscape treatments;

(f) buildings are generally low-medium rise and create a sensitive transition in scale from the surrounding neighbourhood;

(g) the design of district centres gives priority to improved accessibility to and within centres by walking, cycling and public transport;

(h) centres are designed and operated to minimise adverse impacts on the amenity of surrounding residential neighbourhoods; and

(i) opportunities for energy efficiency through built form are maximised.

(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts:

Idalia district centre precinct:

(a) Idalia will develop to provide a focus for larger format showrooms for the southern parts of the city, and will complement, but not undermine the role of the Domain Central precinct on the northern side of Townsville. It will service a wider catchment than other district centres in this respect. Other retail functions of this centre do not expand substantively; and

(b) new floor space within the centre provides for a wider mix of non-retail uses including residential uses, community uses, commercial and medical offices and dining activities.

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Figure 6.89 - Idalia district centre precinct

Annandale district centre precinct:

(a) no significant expansion of this centre for retail purposes occurs; and

(b) new floor space within the centre provides for a wider mix of non-retail uses including residential uses, community uses, commercial and medical offices and dining activities.

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Figure 6.90 - Annandale district centre precinct

Deeragun district centre precinct:

(a) further outward expansion of the centre or the establishment of additional supermarkets does not occur;

(b) development assists in consolidating the centre, and facilitates improved integration and connectivity;

(c) showrooms servicing the district catchment may be accommodated; and

(d) new floor space within the centre provides for a wider mix of non-retail uses including residential uses, community uses, commercial and medical offices and dining activities.

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Figure 6.91 - Deeragun district centre precinct

Rasmussen district centre precinct:

(a) further outward expansion of the centre does not occur;

(b) showrooms servicing the district catchment may be accommodated in the longer term; and

(c) new floor space within the centre provides for a wider mix of non-retail uses including residential uses, community uses, commercial and medical offices and dining activities.

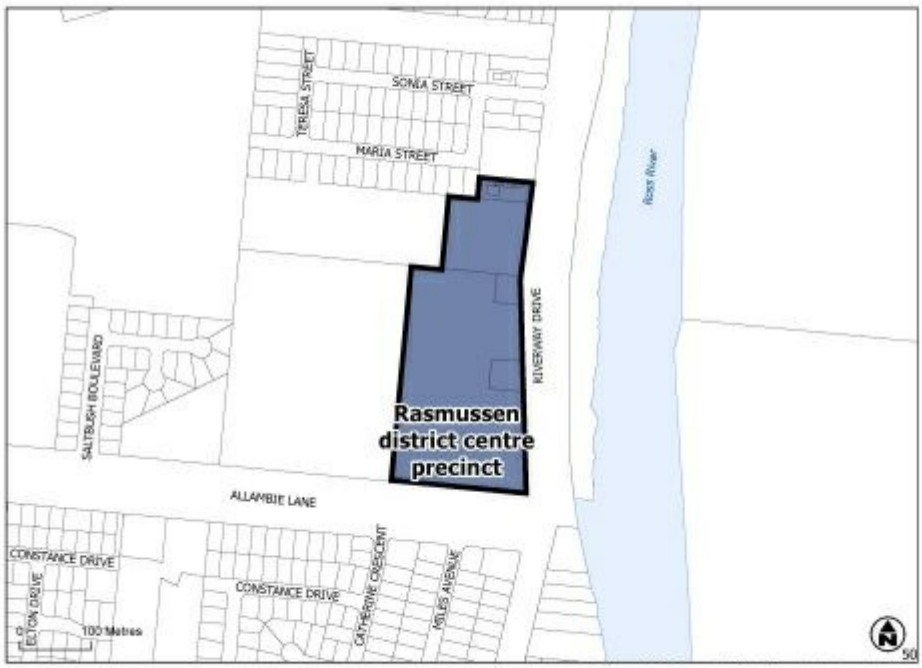

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Figure 6.92 - Rasmussen district centre precinct

6.3.3.3 Assessment benchmarks

Table 6.3.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
General	
PO1 Where provided, outdoor lighting does not adversely affect the amenity of adjoining properties or create a traffic hazard on adjacent roads.	**AO1.1** Light emanating from any source complies with *Australian Standard AS4282 Control of the Obtrusive Effects of Outdoor Lighting*.
	AO1.2 Outdoor lighting is provided in accordance with *Australian Standard AS 1158.1.1 – Road Lighting – Vehicular Traffic (Category V) Lighting – Performance and Installation Design Requirements*.
PO2 Residential uses within the centre do not interrupt the continuity of the streetscape or the active, pedestrian focus of the street frontage.	**AO2** Any residential uses are located above or behind ground storey retail, commercial or community uses.
PO3 Residential uses within the centre are provided with a reasonable level of privacy.	**AO3.1** Windows, balconies, and terraces of a dwelling unit are screened where overlooking a habitable room or private open space of another dwelling within 9m.
	AO3.2 Screening is a solid translucent screen or perforated panels or trellises which have a maximum of 50% openings.
PO4 Residential uses within the centre are provided with a reasonable level of private outdoor living space.	**AO4** Dwellings are provided with private open space or a balcony directly accessible from a habitable room with: (a) a minimum area of $9m^2$; (b) a minimum dimension of 3m; and (c) clear of any utilities such as gas, water tanks or air conditioning units.

Table 6.3.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Role and function	
PO5 Development is consistent with the intended role, scale and character of the district centre and does not compromise the intended role or successful functioning of other district or higher order centres. The growth of floor space within centres is balanced with anticipated growth within their primary catchment and does not substantively impact on the trading of other centres for an extended period of time or unduly undermine the potential for another centre to expand into its intended role.	No acceptable outcome is nominated. **Editor's note—**Applicants should have regard to Economic impact assessment planning scheme policy no. SC6.5 for guidance on how to demonstrate compliance with this performance outcome.
PO6 Development facilitates a range of uses that contributes to the vibrancy of the centre and provides for a compatible mix of active day and night-time uses.	No acceptable outcome is nominated.
PO7 Development facilitates opportunities for appropriate co-location of residential uses and community-related activities or facilities within the centre, to the extent practical.	No acceptable outcome is nominated.

Table 6.3.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Centre design and built form	
PO8 The design of the centre provides for: (a) a coherent and integrated built form, public realm and circulation networks; (b) central, accessible and attractive public spaces for people to congregate and interact; (c) continuity of streetscape and landscape characteristics; (d) pedestrian-friendly and visually interesting frontages to streets and public spaces; (e) optimum energy efficiency; (f) a well-integrated mix of uses; (g) connectivity of pedestrian and cyclist paths and spaces internal and external to the centre; and (h) sensitive transitioning to surrounding land and uses. **Editor's note–**Applicants may be requested to prepare a centre design master plan to demonstrate compliance with this performance outcome.	No acceptable outcome is nominated.

PO9 Buildings are low-rise and are designed to break down the facade into finer scaled components, avoiding large expanses of blank walls.	**AO9.1** Building height does not exceed 3 storeys.
	AO9.2.1 Buildings provide for tenancies fronting the street frontage which have a maximum width of 10m. or **AO9.2.2** Where showrooms are proposed, the maximum length of any unarticulated wall is 15m, without a change in plane of at least 0.75m.
PO10 A strong sense of enclosure and definition of pedestrian space is created along street frontages, with buildings designed to provide visual interest, foster social interaction and create a safe and pleasant pedestrian-focussed environment.	**AO10.1** Buildings are built to the street frontage and provide an awning over the full width of the footpath.
	AO10.2 Parking is provided to the side or the rear of buildings or below ground level, and is not located along the street frontage.
	AO10.3 Entrances to buildings face the street and any public space to which the building has frontage.
	AO10.4 Where buildings are located on a corner site, the main entrance faces the principal street or the corner.
	AO10.5 At the ground storey, a minimum of 65% of building frontage is provided as predominantly transparent windows or glazed doors and a maximum of 35% as solid facade.
PO11 Streetscape treatments and street trees are provided along the street frontage to create a visually cohesive precinct and enhance pedestrian amenity.	No acceptable outcome is nominated.
PO12 Building caps and rooftops create an attractive roofscape and screen plant and equipment.	No acceptable outcome is nominated.
PO13 Buildings housing residential uses within the centre do not interrupt the continuity of the streetscape or the active, pedestrian focus of the street frontage.	**AO13** Any residential uses are located above or behind ground storey retail, commercial or community uses.
PO14 Built form maximises use of natural ventilation, solar heating/cooling and water conservation through building orientation and design, landscaping, building materials and on-site infrastructure.	No acceptable outcome is nominated.

Table 6.3.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Crime prevention through environmental design	
PO15 Development facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building design that promotes safety; (c) adequate lighting; (d) appropriate signage and wayfinding; (e) minimisation of entrapment locations; and (f) building entrances, loading and storage areas that are well lit and lockable after hours. **Editor's note—**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.

Table 6.3.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Accessibility	
PO16 Convenient and legible connections are provided for pedestrians and cyclists to the site, particularly having regard to linkages with existing and proposed public transport infrastructure, the open space network, centres and other community-related activities.	No acceptable outcome is nominated.

Table 6.3.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Amenity	
PO17 Development minimises impacts on surrounding land and provides for an appropriate level of amenity within the centre, having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) visual impact; (e) signage; (f) odour and emissions; (g) lighting; (h) access to sunlight; (i) privacy; and (j) outlook.	No acceptable outcome is nominated.
PO18 Development is located, designed and operated so that adverse impacts on privacy and amenity on nearby land in a residential zone are minimised.	**AO18.1** Buildings are set back 3m from any boundary shared with a residential zone, or half the height of the part of the building, whichever is the greater.
	AO18.2.1 A 1.8m high solid screen fence is provided along all boundaries shared with a residential zone. AND **AO18.2.2** A landscaped buffer with a minimum width of 3m and consisting of dense screen planting is provided along all boundaries shared with a residential zone.
	AO18.3 Windows that have a direct view into an adjoining residential use are provided with fixed screening that is a maximum of 50% transparent to obscure views and maintain privacy for residents.
PO19 Refuse storage areas, loading/unloading and other service or storage areas are screened from view from the street and adjoining land.	**AO19** Refuse storage areas loading/unloading and other service or storage areas are located to the rear or side of a building and are screened from view by a 1.8m high solid fence.
PO20 On-site landscaping is provided to: (a) enhance the appearance of the development, particularly in parking and service areas and in public spaces; (b) contribute to pedestrian comfort through shade; and (c) screen servicing components.	No acceptable outcome is nominated.

Table 6.3.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Community uses, community care centres, clubs	
PO21 Adequate lockable storage space is provided on-site to meet the needs of users.	**AO21** At least one (1) lockable storage space of at least 4m^2 is provided for each room or area that can be hired out or used by community organisations or the public.

Table 6.3.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Showrooms	
PO22 Showrooms are designed and located as an integrated part of the centre, having regard to the continuity of built form and streetscapes, active street frontages and pedestrian and cyclist accessibility and circulation.	No acceptable outcome is nominated.

Table 6.3.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note-**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Deeragun district centre precinct	
PO23 Development in the Deeragun district centre precinct contributes to the consolidation and integration of the centre.	No acceptable outcome is nominated.

6.3.4 Major centre zone code

6.3.4.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.3.4.2 Purpose

(1) The purpose of the Major centre zone code is to provide for a mix of uses and activities. It includes concentrations of higher order retail, commercial, offices, residential, administrative and health services, community, cultural and entertainment facilities and other uses capable of servicing a sub-region in the planning scheme area.

(2) The particular purpose of the code is to provide for a network of centres that are readily accessible, integrated and well-designed, form vibrant focal points for the community, and provide a mix and range of services and facilities that are appropriate to their respective function and catchments. This promotes efficient provision of services and contributes to the quality of life, character and identity of communities.

(3) The purpose of the zone will be achieved through the following overall outcomes:

(a) Hyde Park, Aitkenvale, Thuringowa Central and the future Julago and Burdell major centres act as the most significant centres for the Townsville community after the principal centre (CBD). They service sub-regional catchments and do not compromise the intended role or successful functioning of other major centres or the CBD;

Editor's note—The Julago and Burdell areas are included in the Emerging community zone. The future major centre at Burdell is planned within the North Shore area.

(b) these centres operate as major multifunctional community hubs. They contain the highest order of community, retail and office based functions after the principal centre (CBD), including sub-regional level services such as theatres, major libraries and community centres and health and educational facilities. However, they do not contain any additional department stores;

(c) major centres evolve as vibrant mixed use places where people live, work and play in a high density environment which is active both during the day and night-time and includes residential uses;

(d) major centres are highly accessible by walking and cycling from surrounding medium density residential areas;

(e) major centres become a hub for major public transport routes providing frequent services to other parts of the city, and development facilitates convenient access to public transport facilities as a priority;

(f) showrooms occur within the major centres, but are generally located and designed so that they do not detract from the intended built form, pedestrian focus and accessibility;

(g) centre design and built form creates a walkable and legible pedestrian-focussed environment, with a range of connected, safe and pleasant public spaces forming community focal points. Public spaces and primary pedestrian circulation streets are activated by shop fronts, awnings and kerbside activities;

(h) the height and scale of buildings reinforce the character, legibility and accessibility of the centre. Centres predominantly contain medium-rise buildings. However, a human scale and attractive, pedestrian friendly environment is created at street level;

(i) centres are designed to create a desirable interface with surrounding neighbourhoods, providing for attractive streetscapes and transitioning of building form and scale and minimising potential land use conflicts; and

(j) opportunities for energy efficiency through built form are maximised.

(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts and sub-precincts:

Aitkenvale major centre precinct:

(a) The Aitkenvale major centre builds on existing uses and underutilised land to become a diverse major activity centre;

(b) Aitkenvale leverages its location on the transport corridor to the principal centre (CBD) and James Cook University and Townsville Hospital;

(c) the existing department store at Aitkenvale is not significantly expanded and no additional department store is established;

(d) housing includes student and visitor accommodation to reinforce links with the James Cook University and Townsville Hospital; and

(e) Ross River Road and Nathan Street become tropical boulevards providing a sense of arrival at the centre and strong landscape amenity. This is achieved through street tree planting, stronger definition of road edges by buildings fronting the street and screening of parking areas.

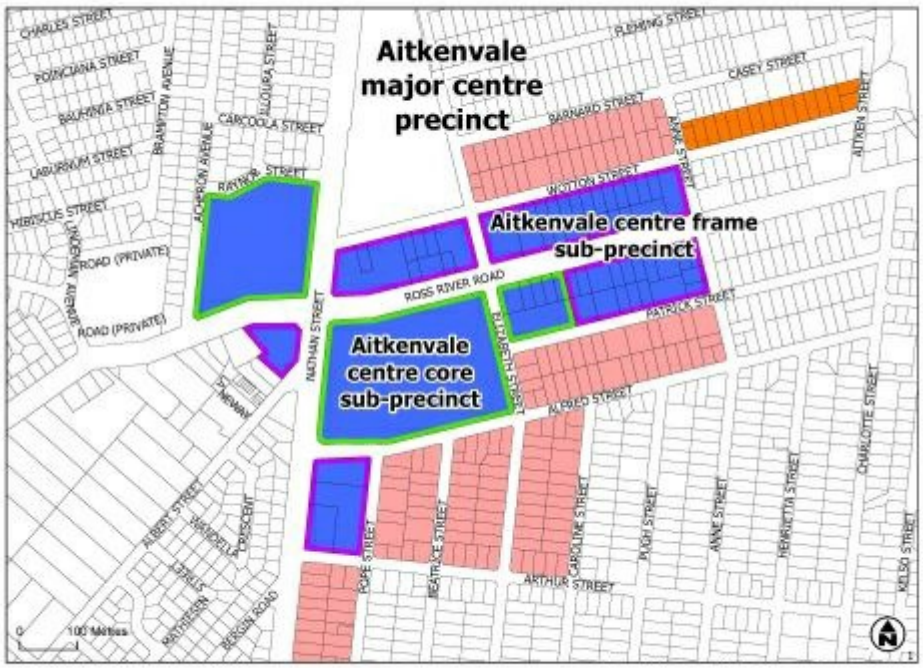

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Figure 6.93 - Aitkenvale major centre precinct

Aitkenvale centre core sub-precinct:

(i) the Aitkenvale centre core encompasses the retail focus of the centre;

(ii) the mix of uses within this sub-precinct is diversified as part of future redevelopment to include additional uses including shopping, office, higher density residential uses, community facilities and dining and entertainment uses;

(iii) residential and office uses are accommodated in mixed use developments, with shopping or entertainment uses at the ground storey;

(iv) a new town square is accommodated within the south-east corner of the sub-precinct. This space is sleeved by medium-rise built form fronting Alfred and Elizabeth Streets;

(v) Elizabeth Street is the focus for the creation of an active main street environment;

(vi) frontages to Nathan Street and Ross River Road are treated with a responsive built form that avoids unarticulated or 'back of house' design responses;

(vii) linkages between the Aitkenvale centre core sub-precinct (north and south sides of Ross River Road), the Aitkenvale centre frame sub-precinct and the surrounding Medium density residential zone are improved through the strengthening of primary pedestrian linkages along Nathan and Elizabeth Streets; and

(viii) streetscaping along Nathan and Elizabeth Street frontages also occurs to improve the interface between the site and the street whilst also improving the pedestrian streetscape environment and experience.

Aitkenvale centre frame sub-precinct:

(i) the centre frame sub-precinct complements the retail core with a mix of uses including additional shopping, offices, community and residential uses that reinforce the centre's role as a mixed use activity centre;

(ii) residential components are accommodated in mixed use developments, with retail or commercial uses at the ground storey; and

(iii) buildings have a strong relationship with their street frontage by contributing to streetscape improvements, passive surveillance, and creation of an identifiable major centre.

Thuringowa Central major centre precinct:

(a) development in the Thuringowa Central major centre continues to grow and diversify the range of activities within the centre. However, a department store is not established within this centre;

(b) higher density housing includes student and visitor accommodation to reinforce economic links with the James Cook University and Townsville Hospital;

(c) the centre is focussed on a new main street and town square along High Range Drive, which provides a strong connector between Riverway and the Willows sub-precinct;

(d) further outward expansion of the centre does not occur, with all new development contributing to the increasing consolidation of the centre and the clear definition of its edges;

(e) new development facilitates improved permeability within the centre for pedestrians and cyclists, provides for safer and shadier pedestrian routes and promotes access to public transport facilities;

(f) a bus interchange forms a focal point within the centre that is well-connected to the Thuringowa town centre heart sub-precinct, the Willows sub-precinct and the surrounding neighbourhoods;

(g) built form is highest and most intensive in the Thuringowa town centre heart sub-precinct, decreasing to the centre edges;

(h) visual and physical connections to Pioneer Park and Riverway are maximised wherever possible; and

(i) Thuringowa Drive, Riverway Drive and Hervey Range Road become tropical boulevards providing a sense of arrival at the centre and strong landscape amenity. This is achieved through street tree planting, stronger definition of road edges by buildings fronting the street and screening of parking areas.

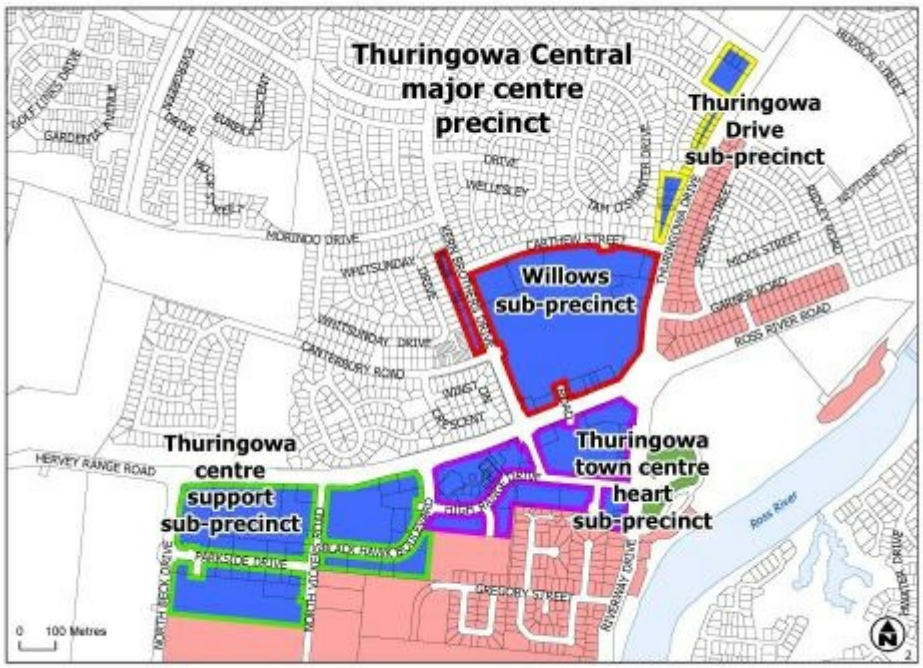

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Figure 6.94 - Thuringowa Central major centre precinct

Thuringowa town centre heart sub-precinct:

(i) a new main street and town square for Thuringowa Central are created along High Range and Pioneer Drive, and provides a community heart and a strong connection between Riverway and the Willows sub-precinct;

(ii) the sub-precinct contains a concentrated mix of uses, including shopping, office, higher density residential uses, community facilities and dining and entertainment uses. Residential and office uses are accommodated in mixed use developments, with shopping or entertainment uses at the ground storey;

(iii) the sub-precinct contains the highest and most concentrated built form within Thuringowa Central, with the most intensive built form along Riverway Drive and the main street sections of High Range and Pioneer Drives;

(iv) buildings along High Range and Pioneer Drive create a strong relationship with the street frontage and facilitate a highly activated environment, accommodating day and night-time activities, shop fronts, outdoor dining and other opportunities for community interaction;

(v) development creates a strong relationship with Hervey Range Road, Riverway Drive and Blackhawk Boulevard, by sleeving the sub-precinct with buildings that are oriented to the street and screen parking areas behind;

(vi) pedestrian spaces and pathways are provided with extensive shading;

(vii) parking is consolidated wherever practicable and is screened and separated from the street by buildings;

(viii) pedestrian and cyclist linkages are improved to the residential neighbourhood to the south and to the centre sub-precincts to the west and north. Additional and safe pedestrian crossings are provided across Hervey Range Road to the Willows sub-precinct; and

(ix) development minimises impacts on the amenity of adjoining residential land to the south of the sub-precinct.

Willows sub-precinct:

(i) this sub-precinct is the primary shopping destination for Thuringowa Central but may also contain a mix of other office, higher density residential uses, community facilities and dining and entertainment uses;

(ii) an improved relationship between built form and Thuringowa Drive, Hervey Range Road and Kern Brothers Drive is created by sleeving the sub-precinct with buildings oriented to the street and screening parking areas;

(iii) built form assists in reducing the internalised orientation of the shopping centre, creating a sense of external activity and reducing the visual dominance of the parking areas;

(iv) development facilitates pedestrian connections with the Thuringowa town centre heart sub-precinct and the surrounding residential neighbourhood; and

(v) development along Kern Brothers Drive and Carthew Street provides an attractive interface and minimises impacts on the amenity of nearby residential land.

Thuringowa Drive sub-precinct:

(i) a mix of office, shops, service industries and residential uses occur within this sub-precinct;

(ii) the corner of Thuringowa Drive and Hinchinbrook Drive creates a gateway to Thuringowa Central. Built form at this corner reinforces this gateway function;

(iii) development facilitates a more continuous building line along Thuringowa Drive, by providing a strong building edge along the street front and locating parking areas to the side or rear of buildings; and

(iv) access points and parking are consolidated wherever practicable.

Thuringowa centre support sub-precinct:

(i) larger format showroom uses, service industries and some low impact industries are accommodated in this sub-precinct. The sub-precinct may also contain office uses and community facilities, but does not contain shopping uses other than those of a convenience nature;

(ii) buildings are oriented to the street frontages, and streetscape is improved through the quality of the adjoining built form and landscaping;

(iii) built form is generally lower rise and less intensive than in the rest of the Thuringowa Central major centre;

(iv) convenient pedestrian connections are created to the Thuringowa town centre heart sub-precinct; and

(v) development along the edges of this sub-precinct provides an attractive interface and minimises impacts on the amenity of nearby residential land.

Hyde Park major centre precinct:

(a) the Hyde Park major centre contains an increasing diversity of business activities and community services. However, a department store is not located within this centre, and no significant expansion of showroom based floor space is intended;

(b) residential and office uses are accommodated in mixed use developments, with shopping or entertainment uses at the ground storey;

(c) development facilitates improved integration with surrounding residential and activity areas, including the showgrounds. Wherever possible, the interface with the lake is enhanced and opportunities for recreational use improved;

(d) Virgil and Dillane Streets are established as primary linkages to new infill residential development within the Hyde Park medium density precinct. Virgil Street becomes the major east-west pedestrian thoroughfare for the locality;

(e) development provides for appropriate immunity to flooding and drainage characteristics; and

(f) development facilitates improved public transport, pedestrian and cyclist connectivity to the principal centre (CBD), particularly along Woolcock Street.

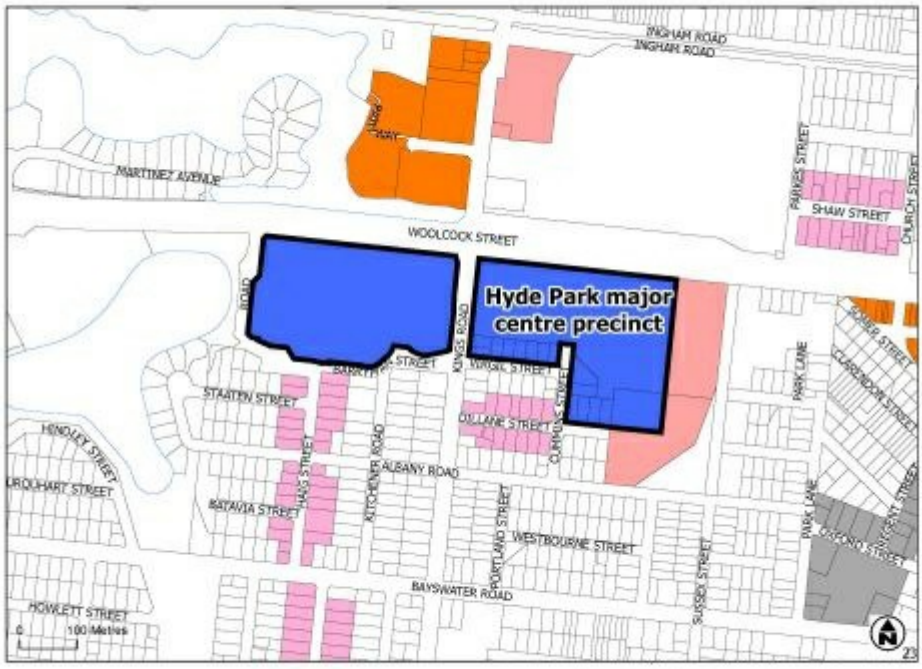

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Figure 6.95 - Hyde Park major centre precinct

6.3.4.3 Assessment benchmarks

Table 6.3.4.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
PO1 Where provided, outdoor lighting does not adversely affect the amenity of adjoining properties or create a traffic hazard on adjacent roads.	**AO1.1** Light emanating from any source complies with *Australian Standard AS4282 Control of the Obtrusive Effects of Outdoor Lighting*.
	AO1.2 Outdoor lighting is provided in accordance with *Australian Standard AS 1158.1.1 –Road Lighting – Vehicular Traffic (Category V) Lighting – Performance and Installation Design Requirements*.
PO2 Residential uses within the centre do not interrupt the continuity of the streetscape or the active, pedestrian focus of the street frontage.	**AO2** Any residential uses are located above or behind ground storey retail, commercial or community uses.
PO3 Residential uses within the centre are provided with a reasonable level of privacy.	**AO3.1** Windows, balconies, and terraces of a dwelling unit are screened where overlooking a habitable room or private open space of another dwelling within 9m.
	AO3.2 Screening is a solid translucent screen or perforated panels or trellises which have a maximum of 50% openings.
PO4 Residential uses within the centre are provided with a reasonable level of private outdoor living space.	**AO4** Dwellings are provided with private open space or a balcony directly accessible from a habitable room with: (a) a minimum area of 9m^2; and (b) a minimum dimension of 3m; and (c) clear of any utilities such as gas, water tanks or air conditioning units.

Table 6.3.4.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Role and function	
PO5 Development is consistent with the intended role, scale and character of the major centre and does not compromise the intended role or successful functioning of the principal centre (CBD) or other major centres. The growth of floor space within centres is balanced with anticipated growth within their primary catchment and does not substantively impact on the trading of other centres for an extended period of time or unduly undermine the potential for another centre to expand into its intended role.	No acceptable outcome is nominated. **Editor's note—**Applicants should have regard to Economic impact assessment planning scheme policy SC6.5 for guidance on how to demonstrate compliance with this performance outcome.

PO6 Development facilitates a range of uses that contributes to the vibrancy of the centre and provides for a compatible mix of active day and night-time uses.	No acceptable outcome is nominated.
PO7 Development facilitates opportunities for appropriate co-location of residential uses and community-related activities or facilities with retail or commercial development within the centre, to the extent practical.	No acceptable outcome is nominated.

Table 6.3.4.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
For assessable development	
Centre design and built form	
PO8 The design of the centre provides for: (a) a coherent and integrated built form, public realm and circulation networks; (b) central, accessible and attractive public spaces for people to congregate and interact; (c) continuity of streetscape and landscape characteristics; (d) pedestrian friendly and visually interesting frontages to streets and public spaces; (e) optimum energy efficiency; (f) a well-integrated mix of uses; (g) connectivity of pedestrian and cyclist paths and spaces internal and external to the centre; and (h) sensitive transitioning to surrounding land and uses. **Editor's note–**Applicants may be requested to prepare a centre design master plan to demonstrate compliance with this performance outcome.	No acceptable outcome is nominated.
PO9 Buildings create a human scale at street level.	No acceptable outcome is nominated.
PO10 A strong sense of enclosure and definition of pedestrian space is created along street frontages, with buildings designed to provide visual interest, foster social interaction and create a safe and pleasant pedestrian-focussed environment.	No acceptable outcome is nominated.
PO11 Streetscape treatments and street trees are provided along the street frontage to create a visually cohesive precinct and enhance pedestrian amenity.	No acceptable outcome is nominated.
PO12 Parking areas are not located along the street frontage.	No acceptable outcome is nominated.
PO13 Building caps and rooftops create an attractive roofscape and screen plant and equipment.	No acceptable outcome is nominated.

PO14 Built form maximises use of natural ventilation, solar heating/cooling and water conservation through building orientation and design, landscaping, building materials and on-site infrastructure.	No acceptable outcome is nominated.

Table 6.3.4.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Crime prevention through environmental design	
PO15 Development facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building design that promotes safety; (c) adequate lighting; (d) appropriate signage and wayfinding; (e) minimisation of entrapment locations; and (f) building entrances, loading and storage areas that are well lit and lockable after hours. **Editor's note—**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.

Table 6.3.4.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Accessibility	
PO16 Convenient and legible connections are provided for pedestrians and cyclists to the site, particularly having regard to linkages with existing and proposed public transport infrastructure, the open space network, centres and other community-related activities.	No acceptable outcome is nominated.

Table 6.3.4.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Amenity	
PO17 Development minimises impacts on surrounding land and provides for an appropriate level of amenity within the centre, having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) visual impact; (e) signage; (f) odour and emissions; (g) lighting; (h) access to sunlight; (i) privacy; and (j) outlook.	No acceptable outcome is nominated.
PO18 Refuse storage areas, loading/unloading and other service or storage areas are screened from view from the street and adjoining land.	**AO18** Refuse storage areas loading/unloading or other service or storage areas are located to the rear or side of a building and are screened from view by a 1.8m high solid fence.
PO19 Development is located, designed and operated so that adverse impacts on privacy and amenity on nearby land in a residential zone are minimised.	**AO19.1** Buildings are set back 4m from any boundary shared with a residential zone.
	AO19.2.1 A 1.8m high solid screen fence is provided along all boundaries shared with a residential zone. AND **AO19.2.2** A landscaped buffer with a minimum width of 3m and consisting of dense screen planting is provided along all boundaries shared with a residential zone.
	AO19.3 Windows that have a direct view into an adjoining residential use are provided with fixed screening that is a maximum of 50% transparent to obscure views and maintain privacy for residents.
PO20 On-site landscaping is provided to: (a) enhance the appearance of the development, particularly in parking and service areas and in public spaces; (b) contribute to pedestrian comfort through shade; and (c) screen servicing components.	No acceptable outcome is nominated.

Table 6.3.4.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Community uses, community care centres, clubs	
PO21 Adequate lockable storage space is provided on-site to meet the needs of users.	**AO21** At least one (1) lockable storage space of at least 4m^2 is provided for each room or area that can be hired out or used by community organisations or the public.

Table 6.3.4.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Showrooms	
PO22 Showrooms are designed and located as an integrated part of the centre, having regard to the continuity of built form and streetscapes, active street frontages and pedestrian and cyclist accessibility and circulation.	No acceptable outcome is nominated.

Table 6.3.4.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in Aitkenvale major centre sub-precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Aitkenvale centre core sub-precinct	
PO23 Development facilitates a town square sleeved by medium-rise mixed use built form at the corner of Elizabeth and Alfred Streets, in accordance with Figure 6.96 — Aitkenvale major centre precinct concept plan.	No acceptable outcome is nominated.
PO24 Development assists in creating a main street environment along Elizabeth Street by facilitating an active edge incorporating externally oriented shops, dining and entertainment uses at the ground storey. Buildings contribute to the creation of this active edge by incorporating features such as: (a) primary building entrances; (b) awnings to provide shade for pedestrians; and (c) significant use of glazing or transparent materials.	No acceptable outcome is nominated.

PO25 On frontages shown on Figure 6.96 — Aitkenvale major centre precinct concept plan as having a strong built form edge, buildings contribute to the creation of a strong and pedestrian-oriented edge to the street, by: (a) being built to the street frontage at the ground storey; (b) creating a generally continuous building alignment; (c) providing awnings over the full width of footpaths; and (d) having facades which contain windows, doors, materials and features which generate visual interest at the street level.	No acceptable outcome is nominated.
PO26 The visual dominance of the parking areas is reduced by buildings sleeving road frontages and by landscape screening.	No acceptable outcome is nominated.
PO27 Pedestrian connections between the centre core north and centre core south are improved wherever possible.	No acceptable outcome is nominated.
PO28 Development provides for pedestrian and cyclist connections to the Rossiter Park precinct and to surrounding areas.	No acceptable outcome is nominated.
PO29 Pedestrian routes are defined by buildings streetscape improvements that provide shade and improve pedestrian comfort.	No acceptable outcome is nominated.
PO30 Building height assists in identifying the centre core as the primary focus of activity within the centre and as a mixed use environment.	**AO30** Building height does not exceed: (a) 8 storeys where as part of a mixed use development and located in accordance with Figure 6.96 - Aitkenvale major centre precinct concept plan; and (b) 5 storeys otherwise.

Figure 6.96 – Aitkenvale major centre precinct concept plan

PO31 Development contributes to the boulevard treatment of Nathan Street and Ross River Road through streetscape and landscape treatments.	No acceptable outcome is nominated.
PO32 Development provides sufficient land and infrastructure to support a new bus interchange along Elizabeth Street.	No acceptable outcome is nominated.

Table 6.3.4.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
Additional benchmarks for assessable development in Aitkenvale major centre sub-precincts **Note—**where acceptable outcomes in this section vary from those provided earlier in this code, the precinct- based acceptable outcomes take precedence.	
Aitkenvale centre frame sub-precinct	
PO33 On frontages shown on Figure 6.96 — Aitkenvale major centre precinct concept plan as having a strong built form edge, buildings contribute to the creation of a strong and pedestrian-oriented edge to the street, by: (a) being built to the street frontage at the ground storey; (b) creating a generally continuous building alignment; (c) providing awnings over the full width of footpaths; and (d) having facades which contain windows, doors, materials and features which generate visual interest at the street level.	No acceptable outcome is nominated.

Figure 6.96 – Aitkenvale major centre precinct concept plan

PO34 Development provides for pedestrian and cyclist connections to surrounding areas wherever practicable.	No acceptable outcome is nominated.
PO35 Development contributes to the boulevard treatment of Nathan Street and Ross River Road through streetscape and landscape treatments.	No acceptable outcome is nominated.
PO36 Parking is provided in consolidated areas wherever practicable.	No acceptable outcome is nominated.
PO37 Parking areas are sleeved by buildings which screen them from street frontages.	No acceptable outcome is nominated.
PO38 Building height creates a medium-rise environment and assists in identifying the centre core as the primary focus of activity within the centre and as a mixed use environment.	**AO38** Building height does not exceed 5 storeys.

Table 6.3.4.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
Additional benchmarks for assessable development in Thuringowa Central major centre sub-precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Thuringowa town centre heart sub-precinct	
PO39 Development facilitates or supports a mix of uses and day and night-time activity throughout the sub-precinct.	No acceptable outcome is nominated.
PO40 Shops, dining and entertainment uses are predominant at the ground storey along the main street section of High Range Drive and Pioneer Drive, identified on Figure 6.97 — Thuringowa town centre heart sub-precinct concept plan.	No acceptable outcome is nominated.
PO41 Residential and office uses are accommodated but do not interrupt ground storey activation by shopping and dining uses along the main street section of High Range Drive and Pioneer Drive, identified on Figure 6.97 — Thuringowa town centre heart sub-precinct concept plan.	No acceptable outcome is nominated.
PO42 Development facilitates a town square at the corner of High Range and Pioneer Drive.	No acceptable outcome is nominated.

PO43 On frontages shown on Figure 6.97 — Thuringowa town centre heart sub-precinct concept plan as having a strong built form edge, buildings contribute to the creation of a strong and pedestrian oriented edge to the street, by: (a) being built to the street frontage at the ground storey; (b) creating a generally continuous building alignment; (c) providing awnings over the footpaths; and (d) having facades which contain windows, doors, materials and features which generate visual interest at the street level.	No acceptable outcome is nominated.
PO44 Building height reinforces the sub-precinct's role as the heart of Thuringowa Central, and is generally medium-rise. The tallest buildings in the sub-precinct occur along Riverway Drive and the main street section of High Range and Pioneer Drives.	**AO44** Building height does not exceed: (a) 8 storeys fronting Riverway Drive and the main street section of High Range and Pioneer Drives, consistent with Figure 6.97 — Thuringowa town centre heart sub-precinct concept plan; and (b) 5 storeys otherwise.
PO45 Parking is provided in consolidated areas wherever practicable.	No acceptable outcome is nominated.
PO46 Parking areas are sleeved by buildings which screen them from street frontages.	No acceptable outcome is nominated.
PO47 Development provides for pedestrian and cyclist connections from Riverway and Pioneer Park to the Willows sub-precinct and to surrounding areas in accordance with Figure 6.97 — Thuringowa town centre heart sub-precinct concept plan.	No acceptable outcome is nominated.

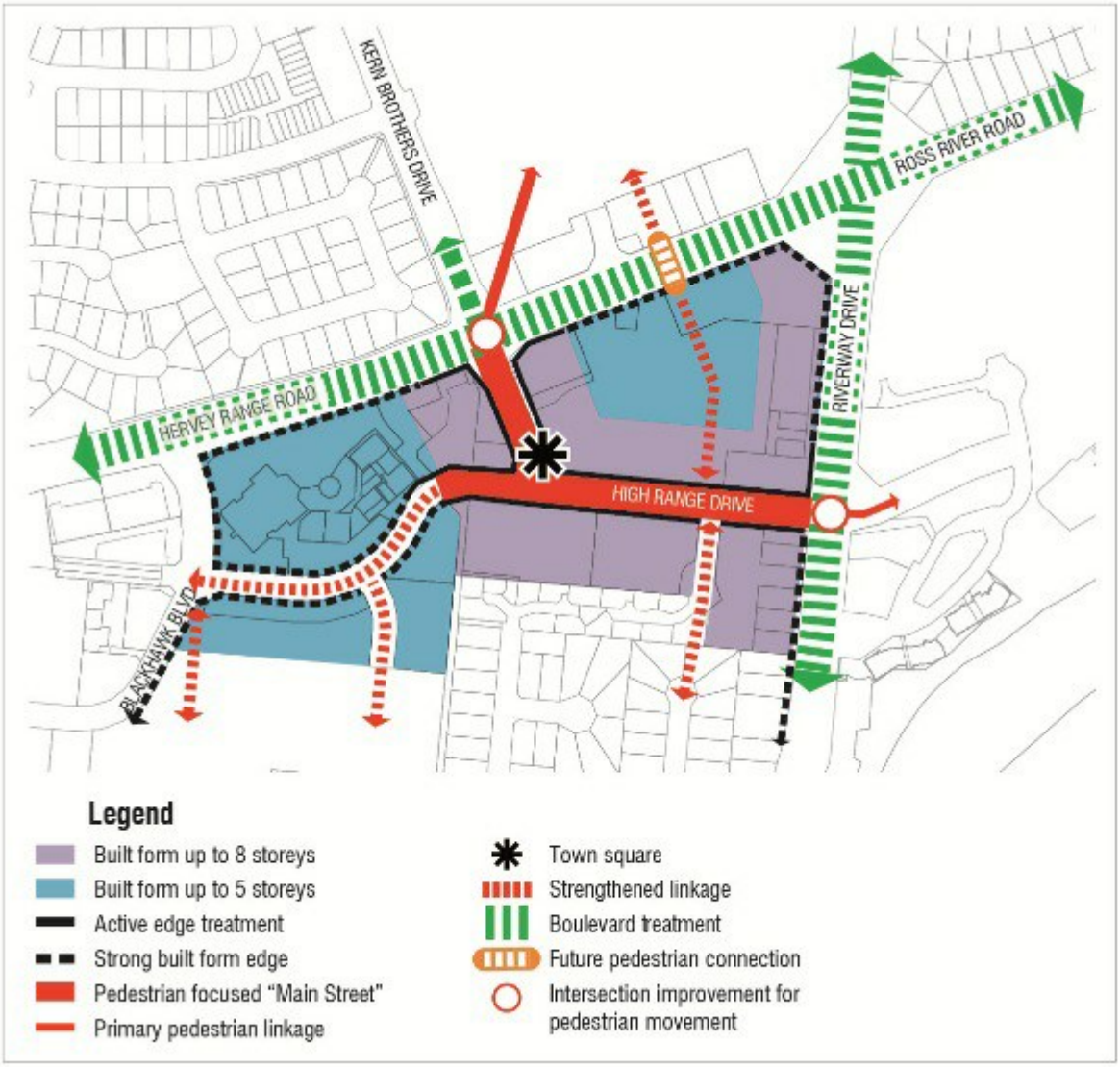

Figure 6.97 – Thuringowa town centre heart sub-precinct concept plan

PO48 Development contributes to the boulevard treatment of Riverway Drive and Hervey Range Road through streetscape and landscape treatments as identified on Figure 6.97 — Thuringowa town centre heart sub-precinct concept plan.	No acceptable outcome is nominated.

Table 6.3.4.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in Thuringowa Central major centre sub-precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Willows sub-precinct	
PO49 Development assists in creating strong edges at the street by buildings that are oriented to the street frontages, identified on Figure 6.98 — Willows sub-precinct concept plan.	No acceptable outcome is nominated.

PO50 Development assists in reducing the internalised orientation of the shopping centre by facilitating externally oriented uses.	No acceptable outcome is nominated.
PO51 The visual dominance of the parking areas are reduced by buildings sleeving road frontages and by landscape screening.	No acceptable outcome is nominated.
PO52 Built form generates visual interest at the street level, having regard to the proportion of openings, windows, materials and features. Large expanses of blank walls are avoided.	No acceptable outcome is nominated.
PO53 Parking is provided in consolidated areas wherever practicable.	No acceptable outcome is nominated.
PO54 Visual connections to Pioneer Park and Riverway are maximised wherever possible.	No acceptable outcome is nominated.
PO55 Development provides for pedestrian and cyclist connections to the Town centre heart sub-precinct, Riverway and Pioneer Park and to surrounding areas in accordance with Figure 6.98 — Willows sub-precinct concept plan.	No acceptable outcome is nominated.

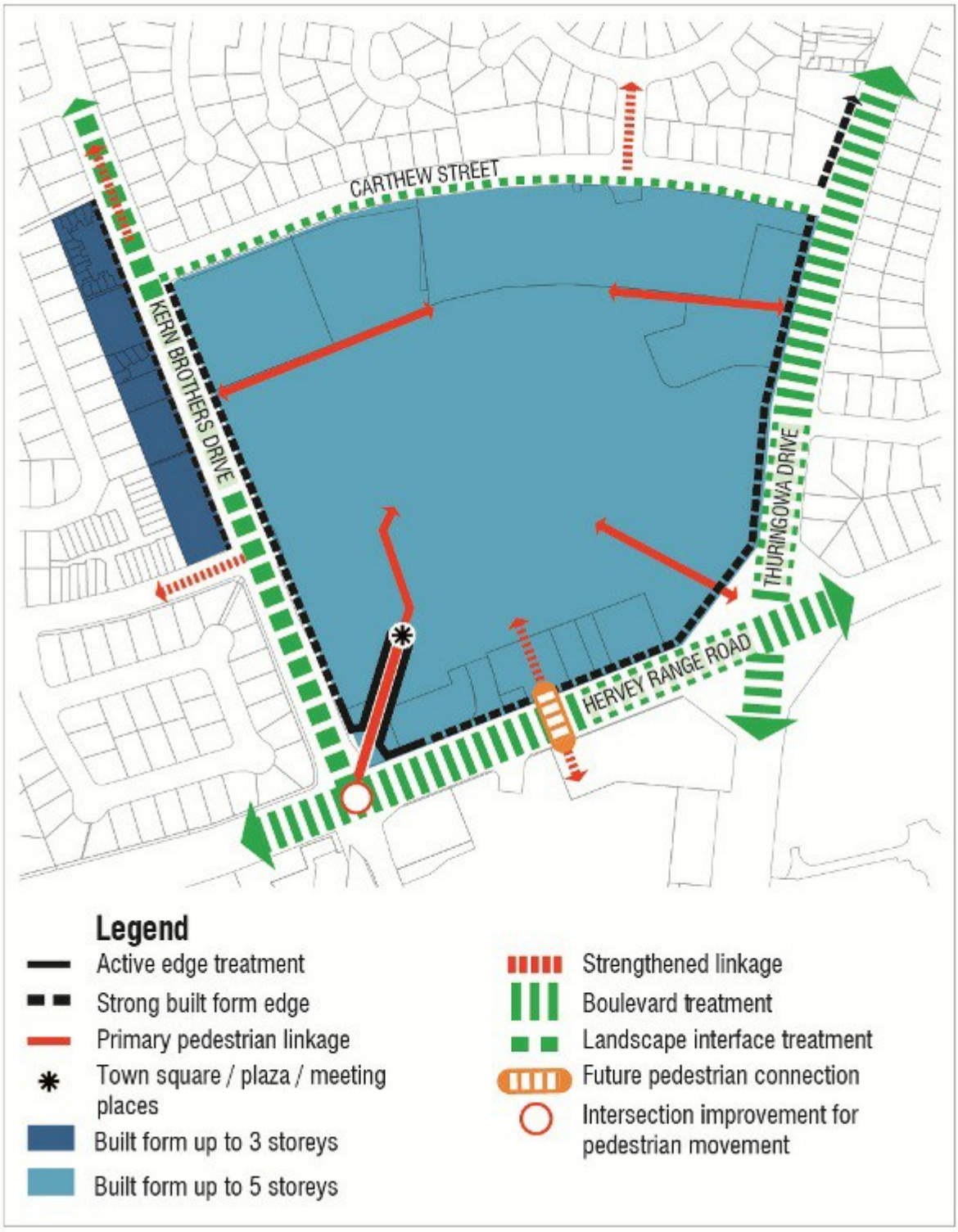

Figure 6.98 – Willows sub-precinct concept plan

PO56 The main pedestrian route connecting to the Town centre heart sub-precinct is defined by buildings and uses creating an active edge.	No acceptable outcome is nominated.
PO57 Building height is generally medium rise, but provides for a transition in building heights to the surrounding neighbourhood.	**AO57** Building height does not exceed 5 storeys within the block bounded by Thuringowa Drive, Hervey Range Road Kern Brothers Drive and Carthew Street, and 3 storeys otherwise, as identified on Figure 6.98 – Willows sub-precinct concept plan.
PO58 Landscaping and streetscape treatments are provided along Kern Brothers Drive and Carthew Street to enhance the outlook from the surrounding neighbourhood.	No acceptable outcome is nominated.
PO59 Development contributes to the boulevard treatment of Riverway Drive and Hervey Range Road through streetscape and landscape treatments.	No acceptable outcome is nominated.

Table 6.3.4.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
Additional benchmarks for assessable development in Thuringowa Central major centre sub-precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Thuringowa Drive sub-precinct	
PO60 Strong edges at the street are created by buildings that are oriented to the street frontages and forming a continuous building line, as identified on Figure 6.99 – Thuringowa sub-precinct concept plan.	No acceptable outcome is nominated.
PO61 Built form generates visual interest at the street level, having regard to the proportion of openings windows, materials and features. Large expanses of blank walls are avoided.	No acceptable outcome is nominated.
PO62 Parking is provided in consolidated areas wherever practicable.	No acceptable outcome is nominated.
PO63 Building height is generally low-rise.	**AO63** Building height does not exceed 3 storeys.
PO64 As identified on Figure 6.99 –Thuringowa sub-precinct concept plan, the corner of Thuringowa Drive and Hinchinbrook Drive creates a gateway to Thuringowa Central. Built form, landscape and streetscape treatment at this corner reinforces a gateway statement, and landscape treatment along Hinchinbrook Drive assists in connecting and unifying the sub-precinct.	No acceptable outcome is nominated.

PO65 Development contributes to the boulevard treatment of Thuringowa Drive through streetscape and landscape treatments.	No acceptable outcome is nominated.

Figure 6.99 – Thuringowa Drive sub-precinct concept plan

Table 6.3.4.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in Thuringowa Central major centre sub-precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Thuringowa centre support sub-precinct	
PO66 Supermarket and discount department store retail uses do not occur in this sub-precinct.	No acceptable outcome is nominated.
PO67 Buildings are oriented to the street frontages along Hervey Range Road and Blackhawk Boulevard, and the streetscape is improved through the quality of the adjoining built form and landscaping, as identified on Figure 6.100 — Thuringowa centre support sub-precinct concept plan.	No acceptable outcome is nominated.
PO68 All building frontages to Hervey Range Road and Blackhawk Boulevard, are provided with large windows and clearly identifiable building entrances.	No acceptable outcome is nominated.
PO69 A pedestrian connection is provided between Blackhawk Boulevard and High Range Drive, in accordance with Figure 6.100 — Thuringowa centre support sub-precinct concept plan.	No acceptable outcome is nominated.
PO70 Development facilitates new road linkages between Blackhawk Boulevard and the residential neighbourhood to the south in accordance with Figure 6.100 — Thuringowa centre support sub-precinct concept plan.	No acceptable outcome is nominated.

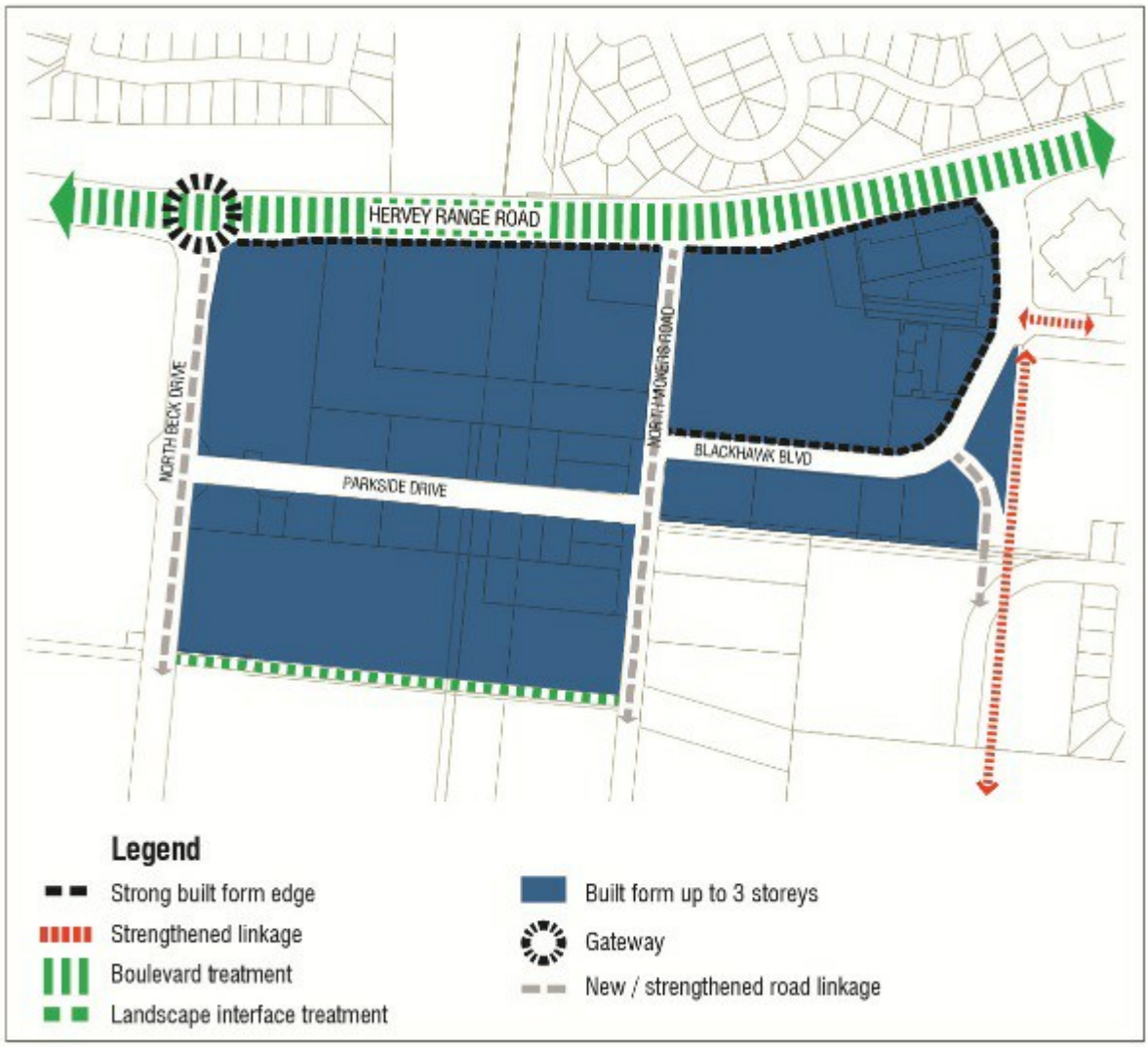

Figure 6.100 – Thuringowa centre support sub-precinct concept plan

PO71 Building height is generally low-rise.	**AO71** Building height does not exceed 3 storeys.
PO72 Landscaping and streetscape treatments are provided along North Beck Drive and Vickers Road North to enhance the outlook from the surrounding neighbourhood.	No acceptable outcome is nominated.
PO73 The appearance of development along the southern edge of this sub-precinct is enhanced through landscape treatment, as identified on Figure 6.100 — Thuringowa centre support sub-precinct concept plan.	No acceptable outcome is nominated.
PO74 As identified on Figure 6.100 — Thuringowa centre support sub-precinct concept plan, the corner of North Beck Drive and Hervey Range Road creates a gateway to Thuringowa Central. Built form, landscape and streetscape treatment at this corner reinforces a gateway statement.	No acceptable outcome is nominated.

PO75 Development contributes to the boulevard treatment of Hervey Range Road through streetscape and landscape treatments.	No acceptable outcome is nominated.

Table 6.3.4.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in Hyde Park major centre precinct **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Hyde Park major centre precinct	
PO76 Strong edges at the street are created by buildings that are oriented to the street frontages and forming a continuous building line, in accordance with Figure 6.101 — Hyde Park major centre precinct concept plan.	No acceptable outcome is nominated.
PO77 Built form generates visual interest at the street level, having regard to the proportion of openings, windows, materials and features. Large expanses of blank walls are avoided.	No acceptable outcome is nominated.
PO78 Parking is provided in consolidated areas wherever practicable.	No acceptable outcome is nominated.
PO79 Building height is generally medium rise.	**AO79** Building height does not exceed 5 storeys.
PO80 Development facilitates the establishment of a new road linkage connecting Woolcock Street to Dillane Street, in accordance with Figure 6.101 — Hyde Park major centre precinct concept plan. This new road assists in creating an active and attractive interface between the major centre and the Hyde Park medium density precinct.	No acceptable outcome is nominated.
PO81 Development facilitates the establishment of Virgil Street as the major east-west pedestrian thoroughfare connecting across Kings Road and east into the Hyde Park medium density precinct and the nearby open space corridor, in accordance with Figure 6.101 — Hyde Park major centre precinct concept plan.	No acceptable outcome is nominated.

Figure 6.101 – Hyde Park major centre precinct concept plan

Table 6.3.4.3 - Accepted development subject to requirements and assessable development (Part)

PO82 Development assists in creating a primary pedestrian and cycle pathway and improving the quality of pedestrian environment along Woolcock Street and Kings Road.	No acceptable outcome is nominated.
PO83 Landscape treatment along Virgil Street, Dillane Street and the parkland assists in connecting and unifying the precinct.	No acceptable outcome is nominated.

6.3.5 Principal centre (CBD) zone code

6.3.5.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.3.5.2 Purpose

(1) The purpose of the Principal centre (CBD) zone code is to provide for the largest and most diverse mix of uses and activities in Townsville.

It includes key concentrations of high-order retail, commercial, employment, residential, health services, administrative, community, cultural, recreational and entertainment activities and other uses, capable of servicing the planning scheme area.

(2) The particular purpose of the code is to:

(a) re-enforce the Townsville central business district (CBD) as the economic heart of the region, and the primary location for business, government and administration uses;

(b) promote the principal centre (CBD) as the location for the highest order activities and facilities of the city including retail, commercial, cultural, civic, sporting, and recreational uses;

(c) consolidate Townsville as Queensland's second capital and be an exemplar city in tropical urban sustainability; and

(d) ensure the principal centre (CBD) contributes to the identity, character and life of the city.

(3) The purpose of the zone will be achieved through the following overall outcomes:

(a) the principal centre (CBD) is a vibrant mixed use place where people live, work and play in a high density environment which is active both during the day and night-time;

(b) the principal centre is the highest order centre in Townsville and services a regional catchment, supported by a network of centres;

(c) the principal centre is the focus for the highest intensity of retail, commercial, administrative, government and employment uses in the city and is the primary location for major office and commercial buildings;

(d) the principal centre offers a more distinctive and higher order retailing than the major centres in an outdoor, main street environment that is characterised by arcades, laneways and footpath dining. The preferred location for any new department store in Townsville is in the Flinders Street retail precinct;

(e) high density residential development, tourist and short-term accommodation are located within the principal centre (CBD);

(f) new, larger scale strategic facilities, such as sports arenas, stadiums, convention centres and entertainment centres are located in other zones outside the CBD. These facilities are intended to be located close to the fringe of and well-connected to the CBD. Shops and commercial uses associated with these facilities do not compromise the CBD;

(g) the scale and density of development creates a critical mass of people living and working in the principal centre, to support the provision of the highest order of public and active transport facilities and promotes sustainable transport choices including public transport, walking and cycling;

(h) the principal centre (CBD) is a major hub for most public transport routes providing a single interchange to access frequent services to other parts of the city. An on-street transport interchange for bus routes to and through the CBD is to be located immediately adjacent to the Flinders Street retail precinct;

(i) Flinders Street, Ogden Street and Hanran Street are slow-speed vehicle environments and provide the main pedestrian and cycle spines through the principal centre. Through traffic is diverted to the fringes, including Walker Street, Blackwood Street, Denham Street and Stanley Street;

(j) pedestrian and cycle access is complemented by a network of shared paths along the banks of Ross Creek and new pedestrian and cycle creek crossings;

(k) Stokes Street is intended to be the primary east-west pedestrian spine linking the Civic and administration precinct, public transport interchange, commercial office, retail heart, Flinders Street, Victoria Bridge and Palmer Street;

(l) public realm provides a platform for public life and is characterised by high quality streetscapes, landscape elements, planting and hardscape materials reflective of the climate and character of Townsville;

(m) a variety of public open space areas at different scales and forms are provided for event and gathering spaces throughout the city, including public plazas, parks and gardens. These are appropriate to the required use and include:

(i) Flinders Square forming the primary civic event and gathering space;

(ii) a new 'front door' to Castle Hill at 'The Cutting', incorporating an information and interpretive centre, viewing platform over the CBD and providing walking track access to Castle Hill;

(iii) Flinders Street East park and plaza, which create a waterfront park for passive recreation, taking advantage of views and amenity; and

(iv) Flinders Street spine, which forms a linear plaza street from Stanley Street to Wickham Street with wider footpaths and slow vehicle speeds.

(n) natural features are retained, enhanced and buffered from the impacts of adjacent uses. Impacts are minimised through location, design, operation and management requirements;

(o) public spaces and streets are activated by shop fronts and kerbside activities at the ground storey whilst awnings over the full width of the footpaths provide protection from the elements;

(p) development is designed to incorporate exemplar sustainable practices including new technologies in maximising energy efficiency, water conservation and climate-responsive design principles;

(q) the height and scale of buildings reinforce the principal role of the centre and contribute to character, legibility and accessibility of the centre. The principal centre predominantly contains high-rise buildings. However, a human scale and attractive, pedestrian friendly environment is created at street level; and

(r) buildings located to the north of Sturt Street do not extend above the maximum height of buildings to the south of Sturt Street.

(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts:

Civic and administration precinct:

(a) the Civic and administration precinct anchors the top of the principal centre (CBD) and is focused around government, administration and civic functions, such as the library and courthouse, local and state government departments;

(b) high quality public and semi-public spaces are incorporated into development to support the community function of these buildings, particularly at the intersection of Stokes and Walker Streets;

(c) lower building forms are contained in this precinct in response to the local topography and the need to provide an appropriate interface with adjoining residential land uses to the north of Wills Street;

(d) building heights in the precinct do not exceed 8 storeys; and

(e) building forms reflect a 'building in plaza' form incorporating a tower design with side and rear setbacks. Recesses in the ground level accommodate plaza spaces which are particularly focussed on presentation to Walker Street.

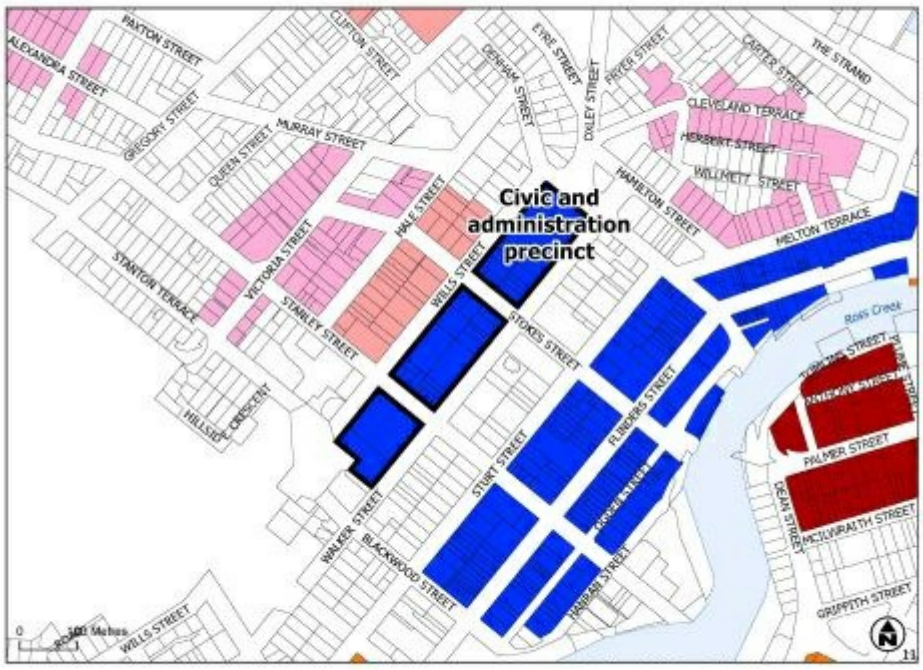

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Figure 6.102 - Civic and administration precinct

Flinders Street retail precinct:

(a) the Flinders Street retail precinct is the core focus for future retail activity and the provision of a new department store in this precinct is highly desired and actively encouraged;

(b) department stores, arcades and internal retail developments connect directly into Flinders Street, supporting the retail spine and do not detract from the attractiveness and activity on the street;

(c) highly attractive and permeable pedestrian-based built form is created with a highly active ground floor and cross block links available during operating hours;

(d) this precinct includes a large concentration of historic buildings. New buildings reflect and integrate with this built form with a low podium height and continuous frontages;

(e) taller building elements are set back from the street frontage to allow for light and air into the street and maintain the outdoor quality and human scale of the street;

(f) shop fronts, café and or restaurant premises are continuous along both sides of the street. Retail is the predominant use; and

(g) parking is not situated at the street frontage at the ground floor, and does not detract from the street activity or create blank walls. Parking structures are screened with green walls, planting, vines, creepers or public art. There are no blank facades along Flinders Street.

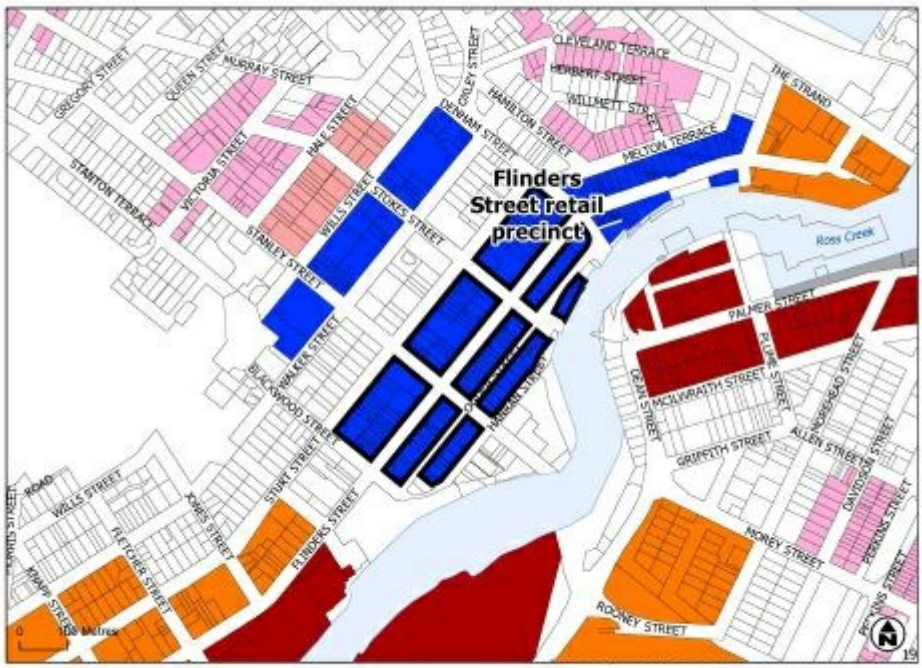

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Figure 6.103 - Flinders Street retail precinct

Flinders Street East precinct:

(a) the Flinders Street East precinct frames the eastern end of the principal centre (CBD). The precinct will continue to emerge as a vibrant entertainment and boutique shopping location, integrated with the principal centre (CBD) but with its own unique identity as a destination;

(b) the precinct will continue to develop at a lower scale than the rest of the principal centre (CBD);

(c) re-use of existing heritage buildings is actively encouraged, and new buildings are designed to respect the heritage attributes of the precinct;

(d) building height fronting Flinders Street East and Melton Terrace is low-rise and consistent with the scale of nearby character and heritage buildings;

(e) retail uses do not compete with the rest of the principal centre (CBD), and will generally be of a boutique shopping and convenience nature;

(f) active uses such as restaurants and pubs are located to the Flinders Street frontage, with new development to Melton Terrace to predominantly consist of residential uses; and

(g) new development contributes to a consistent pallet of local streetscape elements and designs, resulting in the continuing development of a local streetscape character for the precinct.

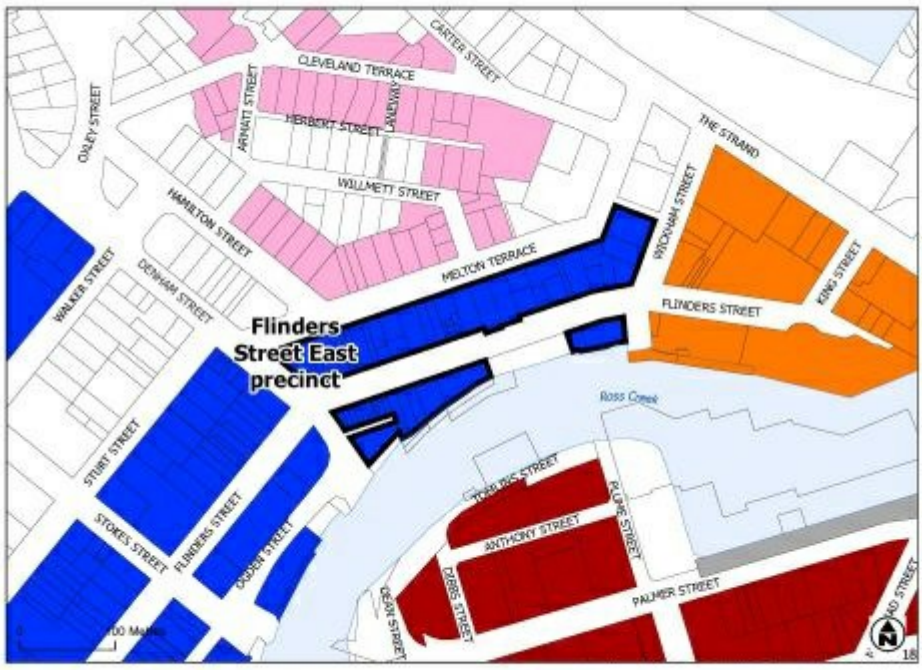

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Figure 6.104 - Flinders Street East precinct

6.3.5.3 Assessment benchmarks

Table 6.3.5.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
PO1 Where provided, outdoor lighting does not adversely affect the amenity of adjoining properties or create a traffic hazard on adjacent roads.	**AO1.1** Light emanating from any source complies with *Australian Standard AS4282 Control of the Obtrusive Effects of Outdoor Lighting*.
	AO1.2 Outdoor lighting is provided in accordance with *Australian Standard AS 1158.1.1 –Road Lighting – Vehicular Traffic (Category V) Lighting – Performance and Installation Design Requirements*.
PO2 Residential uses within the centre do not interrupt the continuity of the streetscape or the active, pedestrian focus of the street frontage.	**AO2** Any residential uses are located above or behind ground storey retail, commercial or community uses.
PO3 Residential uses within the centre are provided with a reasonable level of privacy.	**AO3.1** Windows, balconies, and terraces of a dwelling unit are screened where overlooking a habitable room or private open space of another dwelling within 9m.
	AO3.2 Screening is a solid translucent screen or perforated panels or trellises which have a maximum of 50% openings.
PO4 Residential uses within the centre are provided with a reasonable level of private outdoor living space.	**AO4** Dwellings are provided with private open space or a balcony directly accessible from a habitable room with: (a) a minimum of 9m^2; (b) a minimum dimension of 3m; and (c) clear of any utilities, water tanks and air conditioning units.

Table 6.3.5.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Role and function	
PO5 Development is consistent with the intended role, scale and character of the principal centre. The growth of retail and office floor space and residential uses within this centre allow for it to expand into its intended role as the economic and administrative heart of the region.	No acceptable outcome is nominated.
PO6 Development is generally in accordance with the Figure 6.105 – Principal centre concept plan.	No acceptable outcome is nominated.

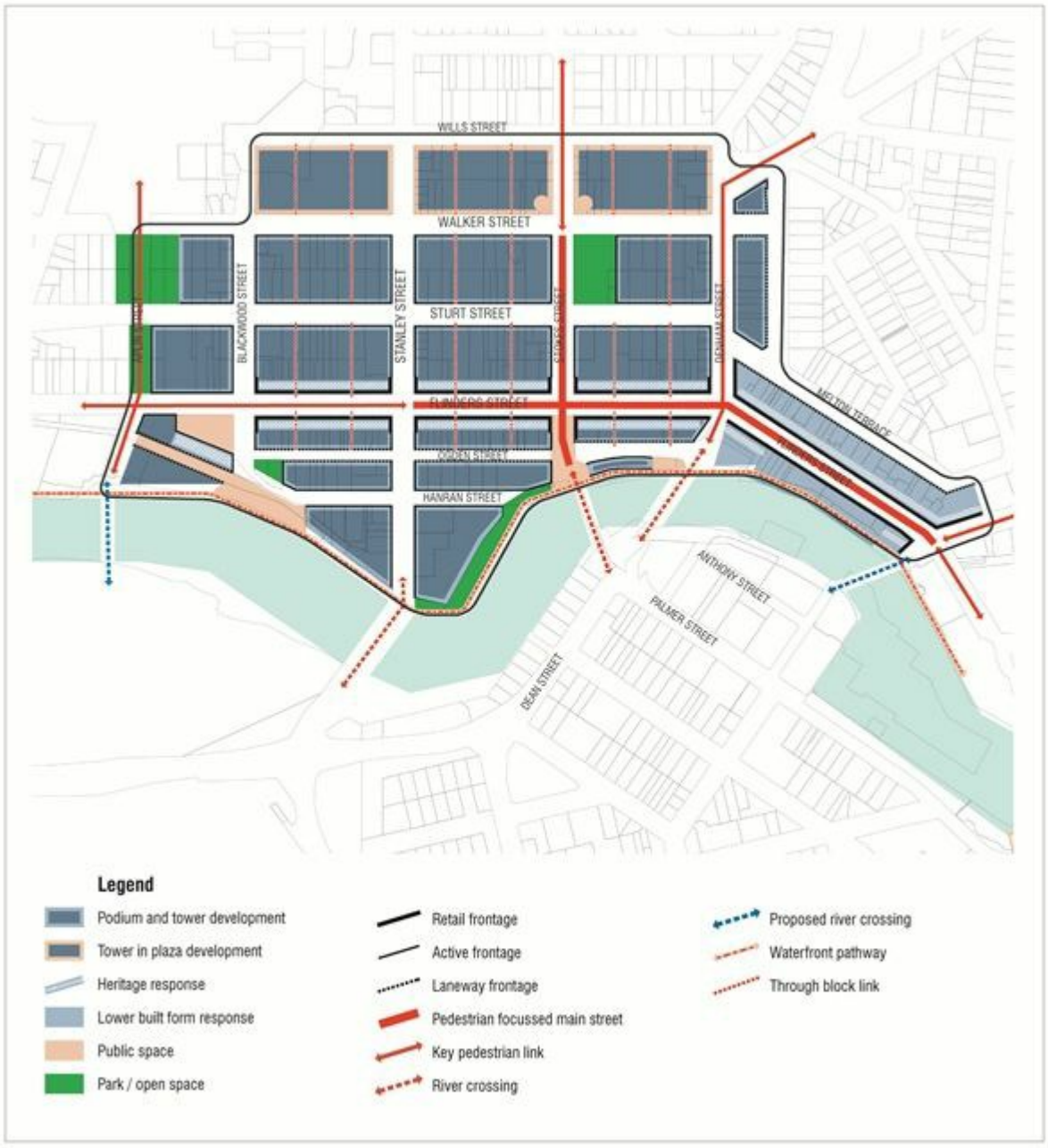

Figure 6.105 – Principal centre concept plan

PO7 Ground floor and podium level development is occupied with uses that contribute to: (a) the core economic, entertainment and cultural functions of the principal centre (CBD); (b) the vitality and vibrancy of the city's public domain; and (c) a compatible mix of active day and night-time uses.	**AO7.1** Podium level development accommodates non-residential uses.
	AO7.2 Uses at ground storey are active and include: (a) retail; or (b) cafes and restaurants incorporating outdoor dining; or (c) services and commercial offices which generate a high level of pedestrian traffic; or (d) recreational and entertainment; or (e) community and cultural uses; or (f) entrance foyers to commercial and residential uses above.

	AO7.3 Car parking is located in basements unless servicing significant citywide infrastructure or unresolvable geotechnical issues means basement parking is inappropriate or unachievable. In this case, parking is located above ground floor.
PO8 Tower development forms are occupied by uses that contribute to the accommodation of a critical mass of people (a resident or working population) within the principal centre (CBD).	**AO8** Uses within tower elements are predominantly: (a) residential accommodation either short or long-term; or (b) commercial offices; or (c) a combination of these.

Table 6.3.5.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Built form	
PO9 Building heights, site cover and setbacks contribute to the legibility, distinctiveness and place making of the city centre by creating an attractive skyline, and reinforcing the sense of primacy of the principal centre (CBD) core through built form outcomes.	**AO9.1** Unless otherwise stated for a particular precinct: (a) buildings greater than 8 storeys have a podium for a minimum of 2 storeys up to a maximum of 4 storeys, and a tower above, in accordance with Figure 6.106 – Tower and podium form; or (b) buildings of 8 storeys or less have a single tower form in accordance with Figure 6.107 – Single tower form.
	AO9.2 Unless otherwise stated for a particular precinct, setbacks and site cover are: (a) for buildings greater than 8 storeys incorporating tower and podium, in accordance with Figure 6.106 – Tower and podium form, and the following: Design Provisions - Zone & Precinct Codes Acceptable Outcome Building Form: > 8 Storey's: Tower & Podium Podium / Tower Height: up to 4 storeys / 20 storeys + (including podium) Site Cover: 100% / 60% SETBACKS Front: 0m / 4m Side: 0m / 3m Rear: 0m / 10m

	(b) for buildings 8 storeys or less and in a single tower form, in accordance with Figure 6.107 – Single tower form, and the following: **Design Provisions - Zone & Precinct Codes** **Acceptable Outcome** **Building Form**: Tower **Height**: Up to 8 storeys **Site Cover**: 70% **SETBACKS** **Front:** 0m **Side:** 3m **Rear:** 6m
PO10 Building heights and massing: (a) contribute to the intended role, scale and character of the principal centre by: (i) accommodating sufficient floor space to provide critical mass and intensity of use to activate the city; (ii) concentrate major development in the CBD core and transition building height at the fringes to ensure appropriate interface with lower scale adjoining developments; and (iii) maximising active uses at lower levels to activate, interact with and overlook street frontages. (b) is appropriate to the character and climate of Townsville and: (i) retains the openness of street vistas, including to the sky, along major elements of the city grid; (ii) provides privacy, natural light penetration and air circulation; (iii) provide transition to and design compatibility with lower scale heritage places and precincts; and (iv) retains an appropriate relationship with established streetscapes. (c) contributes to safe, active streets and public domain, by: (i) defining the street space with human scale elements; (ii) retains the continuity of facades along the street; and (iii) addressing all streets and public spaces with active uses, windows, doors, openings and balconies.	No acceptable outcome is nominated.

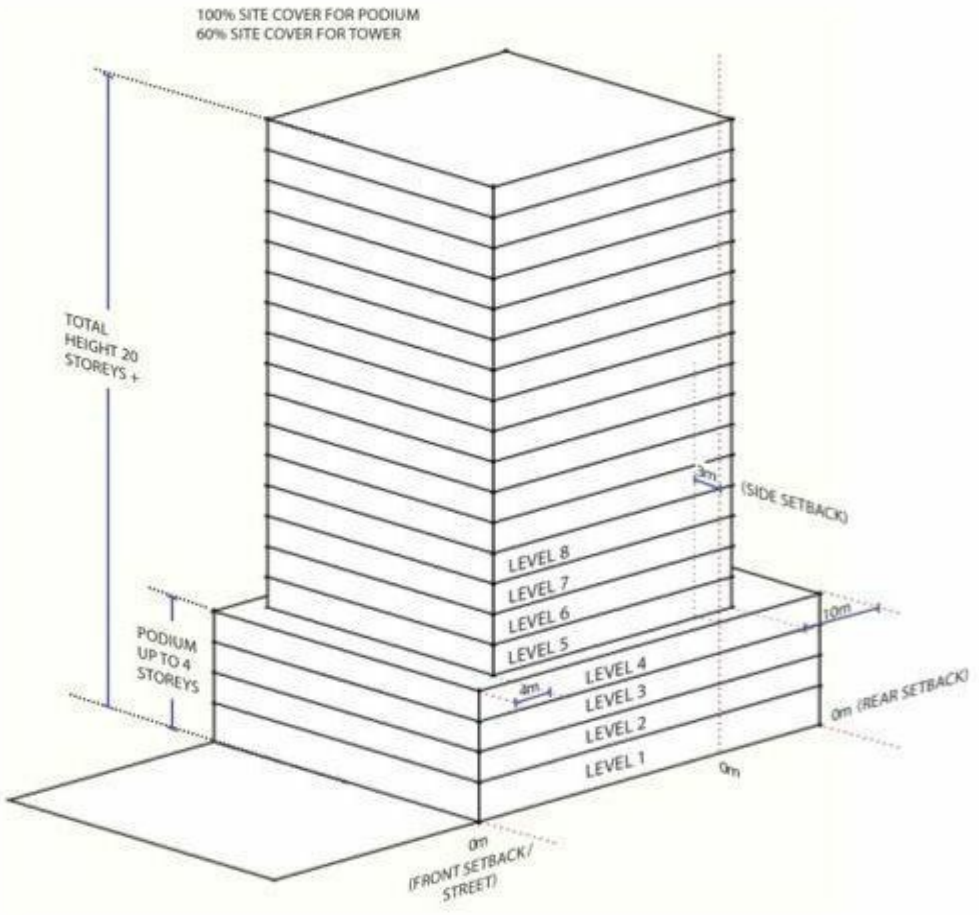

Figure 6.106 – Tower and podium form

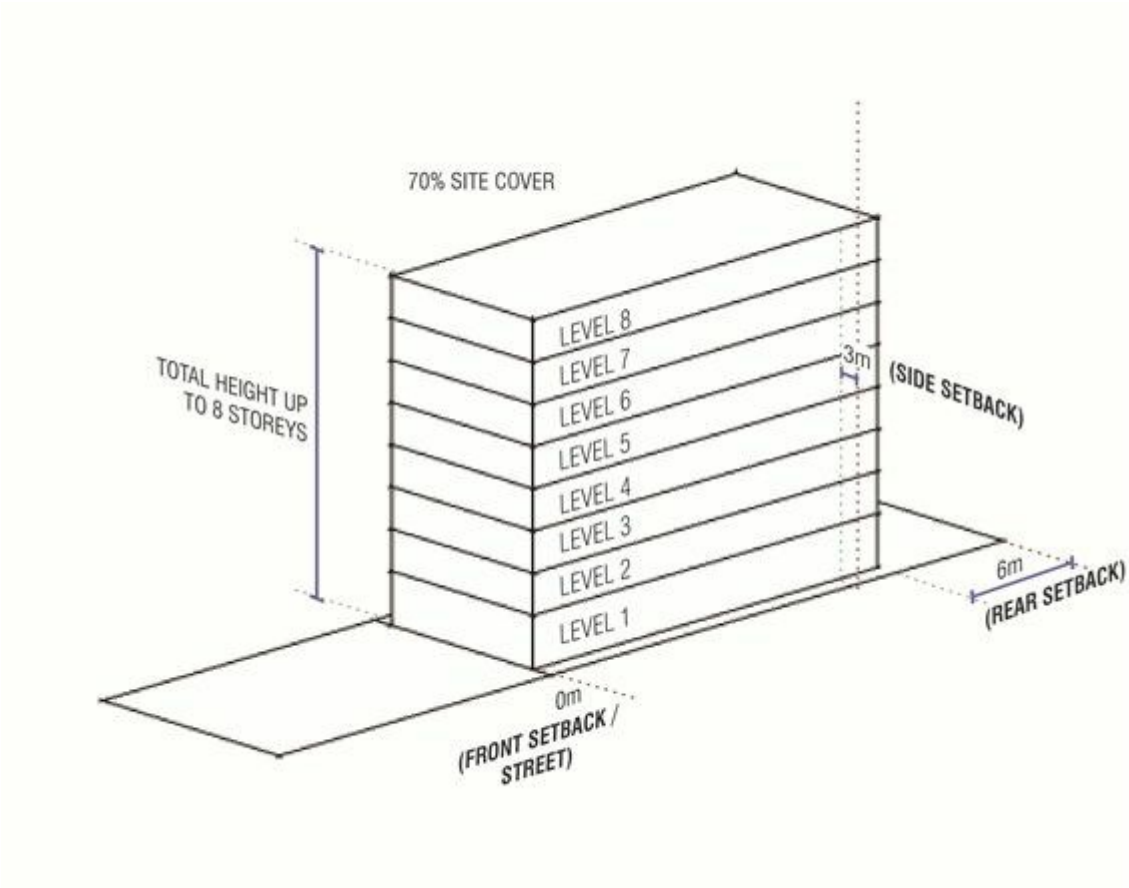

Figure 6.107 – Single tower form

PO11 Tower forms are clearly defined slender building elements with adequate spacing between them to provide for privacy, natural light penetration and air circulation.	**AO11.1** Maximum horizontal dimension for a tower on any side is 40m or 75% of the width of the site, whichever is the lesser.
	AO11.2 On a site greater than 3,000m^2, more than 1 tower is provided.
PO12 Ground floor and podium forms relate positively to streets and public spaces, and activate the public domain by incorporating: (a) operable elements within the building facade such as large window openings, sliding doors, window seating; (b) strong visual and physical connections between internal and external spaces; (c) usable outdoor/semi-outdoor spaces that support outdoor lifestyles and engage with the public realm; and (d) a gradual transition between the public domain and private outdoor or building spaces.	No acceptable outcome is nominated.
PO13 Through block connections are provided in accordance with Figure 6.105 – Principal centre concept plan which are publicly accessible during normal working/operating hours.	No acceptable outcome is nominated.

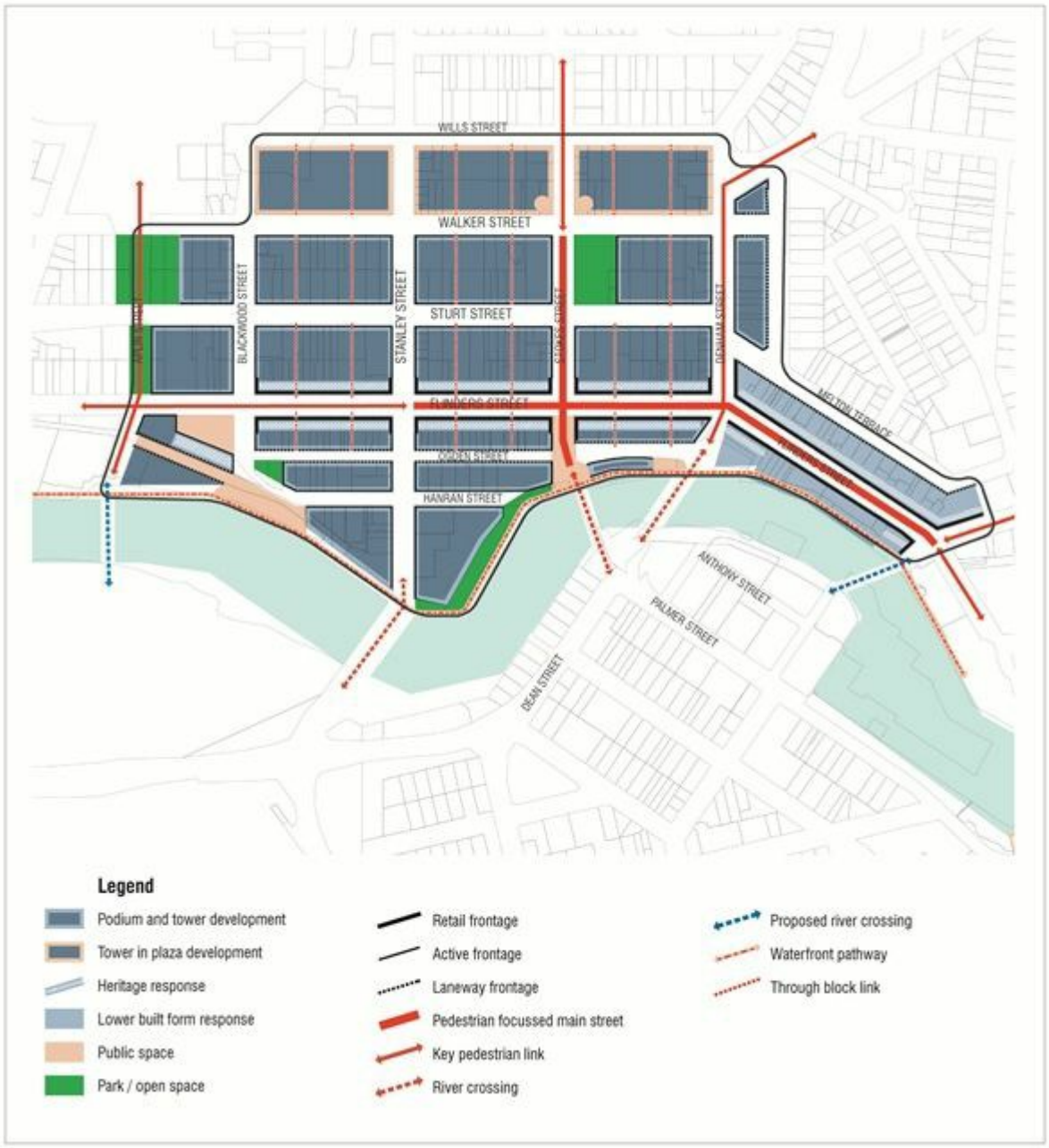

Figure 6.105 – Principal centre concept plan

PO14 Development provides continuity of building facades with adjoining buildings or provides appropriate transitions where a difference necessarily exists.	No acceptable outcome is nominated.
PO15 Ground floor and podium forms exhibit a human scale through: (a) the incorporation of detailed building elements; (b) articulation and definition of windows and openings including framing; (c) creation of a finer grain building rhythm, through design articulation such as variations in horizontal and vertical profiles, and variation in occupancy layouts within the overall building; and (d) where development sites are amalgamated, design of ground floor premises and facade to reflect the original lot widths.	No acceptable outcome is nominated.
PO16 Buildings or towers make a positive contribution to the skyline by: (a) exhibiting exceptional architectural design and quality; (b) utilising high quality materials that contribute to the tropical/Townsville character, are easily maintained and do not readily stain, discolour or deteriorate; and (c) articulating the building silhouette.	No acceptable outcome is nominated. **Editor's note–**where new buildings are proposed within the Principal centre (CBD) zone a design statement/response document is to be submitted with any development application demonstrating achievement of the relevant performance outcomes.
PO17 Roofscapes make a positive contribution to the attractiveness and function of the city through: (a) integrating them with the architectural design of the building; (b) service structures, lift motor rooms, externally mounted air conditioning units and mechanical plant designed as an architectural feature or with attractive screening; (c) creation of a coherent skyline for the city centre; and (d) creation of attractive and usable visual, open space, recreational or ecological spaces, including at podium level.	No acceptable outcome is nominated.
PO18 Buildings do not incorporate any type of glass or other surface that is likely to reflect solar rays that could create undue nuisance, discomfort or hazard to any part of the surrounding locality.	**AO18** Any reflective glass material has: (a) a level of light reflectivity of not greater than 20%; and (b) a level of heat transmission of not less than 20%.

PO19 Fenestration and sun control elements are used to: (a) minimise solar heat gain on building walls and windows; (b) reduce glare; (c) enrich the tropical character; and (d) provide texture to the building facades.	No acceptable outcome is nominated.

Table 6.3.5.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Crime prevention through environmental design	
PO20 Development facilitates the safety and security of people and property having regard to: (a) maximising opportunities for casual surveillance and sight lines; (b) exterior building design that promotes safety; (c) provision of adequate lighting; (d) appropriate signage and wayfinding mechanisms; (e) minimisation of entrapment locations; (f) building entrances, loading and storage areas that are well lit and lockable after hours; and (g) provision of direct movements along desire lines with clear unobscured sight lines. **Editor's note—**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.

Table 6.3.5.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Accessibility	
PO21 Ground storey pedestrian footpaths and access ways are the same level as, and connect without any lip or step to, the footpath and abutting pedestrian areas on neighbouring sites. Where the footpath is sloping, entries to the building are at the same level as the footpath.	No acceptable outcome is nominated.

Table 6.3.5.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Amenity	
PO22 Development minimises impacts on surrounding land and provides for an appropriate level of amenity within the centre, having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) visual impact; (e) signage; (f) odour and emissions; (g) lighting; (h) access to sunlight; (i) privacy; and (j) outlook.	No acceptable outcome is nominated.
PO23 Development provides private open space that is: (a) well-proportioned, appealing, functional and easily accessible, and promotes outdoor living as an extension of the dwelling; (b) provides a high level of privacy for residents and neighbours; and (c) has sufficient size and shape to meet the needs of a diversity of potential residents.	**AO23.1** Private open space is provided as a balcony with: (a) a minimum area of 9m^2 for a 1 bedroom unit or 16m^2 for a 2 or more bedroom unit; and (b) a minimum dimension of 3m, clear of any utilities such as gas, water tanks or air-conditioning units.
	AO23.2 Where clothes drying areas are provided on private balconies they are screened from public view.
	AO23.3 Private open space is located or screened so it does not directly overlook main living areas or private open space of adjoining dwellings.
PO24 Sufficient communal open space is provided to create flexible spaces suitable for a range of activities.	No acceptable outcome is nominated.
PO25 Communal open space provides facilities including seating, shade, flexible spaces suitable for a range of activities. Treatments such as green roofs, green walls or community gardens contribute to the attractiveness of these spaces.	No acceptable outcome is nominated.

PO26 On-site landscaping is provided to: (a) enhance the appearance of the development, particularly in parking and service areas and public spaces; (b) contribute to pedestrian comfort through shade; (c) create green rooves, walls or other sustainable building elements; and (d) screen unsightly components.	No acceptable outcome is nominated.

Table 6.3.5.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Loading and servicing	
PO27 The design and location of parking areas, refuse storage areas, loading/unloading and servicing areas, plant and building control on-site: (a) minimise disruption or breaks in building frontages; and (b) are screened from view from the street and adjoining uses.	**AO27.1** Non-active frontage (vehicle access, fire egress, control room, plant, building services etc.) occupies a maximum 8m or 25% of the primary frontage, whichever is the lesser.
	AO27.2 Refuse storage areas, loading and services bays are: (a) contained within the ground floor or podium built form; and (b) screened from the street by active uses/occupied building space.

Table 6.3.5.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Public domain	
PO28 Footpaths and pathways provide all weather protection within a safe, unobstructed and attractive environment. Awnings are: (a) continuous and compatible with existing awnings; (b) allow for street trees and landscaping; (c) visually safe and amenable; (d) located along key pedestrian routes and connects key destinations; (e) contributes to legibility and wayfinding; (f) do not impede the normal flow of pedestrians; and (g) constructed of materials that reflect the tropical climate and character of Townsville.	**AO28.1** Awnings are provided in accordance with Figure 6.108 – Awning location.
	AO28.2 Awnings: (a) are located above ground floor and is a minimum of 3.2m and generally not more than 4.2m above pavement height; (b) extend from the face of the building and is set back from the inside of the kerb line: 1.5m; (c) are continuous across all street frontages of the site; (d) are contiguous with adjoining buildings and awnings; (e) are cantilevered from the building and does not include posts within the footpath (except within the Flinders Street East precinct); (f) are provided with under awning lighting; and (g) are constructed of lightweight materials.
	AO28.3 Additional pedestrian shelter is provided as free-standing shade structures (such as umbrellas) which: (a) are constructed of lightweight materials; (b) have a minimum number of posts; (c) are a minimum 2.5m above pavement height; and (d) maintain the normal flow of pedestrians.

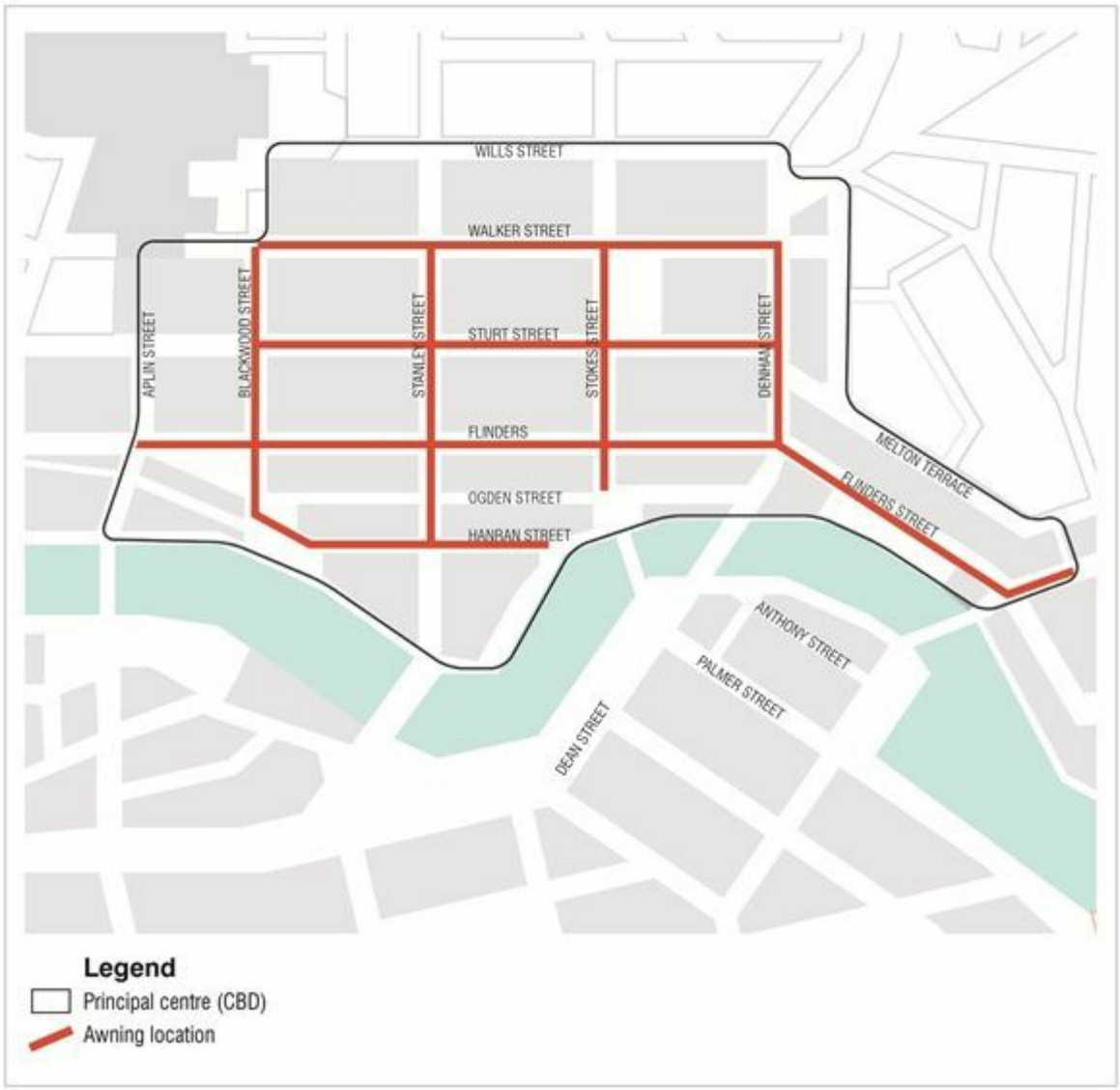

Figure 6.108 – Awning location

PO29 Where the ground floor is setback and upper podium levels overhang, or awnings are provided, these are cantilevered to avoid columns, ensuring no visual or physical obstruction occurs between the footpath and ground floor premises.	No acceptable outcome is nominated.
PO30 The location and placement of steps, escalators, ramps, lifts, automatic teller machines and other facilities which require queuing, standing areas or waiting such as bus stops and taxi ranks: (a) do not impede the normal flow of pedestrians; (b) maintain visibility and good sight lines; and (c) provide adequate space for queuing, standing areas.	**AO30** Any steps, escalators, ramps, lifts and automatic teller machines are set back 1.5m from the building facade at ground floor to allow for adequate waiting space in a manner that does not create concealment spots.
PO31 Pedestrian movement is continuous, convenient, safe and comfortable. Development: (a) provides pathways at street level and not provided via overhead bridges; (b) provides additional through block connections; (c) provides direct connections between key destinations; and (d) priorities pedestrian movement throughout the CBD.	No acceptable outcome is nominated.
PO32 Footpath and public realm design delivers pedestrian spaces that: (a) accommodate the requirements of the adjacent land use and the likely pedestrian traffic; (b) provide all weather protection; (c) provide vegetation that contributes to the city's tropical character; and (d) are constructed and maintained to a consistent standard.	No acceptable outcome is nominated.

Table 6.3.5.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Provision of public spaces	
PO33 A variety of public spaces are provided throughout the principal centre (CBD) and include: (a) small-scale spaces; (b) laneways; (c) public promenades; (d) public squares; (e) urban boulevards; (f) parks and gardens; (g) performance spaces; and (h) arcades and through block links.	**AO33** New public spaces, corridors, pathways and through block connections are provided in accordance with Figure 6.105 – Principal centre concept plan.
PO34 Development adjoining Ross Creek contributes to the provision of a continuous riverside bikeway/walkway linking Reid Park to The Strand and extending out to the Breakwater precinct. The pathway system: (a) provides a shared path for pedestrians and cyclists; (b) is safe and attractive providing opportunities for pausing and weather protection along the route; and (c) provides direct connections between the pathway and the adjoining street network.	**AO34** Any development on premises adjoining Ross Creek provides: (a) a fully publicly accessible riverside walkway/bikeway that is dedicated to council and has a minimum unobstructed pavement width of 4.5m and a minimum overall width of 6m; (b) tree planting, lighting, balustrading, and pavement treatment are provided along the full length and within the pathway; and (c) furniture, including seating, awnings and public art for weather protection are provided at the intersection of the pathway and key streets.

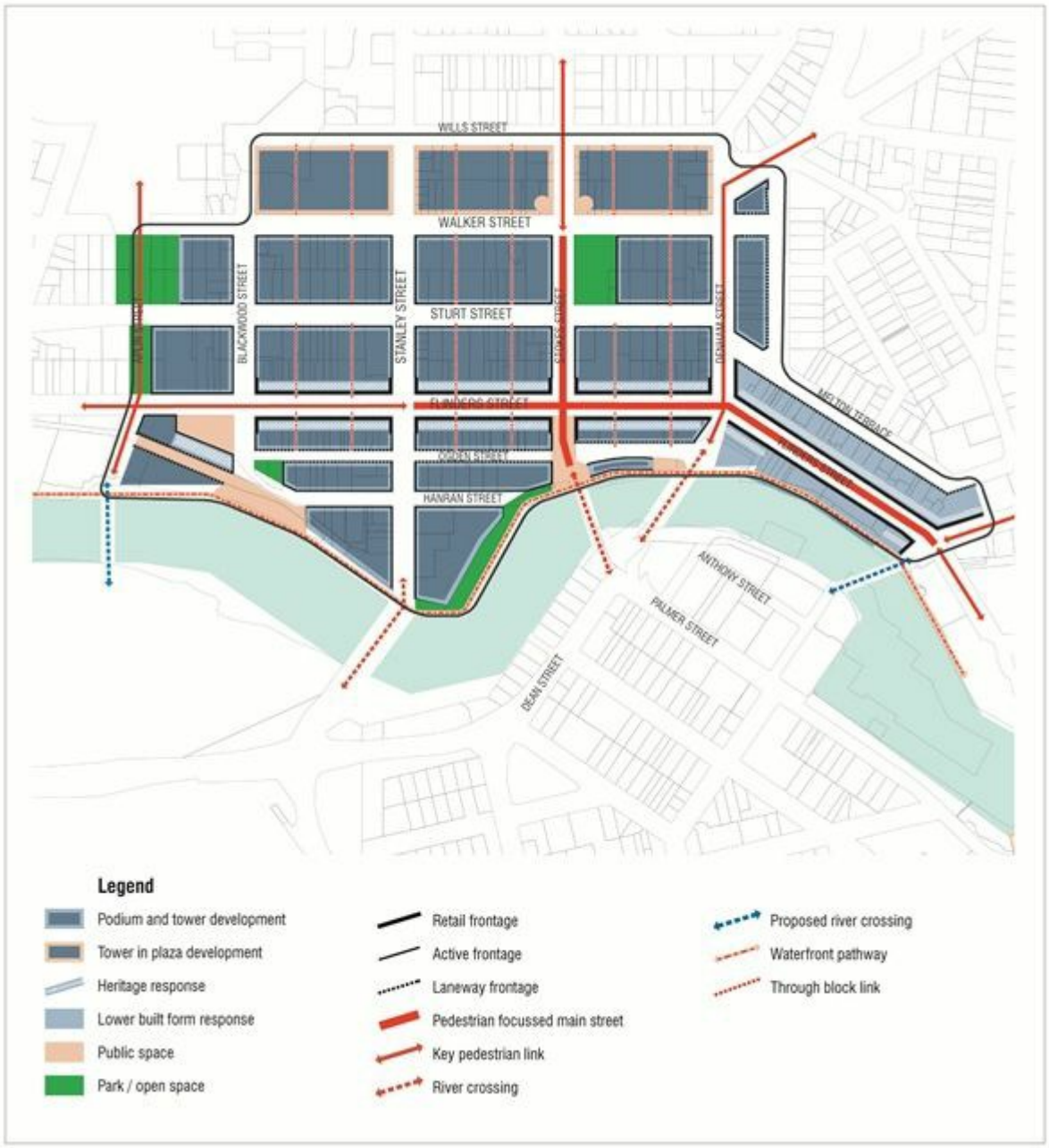

Figure 6.105 – Principal centre concept plan

Table 6.3.5.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Civic and administration precinct	
PO35 Development facilitates or supports a mix of uses and day and night-time activity throughout the precinct including: (a) civic, administration, government, education and commercial office buildings are the predominant uses; and (b) shops, dining, café and restaurant uses may occur at the ground storey along street frontages and adjoining public entrances and forecourts.	No acceptable outcome is nominated.
PO36 Building form and massing reflect a distinctive 'building in plaza' setting to contribute to the civic character and identity of the precinct including: (a) substantial areas of the ground plane given over to public access; (b) a high quality public realm including both hard and soft-scape materials; (c) creation of stand-alone pavilions; and (d) consistent single, uniform building elements.	**AO36.1** Buildings: (a) do not have a site cover exceeding 60% of the site; and (b) incorporate a significant space as an entrance plaza/waiting or meeting area. Figure 6.109 — Civic and administration precinct built form illustrates the desired outcome. **AO36.2** Building setbacks are: (a) a minimum of 5m from street and side boundaries; (b) a minimum of 6m from the rear boundary; and (c) are generally consistent for the full height of the building on a single side, with only minor (less than 1m) indents or projections in the facade. Figure 6.109 — Civic and administration precinct built form illustrates the desired outcome.

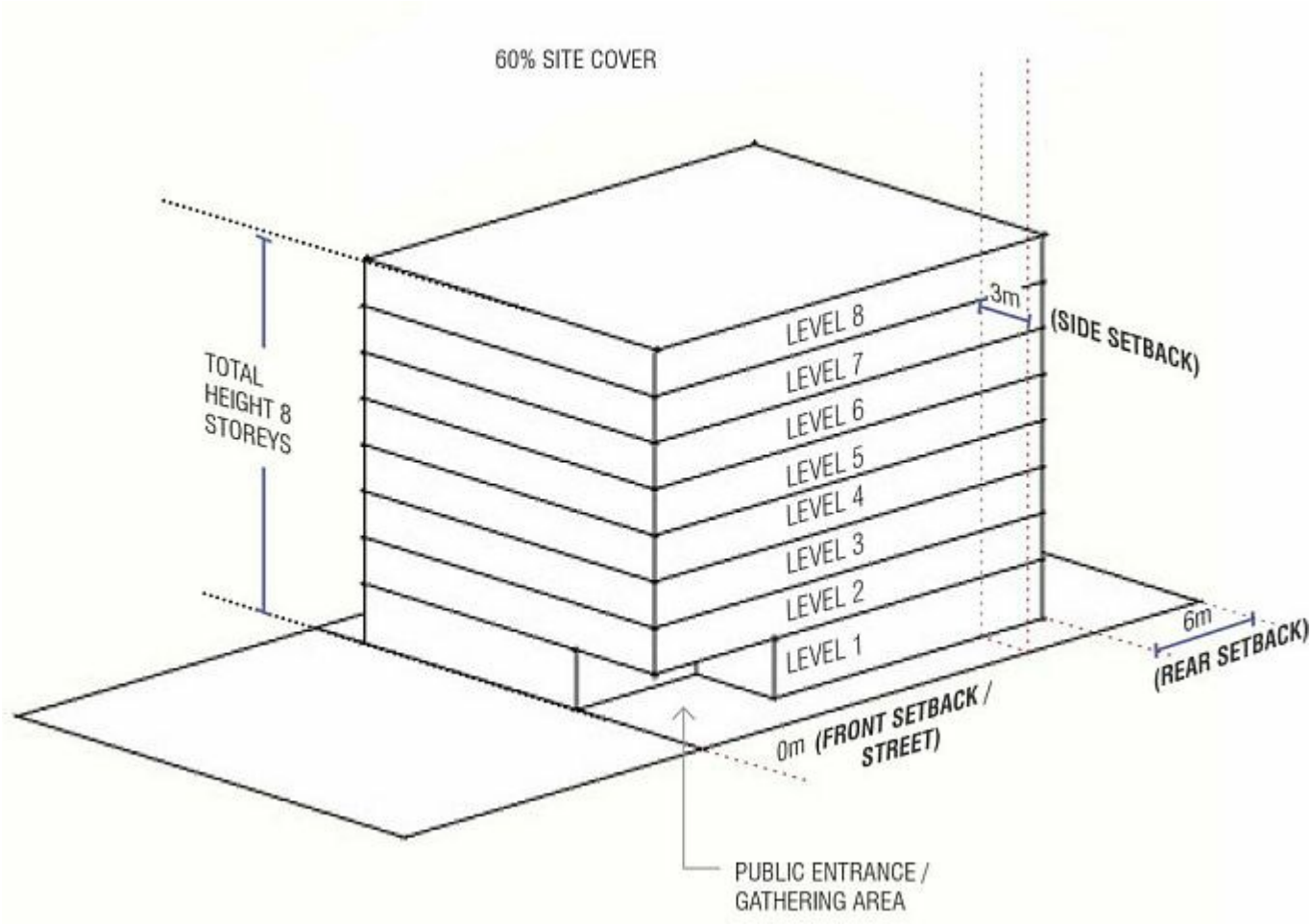

Figure 6.109 – Civic and administration precinct built form

PO37 Building heights and setbacks contribute to the legibility, distinctiveness and place making of the city centre by contributing to an attractive skyline, and reinforce the sense of primacy of the principal centre (CBD) core through built form outcomes. Buildings in the Civic and administration precinct provide a transition from the built form intensity and scale to the central parts of the CBD to adjoining residential development generally at a lower scale.	**AO37** Building height does not exceed 8 storeys.
PO38 Overall building siting and location on the site: (a) provides glimpses of Castle Hill between buildings as a constant reference point, wherever possible; and (b) creates spaces in and around the building which are proportionate to the overall dimensions of the building.	No acceptable outcome is nominated.
PO39 At the ground floor, design is to incorporate innovative responses to public realm interface, including the use of additional corner setbacks integrated with public entrances and gathering areas.	No acceptable outcome is nominated.

Table 6.3.5.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Flinders Street retail precinct	
Role and function	
PO40 Ground floors of buildings on Flinders Street frontage are occupied by uses that have a visible presence on and interaction with the street and public domain. Predominant uses reflect the role of this precinct as the focus for retail uses within the principal centre (CBD) and the highest order retailing in the city by: (a) retail and other active uses at ground floor along Flinders Street and Odgen Street in this precinct; (b) accommodating specialist retailing; and (c) accommodating a department store.	**AO40** New development provides at least the same amount of retail floor space as existed prior to that development, ensuring there is no net loss.
PO41 Active uses including retail, shops, banks, active commercial tenancies and café uses are located: (a) at ground floor along Flinders Street and Odgen Street; (b) along the ground floor of any through block links, arcades or indoor retail developments; and (c) at upper levels where indoor retail developments.	No acceptable outcome is nominated.
PO42 Any department or discount department store has a frontage to Flinders Street and is incorporated into larger retail and entertainment development where possible.	No acceptable outcome is nominated.

Table 6.3.5.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Flinders Street retail precinct	
Building form and massing	
PO43 Building heights and massing: (a) reflect and respond to the scale of adjoining historic building forms; (b) facilitate a high degree of pedestrian amenity by: (i) minimising overshadowing and adverse wind effects; (ii) providing for good light penetration and air circulation with visibility to the sky; and (c) ensure the scale and character of the heritage buildings is the prevailing built form.	**AO43.1** Along the Flinders Street frontage and Sturt Street frontage: (a) podium height is a maximum of 4 storeys; (b) where adjoining a heritage or character building, podium height is a maximum of 2 storeys, or is within 20% of the height of the adjoining building height; (c) podium development is built to boundary on all site boundaries; (d) towers are set back from Flinders Street a minimum of 10m; (e) towers are set back from Sturt Street a minimum of 4m; and (f) unless otherwise stated building form, setbacks, heights, and site cover are as illustrated in Figure 6.110 – Flinders Street retail precinct building massing, and the following: Design Provisions - Zone & Precinct Codes Acceptable Outcome Building Form: Heritage Frontage and Tower set back from street Podium: Height: 2-3 storey's Flinders Street; 4 storeys Sturt St & Ogden St; Site Cover: 100%; SETBACKS Front/ Street: 0m; Side: 0m; Rear: 0m Tower: Height: 20 storeys + (including podium); Site Cover: 60%; SETBACKS Front/ Street: 20m Flinders St, 4m Sturt & Ogden St; Side: 3m; Rear: 10m or between tower elements

AO43.2

Along the Ogden Street frontage:

(a) podium height is maximum of 4 storeys;

(b) podium development is built to boundary on all site boundaries;

(c) the tower are setback a minimum of 5m from the street frontage; and

(d) unless otherwise stated building form, setbacks, heights, and site cover are as illustrated in Figure 6.106 – Tower and podium form, and the following:

Design Provisions - Zone & Precinct Codes

Acceptable Outcome

Building Form		> 8 Storey's:	Tower & Podium
		Podium	**Tower**
Height		up to 4 storeys	20 storeys + (including podium)
Site Cover		100%	60%
SETBACKS	**Front:**	0m	4m
	Side:	0m	3m
	Rear:	0m	10m

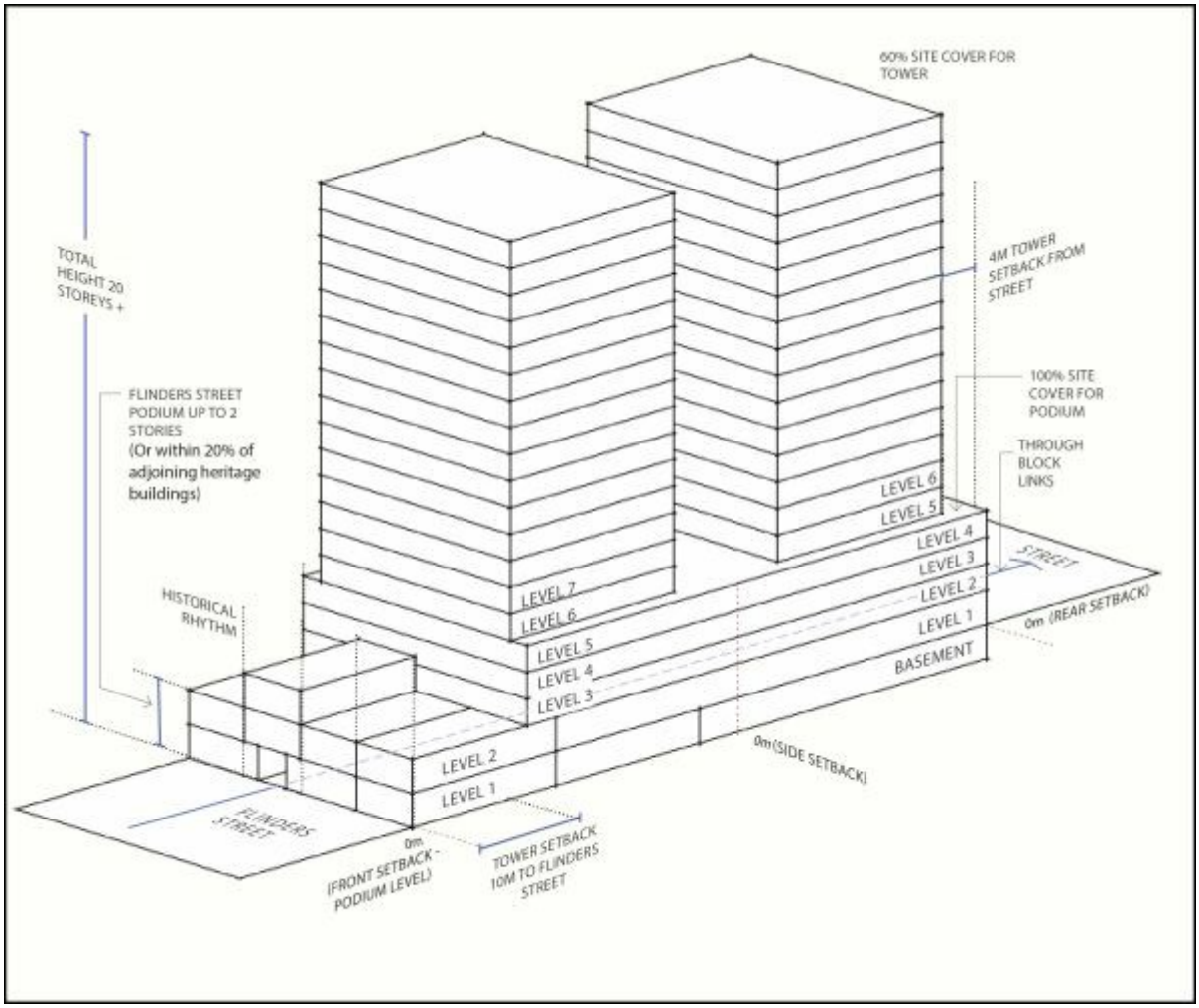

Figure 6.110 – Flinders Street retail precinct building massing

Table 6.3.5.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Flinders Street East precinct	
Role and function	
PO44 Development is consistent with the role of this precinct as the focus for entertainment and late night-time economy.	No acceptable outcome is nominated.
PO45 Development contributes to a mix of day and night-time activity on Flinders Street (East) which enhances the safety of the precinct, including some retail uses and nightclub entertainment facilities with extended operating hours for daytime dining.	No acceptable outcome is nominated.
PO46 Retail uses are not established to a level that would undermine the Flinders Street retail precinct as the primary shopping area in the principal centre (CBD).	**AO46** Where retail uses are provided these are located at ground floor and do not contribute to the overall retail frontage on the street exceeding 40% of the entire length of the street frontage at ground floor.
PO47 Where short-term accommodation is located within this precinct it is accommodated above ground floor.	No acceptable outcome is nominated.

Table 6.3.5.3—Accepted development subject to requirements and assessable development (Part)

<table>
<tr><th>Performance outcomes</th><th>Acceptable outcomes</th></tr>
<tr><td colspan="2">Flinders Street East precinct</td></tr>
<tr><td colspan="2">Building form and massing</td></tr>
<tr><td>PO48
Building heights and massing:
(a) reflect and respond to the scale of adjoining heritage building forms;
(b) create a predominantly continuous built edge to the street at the ground storey; and
(c) retain views to and from Melton Hill to South Townsville (Tomlins Street).</td><td>AO48
In the Flinders Street East precinct:
(a) building height along Flinders Street (East) is 3 storeys or within 20% of the adjoining heritage buildings;
(b) no towers are established;
(c) buildings are set back 0m from Flinders Street (East);
(d) side setbacks do not exceed 1.5m;
(e) building height along Melton Terrace is a maximum of 2 storeys above the level of the adjoining road; and
(f) unless otherwise stated building form, setbacks, heights, and site cover are as illustrated in Figure 6.111 – Flinders Street East building massing, and the following:
Design Provisions - Zone & Precinct Codes
Acceptable Outcome
<table><tr><td colspan="2">Building Form</td><td>Heritage frontage with development behind</td></tr><tr><td colspan="2">Height</td><td>Flinders Street East: 2-3 storeys
Melton Terrace: 2 storeys</td></tr><tr><td colspan="2">Site Cover</td><td>100%</td></tr><tr><td rowspan="3">SETBACKS</td><td>Front/ Street:</td><td>Flinders Street East:
0m for levels 1-3
20m for levels 3+
Melton Terrace: 3m</td></tr><tr><td>Side:</td><td>0m</td></tr><tr><td>Rear:</td><td>N/A</td></tr></table></td></tr>
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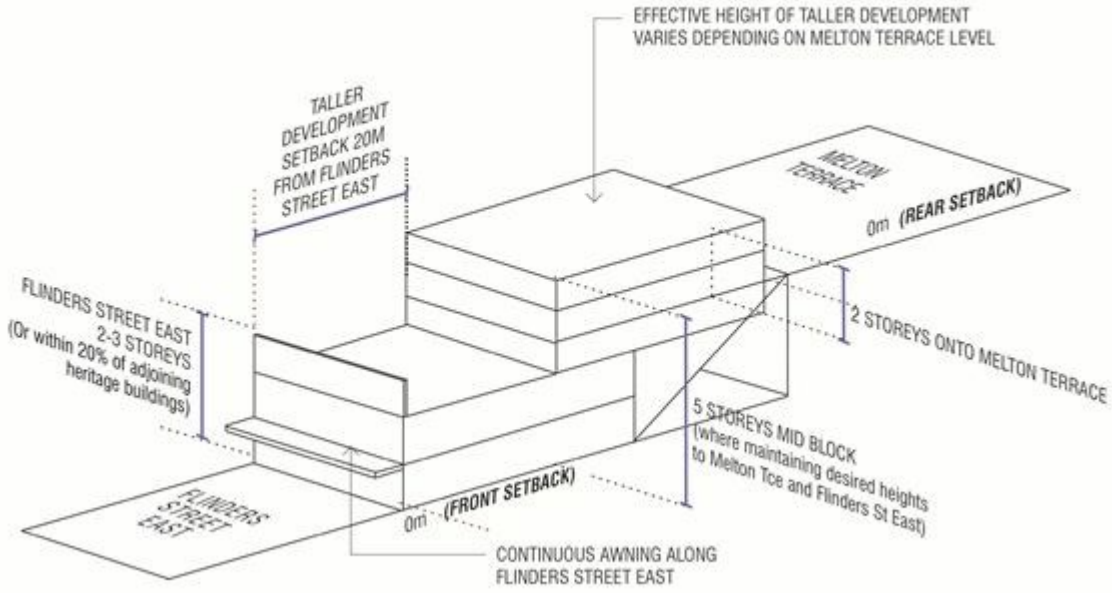


Figure 6.111 – Flinders Street East building massing

Table 6.3.5.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Flinders Street East precinct	
Roof form and awnings	
PO49 Roof form is contemporary and contributes to tropical design character, complementing but not mimicking heritage building elements.	No acceptable outcome is nominated.

6.3.6 Specialised centre zone code

6.3.6.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.3.6.2 Purpose

(1) The purpose of the Specialised centre zone code is to provide for one or more specialised uses.

(2) The particular purpose of the code is to:

- (a) recognise the role and function of each of the specialised centres and guide development within each centre; and
- (b) protect each centre from encroachment by development which may impact on that role and function.

(3) The purpose of the zone will be achieved through the following overall outcomes:

- (a) the zone accommodates large public, commercial or institutional facilities which are significant to the economic and social well-being of Townsville but are not appropriately included in other zones. These centres include Domain Central, the James Cook University-Townsville Hospital precinct, Lavarack Barracks, Townsville Airport, Port of Townsville and major medical precincts;

  Editor's note—While the planning scheme does not regulate land within some of these sites, this code is intended to give direction to development within or in the vicinity of these sites, to the extent possible.

- (b) the centres perform a specific function for the Townsville and wider North Queensland community, and are major nodes of business activity, services or employment;
- (c) these centres generally have strong relationships with the other multifunctional activity centres in Townsville, but do not incorporate the breadth and depth of activities of these other centres and do not compete with or undermine the retail and commercial functions of these other centres;
- (d) development supports and is compatible with the primary focus for the centre. The specialised centre retains its dominant function and new development does not prejudice its ongoing operation or significantly impact on the amenity of nearby sensitive uses;
- (e) shops and shopping centres within these centres are limited to convenience retail, food and drink outlets servicing on-site businesses, workers and, where they exist, residents. Offices are limited to those directly related to the primary focus of the centre;
- (f) specialised centres grow in a consolidated way that makes efficient use of the zoned area. Development near the boundaries of specialised centres is located and designed to minimise impacts on sensitive land uses in other zones;
- (g) development surrounding a specialised centre does not impact on the continued functioning and expansion of the centre for its intended primary purpose;
- (h) design of built form and public spaces facilitates safe and secure environments and discourages antisocial behaviour; and
- (i) opportunities for energy efficiency through built form are maximised.

(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts and sub-precincts:

Townsville Airport precinct:

(a) the long-term operation and expansion of the Townsville Airport is supported for both Department of Defence purposes, and to satisfy the primary air transport needs of the Townsville and North Queensland regions;

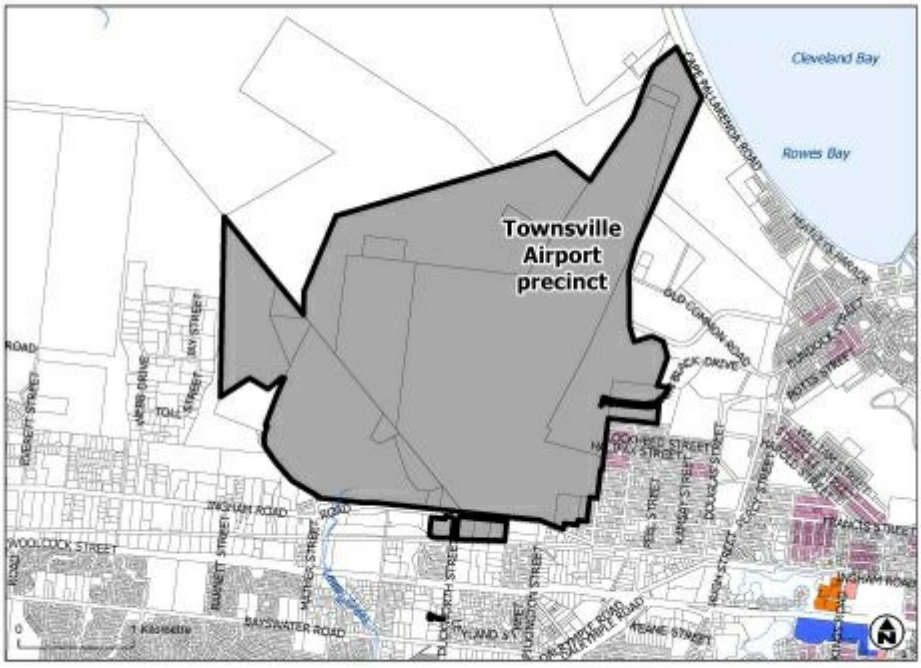
(b) the timely and cost-effective provision of aeronautical infrastructure is facilitated;

(c) aviation-related related businesses, research and technology industries and low impact industries are accommodated;

(d) development is not of a type or scale that undermines the successful operation of the principal centre (CBD) or major centres in Townsville; and

(e) residential development is limited to short-term accommodation.

Editor's note—The Townsville Airport does not fall within the regulatory jurisdiction of the Townsville City Plan. However, council recognises its important joint defence and civil functions through this zoning and acknowledges the intentions of Townsville Airport's master planning document.



Click here to view PDF high resolution map.

Figure 6.112 - Townville Airport precinct

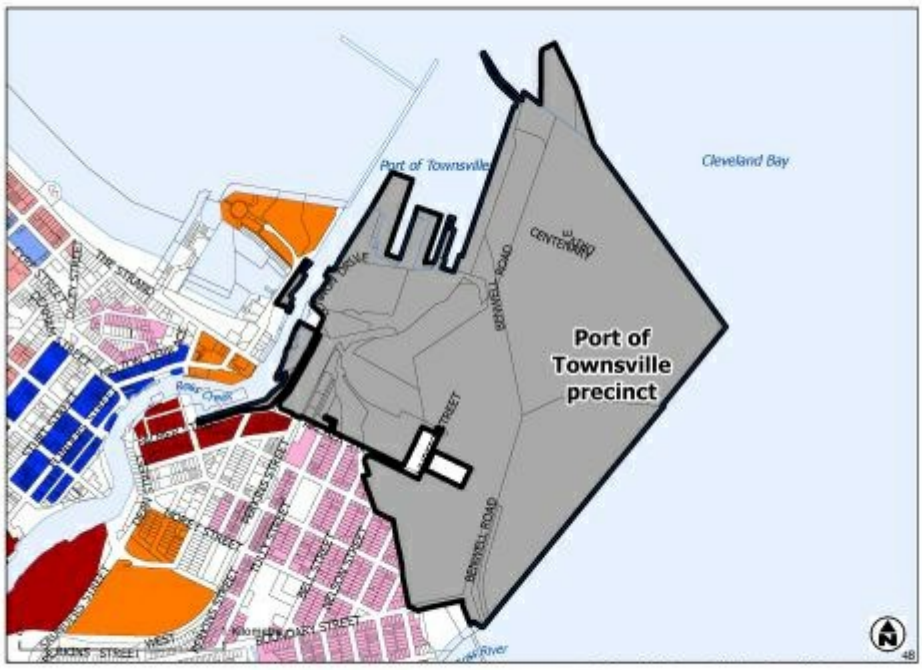
Port of Townsville precinct:

(a) the long-term operation of the Port of Townsville is protected for the benefit of the local and regional economy;

(b) the operations of the port are protected from incompatible land uses and activities on nearby land; and

(c) waterfront development within the port is integrated with the Palmer Street and The Strand areas where possible, to maximise community access to and use of waterfront areas.

Editor's note—The Port of Townsville does not fall within the regulatory jurisdiction of the Townsville City Plan. However, council recognises its important function through this zoning and the acknowledges the intentions of Port of Townsville's master planning documents.



Click here to view PDF high resolution map.

Figure 6.113 - Port of Townsville precinct

Lavarack Barracks precinct:

(a) the ongoing use and development of the barracks area for Department of Defence-related purposes, including aviation, communications, logistics, administration, training, and accommodation and recreation facilities for defence personnel is protected; and

(b) to the extent practicable, development is encouraged to create an attractive frontage to University Road.

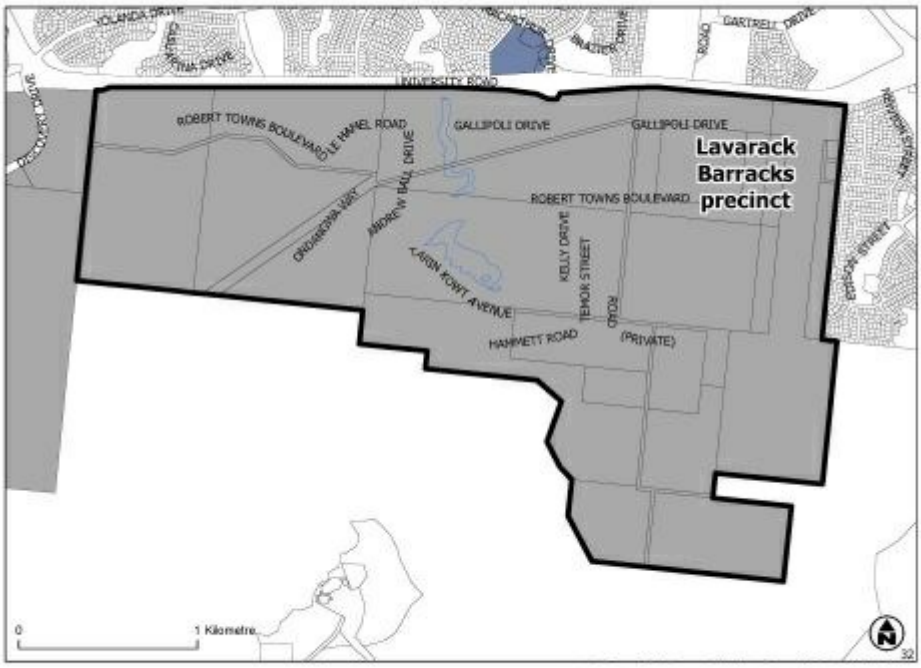


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Figure 6.114 - Lavarack Barracks precinct

Editor's note—Lavarack Barracks does not fall within the regulatory jurisdiction of the Townsville City Plan. However, council recognises its important function through this zoning.

Domain Central precinct:

(a) this centre accommodates showrooms primarily servicing the northern Townsville community;

(b) apart from small-scale food and drink outlets, Domain Central is not substantially expanded to include further shops or shopping centres; and

(c) the integration of this centre is strengthened through built form and layout, and pedestrian-based accessibility is improved.

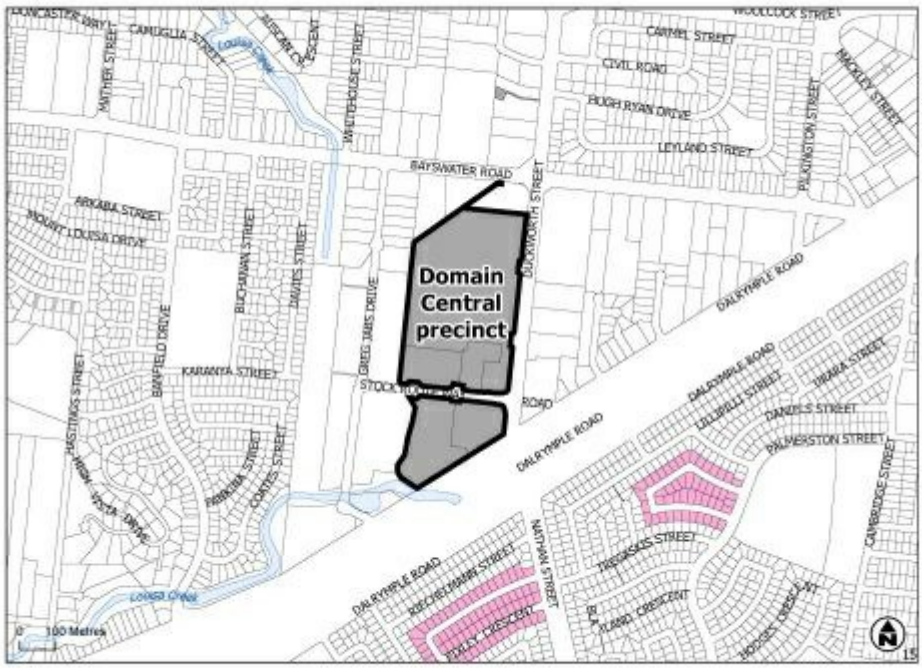

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Figure 6.115 - Domain Central precinct

Fulham Road medical precinct:

(a) the precinct continues to be the focus for private acute medical services in the Townsville region;

(b) the continued efficient and effective operation of the hospital is protected;

(c) the precinct accommodates medical centres, medical offices and health care services, research and technology industries, accommodation and other activities that support or are otherwise allied to the hospital activities;

(d) the hospital has the highest scale and intensity of any use within the precinct; and

(e) development facilitates an active pedestrian environment along Fulham Road which promotes connectivity to adjoining areas including Anderson Park.

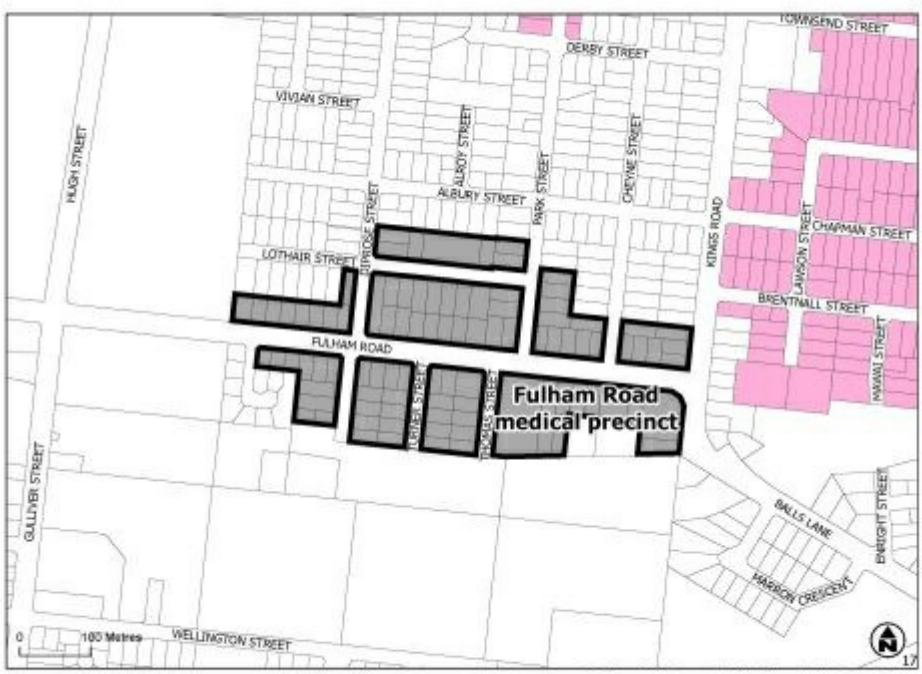

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Figure 6.116 - Fulham Road medical precinct

Bayswater Road medical precinct:

(a) the continued efficient and effective operation of the hospital is protected;

(b) the hospital has the highest scale and intensity of any use within the precinct;

(c) the precinct accommodates medical centres, medical offices and health care services, research and technology industries, accommodation and other activities that support or are otherwise related to the hospital activities;

(d) the primary hospital entry and pedestrian activity within the precinct is focused around the Oxford Street and Regent Street intersection;

(e) Oxford and Regent Street are active pedestrian environments and direct pedestrian connections are provided through the hospital site; and

(f) parking associated with the hospital and other allied health uses is provided in consolidated areas.

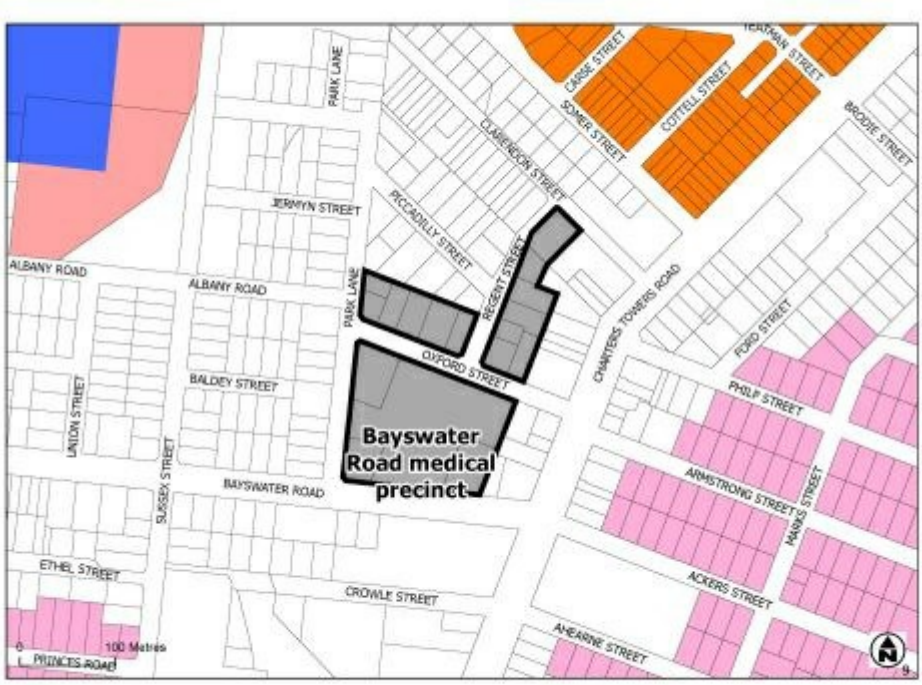

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Figure 6.117 - Bayswater Road medical precinct

James Cook University-Townsville Hospital precinct:

(a) the James Cook University-Townsville hospital precinct is evolving into a 'world-class knowledge community' with a focus on the tropics and on sustainability. Prominent land uses include health and education services and a range of research and technology industries;

(b) the land use mix and scale of development reflects the role of the precinct in the city and the tropics. Land uses which benefit and enhance the knowledge community are accommodated. Development not related to the focus of the precinct, and that would adversely affect other centres, is not established;

(c) the precinct changes from a collection of single use campuses into a mixed use urban centre. The precinct integrates existing institutions and is integrated into the wider city including strong links to the CBD and the Aitkenvale and Thuringowa Central major centres;

(d) the James Cook University-Townsville Hospital precinct takes on a specific role in leadership in sustainability. Development provides exemplar and culture changing projects in areas like public transport, housing, public spaces and community development as well in its traditional academic and healthcare focus;

(e) the James Cook University-Townsville Hospital precinct exhibits increased self-containment compared to normal practice, with people living and working within the centre. Development minimises the use of finite resources like land, energy, water and wastewater. An overall test for all development at the centre, including residential development, is that it exemplifies sustainable development in all its realms;

(f) an emerging and sustainable resident community is well-connected to the wider city by active and public transport;

(g) car dominance within the precinct is redressed, with walking and cycling given priority in all development components;

(h) development does not extend into areas of landslip or bushfire risk, high scenic amenity or local, regional or state ecological significance; and

(i) development is well-designed at the centre, precinct, street, public space and building scales.

Editor's note—Development of James Cook University (Douglas Campus), which is undertaken in terms of a Ministerial Designation, does not fall within the regulatory jurisdiction of the Townsville City Plan.

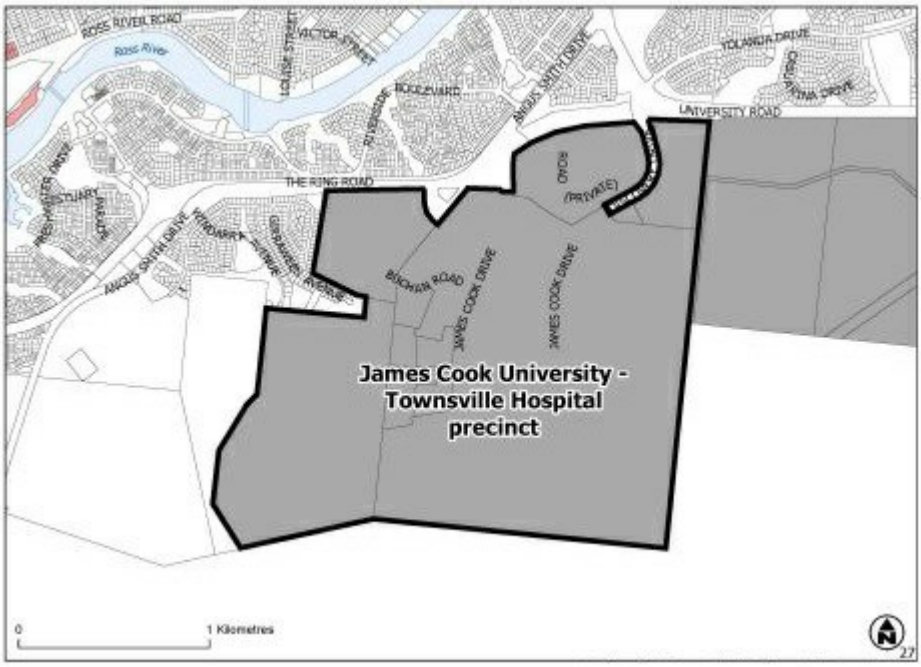

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Figure 6.118 - James Cook University - Townsville Hospital precinct

Discovery Central sub-precinct:

(i) at the heart of the precinct, development at Discovery Central exhibits the most intensive mix of uses and is busy with people throughout the day, week and year;

(ii) Discovery Central provides a strong focus for the hospital and university communities. Significant uses include research institutions and teaching facilities. Student and short-term accommodation is also present;

(iii) at street level, shops, cafes and bars are part of the mix;

(iv) Discovery Central is focussed on the 'ideas market', a significant public space located on the axis between the hospital and university library, and Mt Stuart Street, a new urban street connecting east-west through the centre. Pocket parks and small-scale spaces punctuate the area;

(v) buildings are 4 to 6 storeys and frame the street with no setbacks. Many buildings are mixed use;

(vi) footpaths and public spaces are well shaded. Walking is the best way to get around Discovery Central;

(vii) retail, including a supermarket, and other business uses support the daily needs of the knowledge community and are only established when need is demonstrated. Comparison shopping is not found here; and

(viii) buildings, streets and spaces are well-designed. The image and identity speaks strongly of Townsville's climate and place in the 21st century.

Discovery village sub-precinct:

(i) dwelling density within the precinct achieves a minimum net residential density of 30 dwellings per hectare through a mix of housing types including a range of townhouses, apartments and small lot homes. A focus on traditional dwelling houses does not occur;

(ii) buildings and neighbourhood design exhibit exemplar sustainable and social principles;

(iii) development does not alter the natural topography and maximises the retention of vegetation through street and housing design;

(iv) housing areas are well-connected to the central parts of the campus via pedestrian paths;

(v) a high quality public realm is created with passive recreation areas overlooked by verandahs and other living spaces in residences, shaded footpaths along all streets and a high level of permeability for pedestrians and bicycles; and

(vi) housing design provides exemplar responses to the Dry Tropics climate having regard to building massing and depth, solar orientation and shading and use of cooling and water sensitive landscape elements.

Editor's note—Sub-precincts are shown in Figure 6.123 — James Cook University-Townsville Hospital centre strategy plan.

6.3.6.3 Assessment benchmarks

Table 6.3.6.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Role and function	
PO1 Development does not prejudice or detract from the primary function of the specialised centre.	No acceptable outcome is nominated.
PO2 Other uses occur on a site where they: (a) directly support or are directly allied with the primary function of the particular centre; and (b) are subordinate to that primary function.	No acceptable outcome is nominated.
PO3 Development is consistent with the intended role, scale and character of the centre and does not compromise the intended role or successful functioning of the other specialised centres, the Principal centre (CBD) or major centres.	No acceptable outcome is nominated. **Editor's note—**Applicants should have regard to Economic impact assessment planning scheme policy no. SC6.5 for guidance on how to demonstrate compliance with this performance outcome.
PO4 Shops and shopping centres accommodate convenience retail, food and drink outlets, service industries and other services providing for the day-to-day needs of on-site businesses, workers, visitors or residents.	No acceptable outcome is nominated.

Table 6.3.6.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Design and built form	
PO5 The design of the precinct provides for: (a) efficient use of the available land; (b) a coherent and integrated built form, public realm and circulation networks; (c) central, accessible and attractive public spaces for people to congregate and interact; (d) continuity and complementarity of streetscape and landscape characteristics; (e) pedestrian friendly and visually interesting frontages to streets and public spaces; (f) optimum energy efficiency; (g) a compatible mix of uses; (h) connectivity of pedestrian and cyclist paths and spaces internal and external to the centre; and (i) sensitive transitioning of built form and uses to surrounding land. **Editor's note—**Applicants may be requested to prepare centre design master plans to demonstrate compliance with this performance outcome.	No acceptable outcome is nominated.
PO6 Building setbacks and orientation provide for an attractive streetscape that is sympathetic to existing characteristics of the local area.	No acceptable outcome is nominated.
PO7 Development is sympathetic to the scale of surrounding buildings, avoids expanses of blank walls and includes features that contribute to an attractive streetscape.	**AO7.1** The maximum length of any unarticulated wall is 15m, without a change in plane of at least 0.75m.
	AO7.2 Landscaping is provided along the street frontage, including substantive planting along at least 50% of the length of the frontage.
PO8 Streetscape treatments and street trees are provided along the street frontage to create a visually cohesive precinct and enhance pedestrian amenity.	No acceptable outcome is nominated.
PO9 Building caps and rooftops create an attractive roofscape and screen plant and equipment.	No acceptable outcome is nominated.
PO10 Built form maximises use of natural ventilation, solar heating/cooling and water conservation through building orientation and design, landscaping, building materials and on-site infrastructure.	No acceptable outcome is nominated.

Table 6.3.6.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Crime prevention through environmental design	
PO11 Development facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building design that promotes safety; (c) adequate lighting; (d) appropriate signage and wayfinding; (e) minimisation of entrapment locations; and (f) building entrances, loading and storage areas that are well lit and lockable after hours. **Editor's note—**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.

Table 6.3.6.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Accessibility	
PO12 Convenient and legible connections are provided for pedestrians and cyclists to the site, particularly having regard to linkages with existing and proposed public transport infrastructure, the open space network, centres and other community-related activities.	No acceptable outcome is nominated.

Table 6.3.6.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Amenity	
PO13 Development minimises impacts on surrounding land and provides for an appropriate level of amenity within the centre, having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) visual impact; (e) signage; (f) odour and emissions; (g) lighting; (h) access to sunlight; (i) privacy; and (j) outlook.	No acceptable outcome is nominated.
PO14 Where provided, outdoor lighting does not adversely affect the amenity of adjoining properties or create a traffic hazard on adjacent roads.	**AO14.1** Light emanating from any source complies with *Australian Standard AS 4282 Control of the Obtrusive Effects of Outdoor Lighting*.
	AO14.2 Outdoor lighting is provided in accordance with *Australian Standard AS 1158.1.1 – Road Lighting – Vehicular Traffic (Category V) Lighting – Performance and Installation Design Requirements*.
PO15 Refuse storage areas and storage of goods or materials in open areas is presented in a manner that does not detract from the visual amenity of the local area.	**AO15** The open area used for the storage of refuse, vehicles, machinery, goods and materials used on the site is: (a) located no closer than 3m from any boundary; and (b) are screened from view by a 1.8m high solid screen fence.
PO16 On-site landscaping is provided to: (a) enhance the appearance of the development, particularly in parking and service areas and in public spaces; (b) to contribute to pedestrian comfort through shade; and (c) to screen servicing components.	No acceptable outcome is nominated.

Table 6.3.6.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Protection of natural values	
PO17 The site layout, size and design responds sensitively to on-site and surrounding topography, drainage patterns and ecological values by: (a) minimising earthworks; (b) maximising retention of natural drainage patterns; (c) ensuring existing drainage capacity is not reduced; (d) maximising the retention of existing vegetation; and (e) providing buffers to protect the ecological functions of waterways; and protects environmental values and water quality objectives of receiving waters. **Editor's note—**The environmental values and water quality objectives are established under the Environmental Protection (Water) Policy (2009). For Townsville, they are specified in the Ross River Basin Environmental Values and Water Quality Objectives 2012 and Black River Basin Environmental Values and Water Quality Objectives (2012).	No acceptable outcome is nominated.

Table 6.3.6.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Domain Central precinct	
PO18 Domain Central is not substantially expanded to include further shops or shopping centres.	No acceptable outcome is nominated.
PO19 Development is consistent with the height of existing buildings in the area.	**AO19** Building height does not exceed 3 storeys.
PO20 Buildings create an attractive, safe and pleasant pedestrian-focussed environment along street frontages.	No acceptable outcome is nominated.

Table 6.3.6.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Fulham Road medical precinct	
PO21 Development creates a medium-rise environment with the highest built form, scale and intensity centred on the hospital, and built form stepping down to a low-rise environment at the eastern and western edges of the precinct.	**AO21** Development occurs in accordance with building heights shown on Figure 6.119 — Fulham Road medical precinct concept plan.
PO22 Development has a direct nexus with the hospital or other medical uses within the precinct. The type and scale of retail and other commercial development does not compromise the intended role or successful functioning of the CBD, district or major centres.	No acceptable outcome is nominated.
PO23 Development provides an active interface at the street level.	**AO23.1** Buildings are oriented to all street frontages and have points of entry visible to each street frontage.
	AO23.2 Non-residential uses occur at the street level where shown as a primary or secondary active frontage on Figure 6.119 — Fulham Road medical precinct concept plan.
	AO23.3 Development provides outdoor seating and dining along the primary active frontage.
	AO23.4 Development involving the expansion of the Mater Hospital provides a formal entrance along Park Street.
PO24 Building setbacks: (a) assist in defining key activity areas; (b) create a well-defined edge to the street; and (c) provide a soft edge to the adjoining parkland.	**AO24.1** Buildings setbacks at ground level are in accordance with Figure 6.119 — Fulham Road medical precinct concept plan.
	AO24.2 Buildings built to 6 storeys are setback 20m from any property boundary.
PO25 Development provides protection from the weather for pedestrians along the frontage of the site.	**AO25** Development provides a 3m wide awning along the frontage of the site where identified on Figure 6.119 — Fulham Road medical precinct concept plan as having either a primary or secondary active frontage.
PO26 Private open space is located and oriented to allow passive surveillance of the street.	**AO26** Residential uses above the street level incorporate balconies and are setback 3m to the building wall. Figure 6.120 — Residential uses above street level illustrates.

Figure 6.119 – Fulham Road medical precinct concept plan

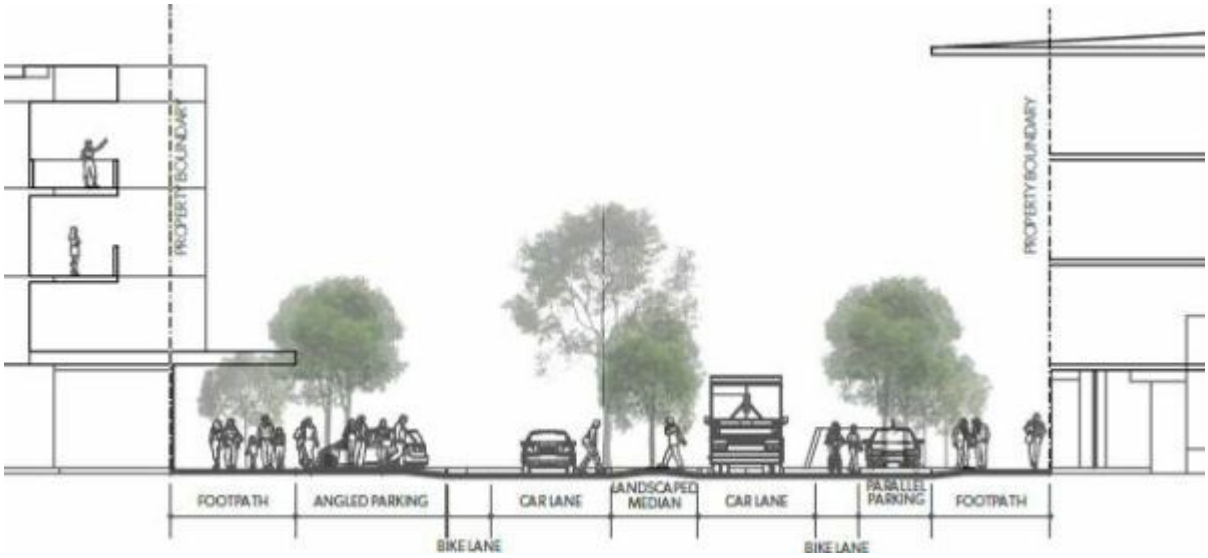


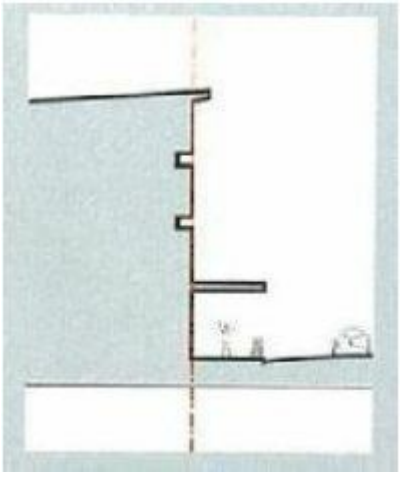
Figure 6.120 – Residential uses above street level

PO27 Development facilitates clear and safe pedestrian links between Anderson Park and Fulham Road.	No acceptable outcome is nominated.
PO28 Parking and access are consolidated and do not dominate the street frontage.	**AO28.1** Parking is provided within or behind buildings and is screened so that it is not visible from the street.
	AO28.2 Development does not obtain access to Fulham Road between Diprose Street and Thomas Street.
PO29 Where possible, development provides shared access and parking with adjoining uses.	No acceptable outcome is nominated.
PO30 Where development has a common boundary with Anderson Park, opportunities for overlooking and casual surveillance to the Park are created through the orientation of buildings and private open space.	No acceptable outcome is nominated.

Table 6.3.6.3—Assessable development (Part)

Performance outcomes	**Acceptable outcomes**
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Bayswater Road medical precinct	
PO31 Development creates a medium-rise environment with the highest built form, scale and intensity centred on the hospital.	**AO31** The maximum building height is in accordance with Figure 6.121 — Bayswater Road medical precinct concept plan.
PO32 Development has a direct nexus with the hospital or other medical uses within the precinct. The type and scale of retail and other commercial development does not compromise the intended role or successful functioning of the CBD, district or major centres.	No acceptable outcome is nominated.
PO33 Buildings are oriented to the street frontages and have points of entry visible to each street frontage.	No acceptable outcome is nominated.
PO34 Development provides an active and pedestrian-friendly interface at the street level.	**AO34.1** Non-residential uses occur at the street level.
	AO34.2 Where development has an active frontage identified in Figure 6.121 — Bayswater Road medical precinct concept plan: (a) buildings are built to the street boundary; and (b) development provides a 3m wide awning over the footpath. Figure 6.122 — Buildings built to the frontage illustrates.

Figure 6.121 – Bayswater Road medical precinct concept plan



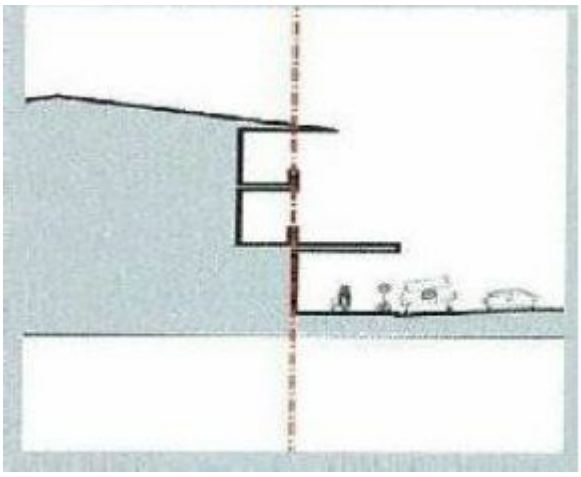


Figure 6.122 – Buildings built to the frontage

PO35 The primary pedestrian entrance to the Mater hospital is oriented to Oxford Street and the Oxford Street/Regent Street intersection.	No acceptable outcome is nominated.
PO36 Development facilitates a direct pedestrian connection from Bayswater Road through the Mater hospital site to the Oxford and Regent Street intersection.	No acceptable outcome is nominated.
PO37 Development on the hospital site facilitates the consolidation of parking within a centralised parking facility.	No acceptable outcome is nominated.

Table 6.3.6.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
James Cook University-Townsville Hospital precinct	
PO38 Development is generally in accordance with the land use allocations shown in Figure 6.123 — James Cook University- Townsville Hospital centre strategy plan and is consistent with the following intentions: (a) Townsville Hospital sub-precinct — development facilitates the efficient operation of Townsville's major hospital and ensures integration of the hospital and university campuses into a seamless urban centre; (b) Discovery Central sub-precinct — development creates a vibrant community heart containing the most intensive mix of uses; (c) Enterprise Village sub-precinct— development facilitates the establishment of knowledge businesses and industries; (d) Academic Core sub-precinct — development facilitates continued operation and expansion of educational purposes; (e) University Village sub-precinct and College sub-precinct — development facilitates student accommodation; (f) Discovery School sub-precinct — development facilitates the establishment of a new high school; (g) Discovery Village sub-precinct — development creates a mixed density residential community which has strong links to the university and hospital; and (h) Green Space sub-precinct — accommodates natural areas within the centre including watercourses, environmental areas and corridors, parks and sport and recreation area.	No acceptable outcome is nominated. **Editor's note—**The first stage of Discovery Village may develop as a pioneer project to demonstrate the sustainability principles sought.
PO39 The land use mix and scale of development have a direct nexus with, and enhance, the knowledge community focus.	No acceptable outcome is nominated.
PO40 The community is well-connected internally and to the wider city by active and public transport.	No acceptable outcome is nominated. **Editor's note -** Future growth of the precinct will increase transport demand. In order to support development in this precinct, and the preferred pattern of development in Townsville as a whole, improved public transport to this precinct will be necessary. Planning has identified the need to preserve a potential route for a rapid bus transit corridor and identify potential sites for Townsville Hospital and James Cook University Bus Stations.

PO41 Development exemplifies leadership in economic, social and environmental sustainability.	No acceptable outcome is nominated. **Editor's note—**For guidance, refer to Discovery Rise Design Guidelines adopted by the place making panel established for James Cook University (JCU).
PO42 Development is well-designed at the precinct, street, public space and building scales.	No acceptable outcome is nominated. **Editor's note—**For guidance, refer to Discovery Rise Design Guidelines adopted by the place making panel established for James Cook University (JCU).
PO43 Development is well planned and orderly, and within the capacity of available infrastructure.	No acceptable outcome is nominated. **Editor's note—**Council will request that an area/precinct scale structure plan — comprising land use, infrastructure, staging, urban design and implementation - is prepared and agreed to by the place making panel established for JCU before development takes place.
PO44 Development does not extend in to areas of landslip or bushfire risk, high scenic amenity or local, regional or state ecological significance.	No acceptable outcome is nominated.

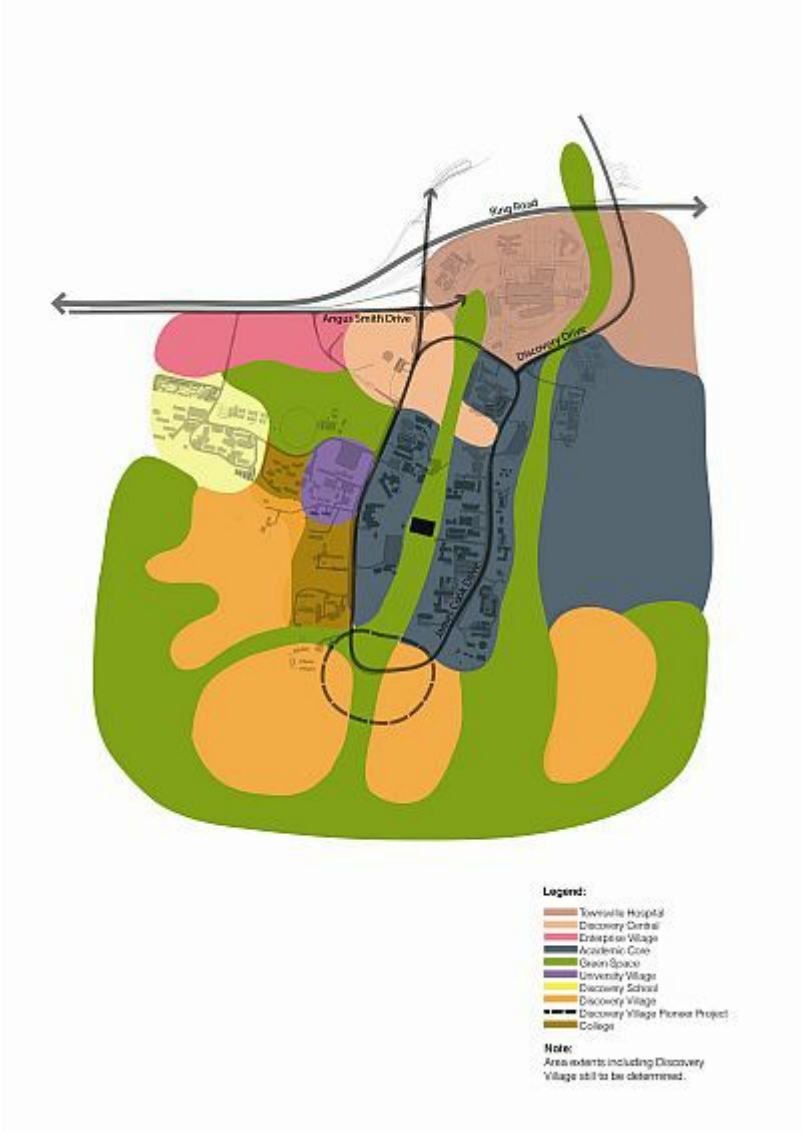
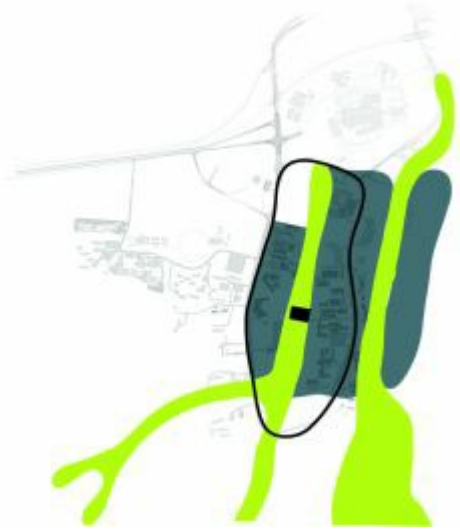


Figure 6.123 – James Cook University-Townsville Hospital centre strategy plan

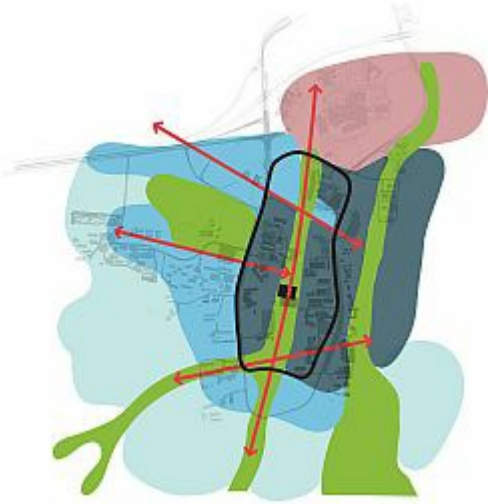
PO45 Development complies with and advances the design concepts set out in Figure 6.124 – James Cook University-Townsville Hospital precinct development concepts.	No acceptable outcome is nominated.

1. **Axes**
Original axes/view lines from Birell's 1964 Master Plan.

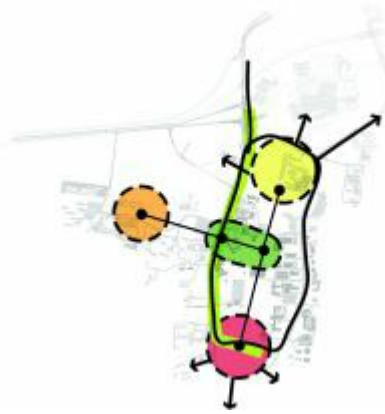
2. **Academic Core**
This needs to be retained as the heart of Discovery Rise.



3. **Connect Academic Core to New Uses:**
Existing campus axes from 'key connectors' linking new development around academic core into the heart of the campus.
Denser development closer to the academic core.



4. **Hubs Interconnected**
Create 'hubs' of mixed academic and new uses.



5. **Public Spaces**
Public spaces are located along 'key connectors', in the centre of significant hubs.

6. **Density**
Create greatest density along 'key connectors' streets, pedestrian pathways and public spaces.

7. **Pedestrian and Cycle Paths**
Create an interconnected network of paths and bike routes emphasising linkages into the campus heart and academic core. These paths are cool, shaded and green.

8. **Road Network**
James Cook Drive as primary circulating street, slower speed, shady street environments for east-west connecting streets. New street to link to existing neighbouring suburban development to the west.

9. **Public Transport**
Existing bus and taxi set down areas on Mt Stuart Street, at Discovery Village and at Discovery School. Approximately 10-20m wide corridor to be reserved for a future rapid bus transit corridor and associated Townsville Hospital and James Cook University Bus Stations, to be determined through collaborative planning between Townsville Hospital, James Cook University, Department of Transport and Main Roads and Townsville City Council.

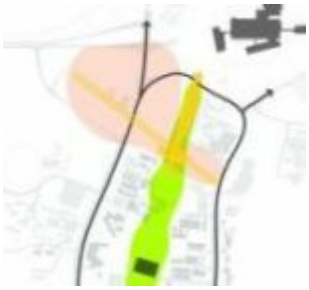
Figure 6.124 - James Cook University-Townsville Hospital precinct development concepts

Table 6.3.6.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Discovery Central sub-precinct	
PO46 Development accommodates the primary structural elements shown in Figure 6.125 — Discovery Central primary elements.	No acceptable outcome is nominated.

1. Pedestrian Paths

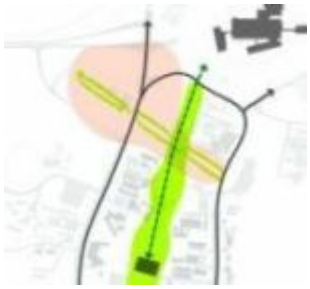
2. Road Linkages



3. Public Spaces

4. Frontage Treatment

5. Shading



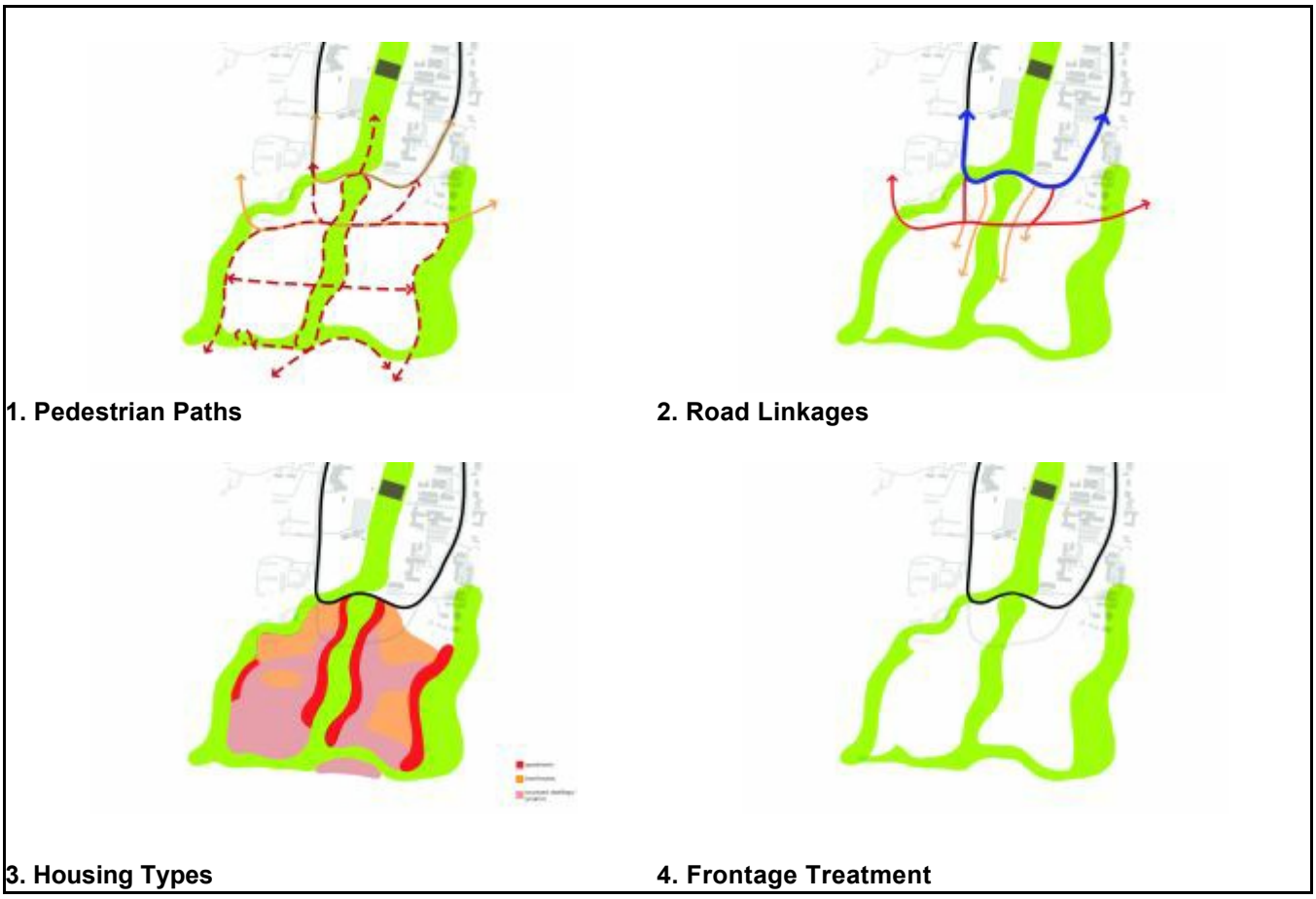
6. Greenspace Corridors

7. View and Connection Axes

Figure 6.125 – Discovery Central primary elements

Table 6.3.6.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Discovery Village sub-precinct	
PO47 Development accommodates the primary structural elements shown in Figure 6.126 — Discovery Village primary elements.	No acceptable outcome is nominated.



1. Pedestrian Paths

2. Road Linkages

3. Housing Types

4. Frontage Treatment

Figure 6.126 – Discovery Village primary elements

PO48 Development occurs at medium densities that optimise public transport and walkability, and sustainable living.	**AO48** Dwelling density within the precinct achieves a minimum net residential density of 30 dwellings per hectare.

6.3.7 Mixed use zone code

6.3.7.1 Application

This code applies to assessing a development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.3.7.2 Purpose

(1) The purpose of the Mixed use zone code is to provide for a mixture of development that may include service industry, business, retail, residential, tourist accommodation and associated services and low impact industrial uses.

(2) The particular purpose of the code is to guide a range of activities which create an attractive mixed business and living environment and which do not compromise the principal centre (CBD), district or major centres.

(3) The purpose of the zone will be achieved through the following overall outcomes:

- (a) this zone accommodates small to medium-sized pockets and corridors of mixed use development throughout Townsville, which are generally close to centres, significant entry points, and providing interface between residential, commercial, retail or industrial uses;
- (b) mixed use areas do not compromise the intended role or successful functioning of other centres. They do not contain full line supermarkets, discount department stores or department stores;
- (c) unless otherwise stated for a particular precinct, the areas in this zone evolve to contain a wider mix of medium density residential uses as well as dining, convenience shops and specialty retailing, small-scale office uses, professional services, and service and low impact industries;
- (d) uses such as showrooms and outdoor sales may occur in the zone, other than within the Breakwater precinct. Where they occur, showrooms are located and designed so that they contribute to the attractiveness, pedestrian focus and continuity of the streetscape;
- (e) built form and landscaping create an attractive, pedestrian oriented streetscape, and visual amenity along major roads is improved;
- (f) mixed use areas identified along major roads are designed to encourage a consolidation of built form and activities, access points and signage. Commercial strip development does not extend beyond the zoned mixed use land along major roads;
- (g) where they occur, residential uses are designed to minimise adverse impacts on occupants as a result of noise and other characteristics of the local environment;
- (h) development facilitates improved accessibility by walking, cycling and public transport. Along major roads, access is managed to avoid conflict points and to give priority to pedestrian and cyclist movements;
- (i) design of built form and public spaces facilitates safe and secure environments and discourages antisocial behaviour;
- (j) development is designed and operated to minimise adverse impacts on the amenity of surrounding residential neighbourhoods; and
- (k) opportunities for energy efficiency through built form are maximised.

Editor's note—To remove any doubt, each development site does not need to contain a mixed use development.

(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts.

Magnetic Island villages precinct:

(a) development within this precinct supports the consolidation of retail, business, and service industry activities in dedicated activity nodes for residents and visitors to the various townships around Magnetic Island; and

(b) new buildings and streetscape treatments are in a design style that builds local character by articulation of buildings, incorporating extensive planting and the use of a variety of materials and finishes.

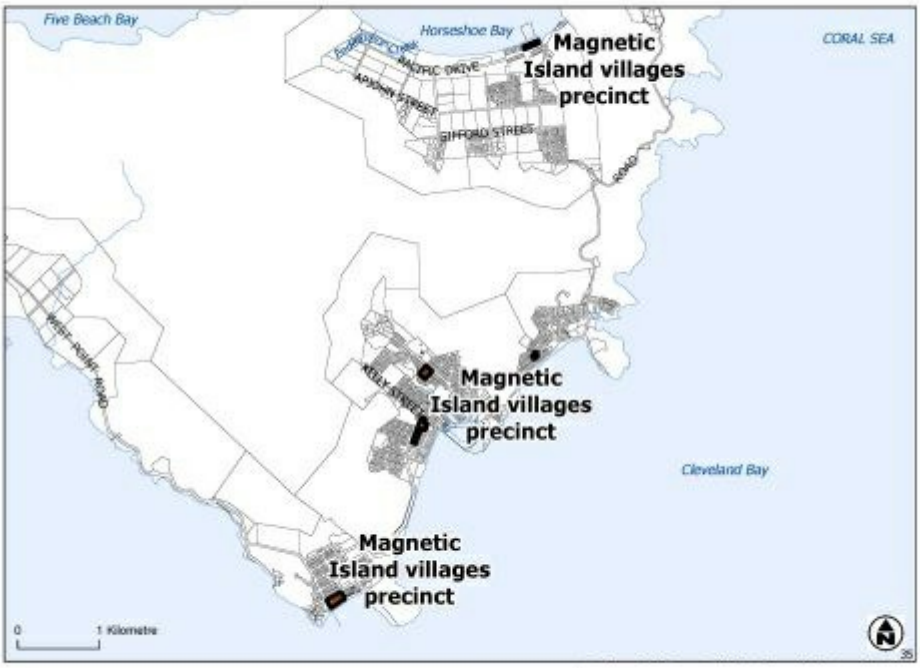


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Figure 6.127 - Magnetic Island villages precinct

Nelly Bay sub-precinct:

(i) a range of tourist and residential uses is provided, including:

(A) the continuation of small-scale retail and other uses which support tourism; and

(B) island-style low-rise medium density residential and short-term accommodation close to tourist uses.

(ii) buildings within the precinct are low-rise (up to 2 storeys in building height) and the scale and massing of buildings limits the impact on the natural character of Magnetic Island.

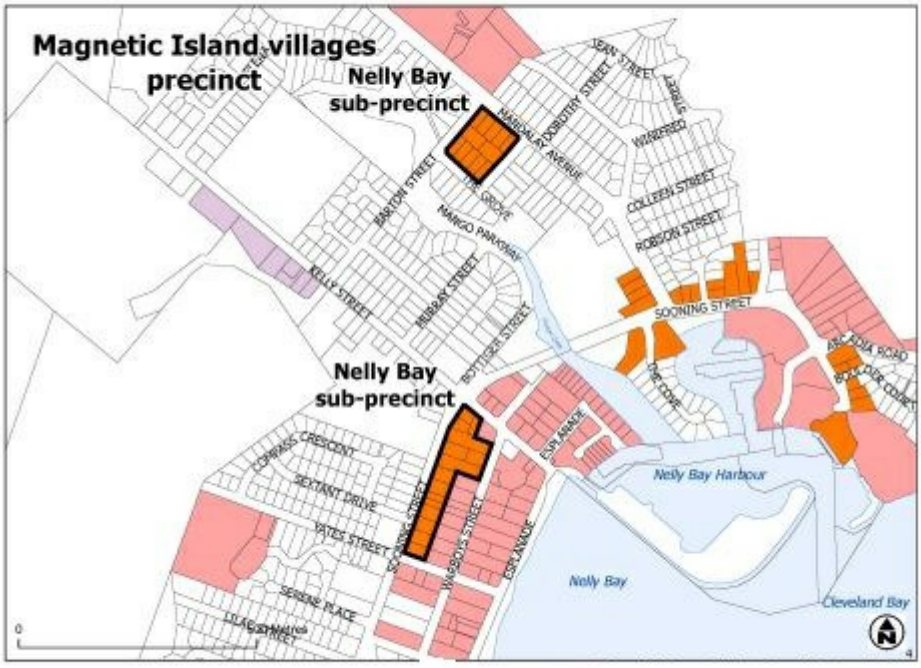

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Figure 6.128 - Nelly Bay sub-precinct

Picnic Bay sub-precinct:

(i) development supports tourism activities and contributes to the revitalisation of existing retail and food related uses including:

  (A) cafes and restaurants; and

  (B) the consolidation of new tourist and retail uses, in the vicinity of the hotel and the jetty/promenade.

(ii) buildings within the precinct are low-rise (up to 3 storeys in building height) and the scale and massing of buildings limits the impact on the natural character of Magnetic Island.

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Figure 6.129 - Picnic Bay sub-precinct

Horseshoe Bay sub-precinct:

(i) development supports the ongoing tourism focus in this location, facilitating the consolidation of retail, office and tourist activity. Short-term accommodation occurs in a ‘shop-top’ format; and

(ii) buildings within the precinct are low-rise (up to 2 storeys in building height) and the scale and massing of buildings limits the impact on the natural character of Magnetic Island.

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Figure 6.130 - Horseshoe Bay sub-precinct

Nelly Bay gateway precinct:

(a) development supports the creation of a gateway within proximity to the primary entrance point to Magnetic Island, at the Nelly Bay ferry terminal;

(b) local tourism-related and other retail and commercial uses and services are encouraged to establish in this precinct;

(c) development creates a strong relationship with Sooning Street and Mandalay Avenue, by sleeving the roads with buildings that are oriented to the street and screening parking areas behind;

(d) buildings within the precinct are low-rise (up to 3 storeys in building height) and the scale and massing of buildings limits the impact on the natural character of Magnetic Island; and

(e) new buildings and streetscape treatments are in a design style that builds local character by articulation of buildings, incorporating extensive planting and the use of a variety of materials and finishes.

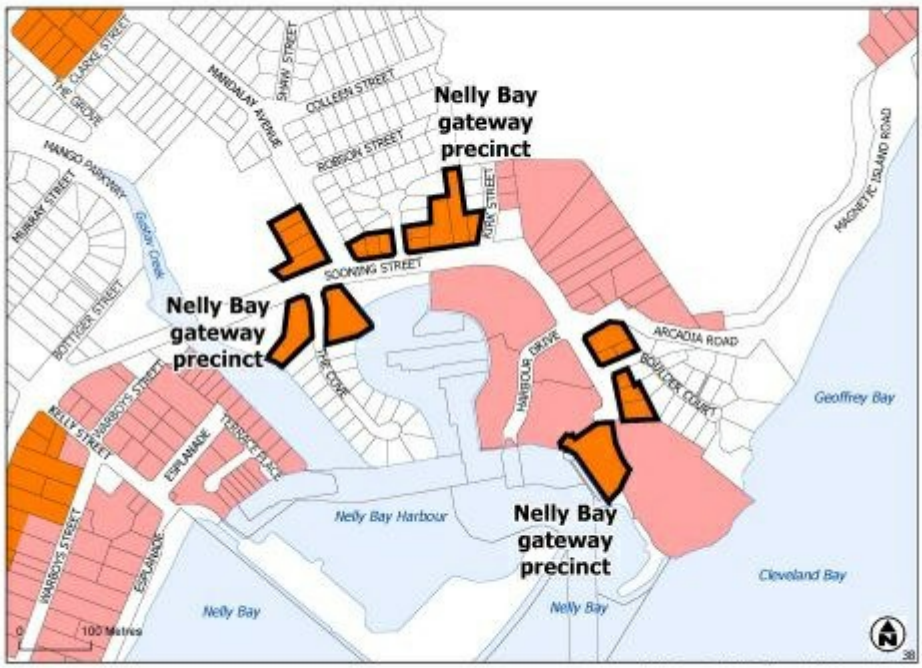

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Figure 6.131 - Nelly Bay gateway precinct

Arcadia Central precinct:

(a) development facilitates the transformation of the precinct as a defined local centre of activity for Arcadia including uses such as shops, small offices, medium density residential and tourist accommodation;

(b) development creates a strong relationship with Marine Parade and Armand Way, by sleeving the precinct with buildings that are oriented to the street and screening parking areas behind;

(c) development incorporates central community space with road frontage, located opposite the beach. Pedestrian connections are provided to surrounding uses such as the restaurants and cafes;

(d) buildings within the precinct are low-medium rise (up to 4 storeys in building height) and the scale and massing of buildings limits the impact on the natural character of Magnetic Island; and

(e) new buildings and streetscape treatments are in a design style that builds local character by articulation of buildings, incorporating extensive planting and use of a variety of materials and finishes.

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Figure 6.132 - Arcadia Central precinct

Kirwan Traders precinct:

(a) small-scale commercial buildings are established, to provide space to incubate small, locally-based businesses;

(b) built form and streetscape treatments in this area contribute to a distinct character as a business hub, in particular on the frontages of Tavern Street, Carlton Street, Castlemaine Street and Burnda Street; and

(c) buildings within the precinct are generally low-medium rise and create a sensitive transition in scale from the surrounding neighbourhood.

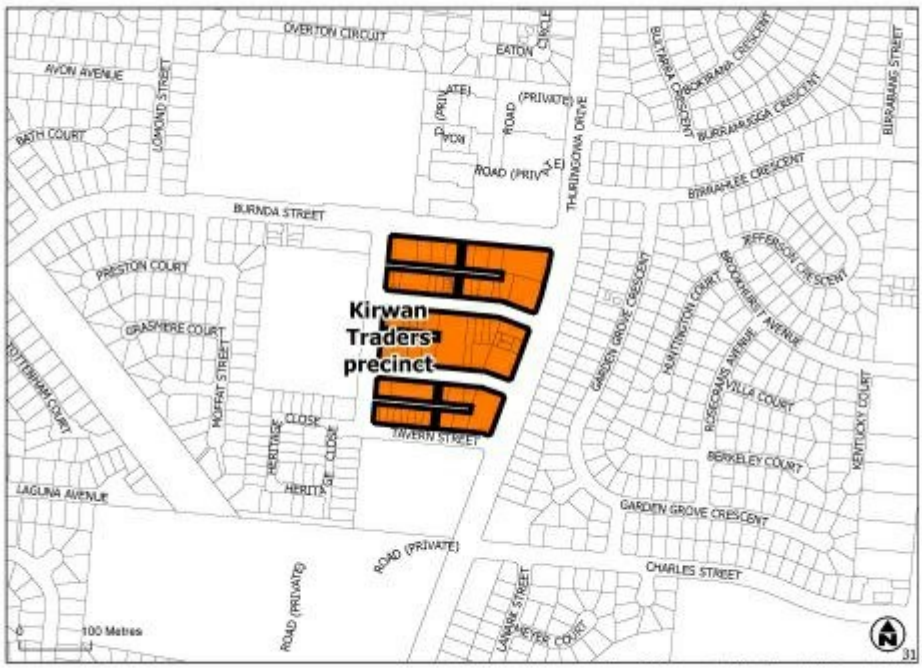

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Figure 6.133 - Kirwan Traders precinct

Charters Towers Road business precinct:

(a) built form and streetscape treatments in this area combine to create a distinct character as a business hub, in particular on the frontages of Woolcock Street, Charters Towers Road and Somer Street;

(b) development at the intersection of Charters Towers Road and Woolcock Street is appropriately treated and designed to serve as a significant gateway feature;

(c) new development located along the frontage of Charters Towers Road supports a transition to new and well-designed commercial activities, including small-scale offices and local service businesses;

(d) residential uses occur in this precinct where they do not restrict or impact on the intended industrial and commercial activities; and

(e) buildings within the precinct are generally low-medium rise and create a sensitive transition in scale from the surrounding neighbourhood.

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Figure 6.134 - Charters Towers Road business precinct

CBD gateway precinct:

(a) this precinct provides for an emerging employment and business area in proximity to, and supporting the development of the principal centre (CBD). Uses in the precinct are intended to include service and low impact industrial uses, convenience shopping and showroom activities;

(b) offices occur where ancillary to industrial uses on the site;

(c) residential uses occur within this precinct where they do not restrict or impact on the intended industrial and commercial activities;

(d) Flinders Street (West) is reinforced as a significant gateway to the principal centre (CBD);

(e) the location of convenience shopping assist in reinforcing key intersections along Flinders Street (West); and

(f) improved pedestrian linkages to the principal centre (CBD) and Ross Creek are created.

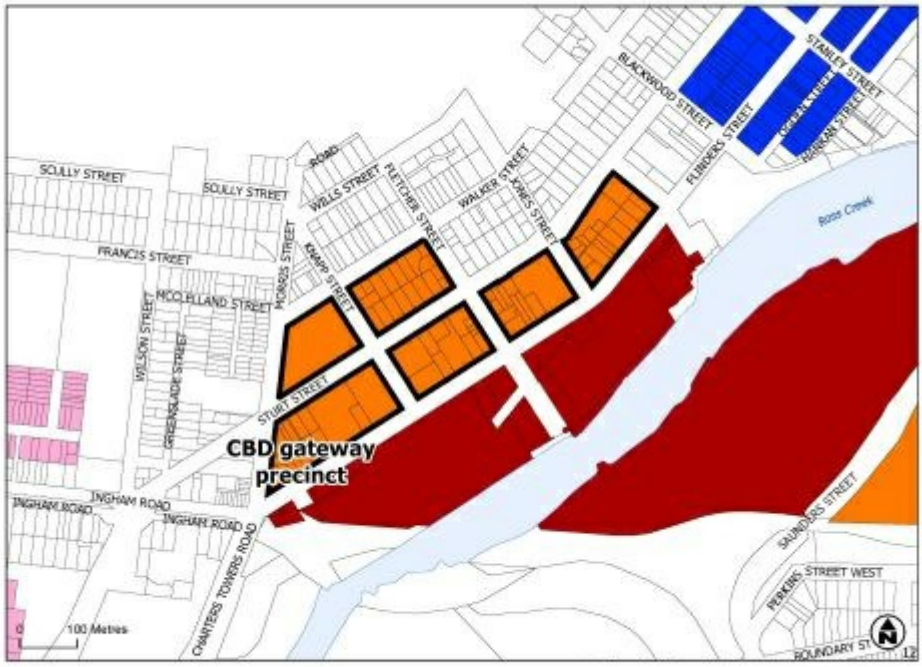

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Figure 6.135 - CBD gateway precinct

South Townsville Railyards and Dean Park precinct:

(a) the South Townsville Railyards and Dean Park present a significant opportunity for the delivery of future strategic infrastructure and ‘city making’ facilities for the whole of Townsville;

(b) the current use of the South Townsville Railyards site is protected until such time as these uses are relocated or become redundant. At that time, redevelopment of this area facilitates:

  (i) the provision of a city centre based sports stadium within an urban setting that relies on a nexus with public transport access;

  (ii) the redevelopment of Dean Park to create a usable parkland of approximately half its current size;

  (iii) the provision of an entertainment and convention centre on the other half of the Dean Park site; and

  (iv) the provision of a bus layover and driver facilities;

(c) interim uses do not compromise the future development of the land;

(d) new development is located and designed to be well-connected to the principal centre (CBD) and nearby high density residential areas;

(e) servicing and loading facilities in new development are considered within the overall design minimising impacts on surrounding residential uses and public spaces;

(f) the intended major facilities may be supported by a mix of complementary uses including service and low impact industry, office, retail and showroom activities, and residential uses, in a low to medium-rise built form; and

(g) Development of a commercial nature is not of a type or size that detracts from the function of the principal centre (CBD), district centres or major centres.

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Figure 6.136 - South Townsville Railyards and Dean Park precinct

Wotton Street precinct:

(a) the precinct provides for a transition between service and low impact industries to the north and the mixed use area to the south adjoining Ross River Road;

(b) residential uses occur in this precinct where they do not restrict or impact on the intended industrial and commercial activities and where they are located above ground storey non-residential uses; and

(c) buildings within the precinct are generally low-medium rise and create a sensitive transition in scale from the surrounding neighbourhood.

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Figure 6.137 - Wotton Street precinct

Breakwater precinct:

(a) the Breakwater precinct accommodates ongoing use and further development of residential, tourism and entertainment uses;

(b) the precinct will grow to establish a landmark high quality accommodation and entertainment destination for Townsville's tourists and residents;

(c) development includes the establishment of a new marina and waterfront pathway on the seaward side of the point, dining, boat club, local convenience facilities and tourist activities, as well as short and long-term accommodation. The precinct does not contain low impact industries other than where there is a nexus with a future marina or boat club;

(d) pedestrian access is focussed on a waterfront pathway, and includes integrated pedestrian pathways providing a high level of permeability throughout the precinct;

(e) development facilitates the consolidation of the casino and allied uses as a highly significant destination for Townsville. Should the Townsville Entertainment Centre re-locate, redevelopment of this site occurs which:

  (i) facilitates a range of activities including short-term accommodation, markets and a new boat club;

  (ii) integrates private and public transport options;

  (iii) enables reuse of existing surface parking areas; and

(f) short-term or permanent high density residential accommodation, is predominant in the central and western part of the precinct. Where adjoining the future marina, uses at the ground floor include local dining and shops.

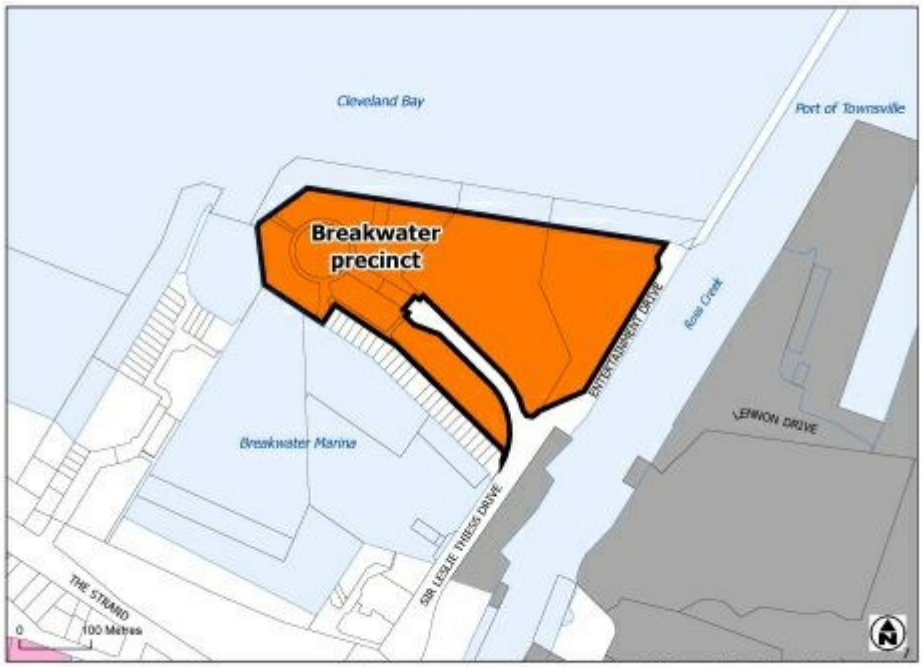

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Figure 6.138 - Breakwater precinct

King Street quarter precinct:

(a) the precinct provides for a revitalised tourism and education based destination in proximity to the principal centre (CBD), and functions as a focus point of activity between the CBD and the Breakwater precinct;

(b) development facilitates the establishment of allied educational uses such as a centre of excellence for marine studies;

(c) the precinct also includes high quality accommodation, dining and entertainment facilities. Residential uses are focused in the pocket of land bounded by Wickham and King Streets;

(d) development protects and respects the values of heritage buildings in the precinct, including the Queens Hotel;

(e) pedestrian permeability is improved through the provision of linkages through and between development sites, and through the continuation of a waterfront pathway along Ross Creek;

(f) improved vehicle circulation and visual links between the CBD, the King Street quarter precinct and the Breakwater precinct are created; and

(g) new parkland is established at the southern end of Anzac Park, and a new pedestrian and visual link across Ross Creek is created in line with the southern end of The Strand.

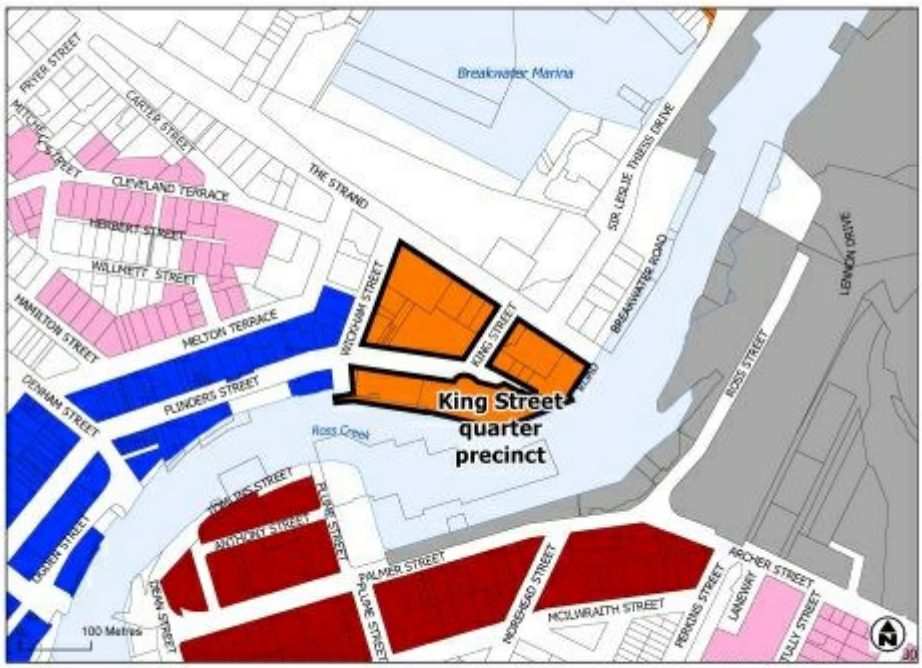

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Figure 6.139 - King Street quarter precinct

Kings Road precinct:

(a) redevelopment facilitates a change in focus for the area to include medium density residential uses and a range of smaller scale retail, dining and entertainment activities that contribute to the area's day and night-time vibrancy;

(b) the precinct plays a support role to the Hyde Park major centre in accommodating non-residential uses;

(c) development creates a medium-rise built form, with variation in built form to create visual interest across the precinct;

(d) the interface with the lake is enhanced through building frontages which orientate towards the lake and contain active uses at street level; and

(e) impacts on residential amenity from the rail corridor and showgrounds are minimised.

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Figure 6.140 - Kings Road precinct

6.3.7.3 Assessment benchmarks

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
PO1 Where provided, outdoor lighting does not adversely affect the amenity of adjoining properties or create a traffic hazard on adjacent roads.	**AO1.1** Light emanating from any source complies with *Australian Standard AS 4282 Control of the Obtrusive Effects of Outdoor Lighting*.
	AO1.2 Outdoor lighting is provided in accordance with *Australian Standard AS 1158.1.1 –Road Lighting – Vehicular Traffic (Category V)* *Lighting – Performance and Installation Design Requirements*.
PO2 Residential uses within the centre do not interrupt the continuity of the streetscape or the active, pedestrian focus of the street frontage.	**AO2** Any residential uses are located above or behind ground storey retail, commercial or community uses.
PO3 Residential uses within the centre are provided with a reasonable level of privacy.	**AO3.1** Windows, balconies, and terraces of a dwelling unit are screened where overlooking a habitable room or private open space of another dwelling within 9m.
	AO3.2 Screening is a solid translucent screen or perforated panels or trellises which have a maximum of 50% openings.
PO4 Residential uses within the centre are provided with a reasonable level of private outdoor living space.	**AO4** Dwellings are provided with private open space or a balcony directly accessible from a habitable room with: (a) a minimum area of 9m^2; (b) a minimum dimension of 3m; and (c) clear of any utilities such as gas, water tanks and air conditioning units.

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Role and function	
PO5 The type and scale of retail and other commercial development does not compromise the intended role or successful functioning of other centres.	No acceptable outcome is nominated. **Editor's note—**Applicants should have regard to Economic impact assessment planning scheme policy SC6.5 for guidance on how to demonstrate compliance with this performance outcome.

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Built form	
PO6 Built form is generally low to medium rise.	**AO6** All buildings and structures do not exceed 3 storeys in building height, except where stated otherwise for a particular precinct.
PO7 Built form provides for a sensitive transitioning in height and scale from surrounding land uses.	No acceptable outcome is nominated.
PO8 Development contributes to an attractive, coherent and integrated streetscape, by: (a) ensuring buildings assist in defining and enclosing the street frontage; (b) improving the continuity of built form; and (c) using complementary landscaping and streetscape treatments.	No acceptable outcome is nominated.
PO9 Built form is designed to: (a) create a pedestrian rather than car oriented street frontage; (b) break down the facade into finer scaled components; and (c) avoid large expanses of blank walls oriented to the street.	**AO9.1** Buildings are built to the street frontage and provide an awning over the full width of the footpath, except where stated otherwise for a particular precinct.
	AO9.2 Parking is provided to the side or the rear of buildings or below ground level, and is not located along the street frontage.
	AO9.3 Entrances to buildings face the street and any public space to which the building has frontage.
	AO9.4 The maximum length of any unarticulated wall is 15m, without a change in plane of at least 0.75m.
	AO9.5 At the ground storey, a minimum of 65% of building frontage is provided as predominantly transparent windows or glazed doors and a maximum of 35% as solid facade.
PO10 Building caps and rooftops create an attractive roofscape and screen plant and equipment.	No acceptable outcome is nominated.
PO11 Built form maximises use of natural ventilation, solar heating and cooling and water conservation through building orientation and design, landscaping, building materials and on-site infrastructure.	No acceptable outcome is nominated.

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Crime prevention through environmental design	
PO12 Development facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building design that promotes safety; (c) adequate lighting; (d) appropriate signage and way finding; (e) minimisation of entrapment locations; and (f) building entrances, loading and storage areas that are well lit and lockable after hours. **Editor's note—**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Accessibility	
PO13 Wherever practicable, vehicular access is provided from rear or side streets or facilitates the amalgamation of access points.	No acceptable outcome is nominated.
PO14 Convenient and legible connections are provided for pedestrians and cyclists to the site, particularly having regard to linkages with existing and proposed public transport infrastructure, the open space network, centres and other community-related activities.	No acceptable outcome is nominated.
PO15 New development provides for safe vehicular and pedestrian access and efficient operation of surrounding roads.	**AO15** Either: (a) development provides no net increase in driveway crossovers; or (b) lots are consolidated to gain access from a minor or lower-order road, except where stated otherwise for a particular precinct.

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Amenity	
PO16 Development minimises impacts on surrounding land and provides for an appropriate level of amenity within the site, having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) visual impact; (e) signage; (f) odour and emissions; (g) lighting; (h) access to sunlight; (i) privacy; and (j) outlook.	No acceptable outcome is nominated.
PO17 Development is located, designed and operated so that adverse impacts on privacy and amenity on nearby land in a residential zone are minimised.	**AO17.1** Buildings are set back 3m from any boundary shared with a residential zone, or half the height of the part of the building, whichever is the greater.
	AO17.2.1 A 1.8m high solid screen fence is provided along all boundaries shared with a residential zone. AND **AO17.2.2** A landscaped buffer with a minimum width of 3m and consisting of dense screen planting is provided along all boundaries shared with a residential zone.
	AO17.3 Windows that have a direct view into an adjoining residential use are provided with fixed screening that is a maximum of 50% transparent to obscure views and maintain privacy for residents.
PO18 Refuse storage areas, loading/unloading and other service or storage areas are screened from view from the street and adjoining land.	**AO18** Refuse storage areas loading/unloading and other service or storage areas are located to the rear or side of a building and are screened from view by a 1.8m high solid fence.
PO19 On-site landscaping is provided to: (a) enhance the appearance of the development, particularly in parking and service areas and in public spaces; (b) contribute to pedestrian comfort through shade; and (c) screen servicing components.	No acceptable outcome is nominated.

PO20 Streetscape treatments are provided to enhance amenity to contribute positively to the city image, particularly along major roads and streets.	No acceptable outcome is nominated.

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Magnetic Island villages precinct	
PO21 Convenient and legible connections are provided for pedestrians and cyclists to the precinct, particularly having regard to linkages to the bay foreshore, residential areas in the community and the open space network.	No acceptable outcome is nominated.
PO22 Building design and massing is consistent with the low-density scale of the Magnetic Island character and articulates individual buildings.	**AO22** Building height does not exceed 2 storeys, or when in the Picnic Bay sub-precinct 3 storeys.
PO23 Design and articulation of buildings contribute to the creation of the local Magnetic Island character through: (a) climate-responsive design; (b) natural setting of buildings within the landscape; and (c) maximising views to the bay.	No acceptable outcome is nominated.
PO24 The design of buildings in this precinct provides for pedestrian-friendly and visually interesting frontages.	No acceptable outcome is nominated.
PO25 Suitable vegetation screening and treatments are provided within the building setback, to minimise the visual impact of the buildings.	No acceptable outcome is nominated.

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Arcadia Central precinct	
PO26 Development supports the creation of a new community node for Arcadia in accordance with Figure 6.141 — Arcadia Central precinct concept plan.	No acceptable outcome is nominated.

PO27 Frontages shown on Figure 6.141 — Arcadia Central precinct concept plan as having active edges, contain: (a) primary building entrances; (b) awnings to provide shade for pedestrians; (c) significant use of glazing or transparent materials; and (d) uses which promote a high level of pedestrian movement and interaction.	No acceptable outcome is nominated.
PO28 Development on the corner of Marine Parade and Armand Way creates a gateway to Arcadia. Built form, landscape and streetscape treatment at this corner reinforces a gateway statement.	No acceptable outcome is nominated.
PO29 Building height is of a low to medium-rise scale and building massing is consistent with the low density character of Magnetic Island.	**AO29** Building height does not exceed 4 storeys.
PO30 Design and articulation of buildings contribute to the creation of the local Magnetic Island character through: (a) climate-responsive design; (b) natural setting of buildings within the landscape; and (c) maximising views to the bay.	No acceptable outcome is nominated.
PO31 Convenient and legible connections are provided for pedestrians and cyclists to the site, particularly having regard to linkages to the foreshore and the open space network.	No acceptable outcome is nominated.
PO32 Access points are minimised along Marine Parade.	No acceptable outcome is nominated.
PO33 New pedestrian connnections consistent with Figure 6.141 — Arcadia Central precinct concept plan are provided.	No acceptable outcome is nominated.
PO34 Increased public open space and improvements to the public domain are provided throughout the precinct.	No acceptable outcome is nominated.

Figure 6.141 – Arcadia Central precinct concept plan

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Nelly Bay gateway precinct	
PO35 Development in this precinct supports the creation of a high quality activity hub for Nelly Bay and Magnetic Island, in accordance with Figure 6.142 — Nelly Bay gateway precinct concept plan.	No acceptable outcome is nominated.
PO36 Development creates a gateway to Nelly Bay and Magnetic Island. Built form, landscape and streetscape treatment reinforces a key entry point to the village.	No acceptable outcome is nominated.
PO37 Frontages shown on Figure 6.142 — Nelly Bay gateway precinct concept plan as having active edges, contain: (a) primary building entrances; (b) awnings to provide shade for pedestrians; (c) significant use of glazing or transparent materials; and (d) uses which promote a high level of pedestrian movement and interaction.	No acceptable outcome is nominated.
PO38 Streetscaping and landscaping provides increased shade and amenity for pedestrians along roads indicated as having local streetscape treatment on Figure 6.142 — Nelly Bay gateway precinct concept plan.	No acceptable outcome is nominated.
PO39 Building design and massing is consistent with the low density scale and character of Magnetic Island.	**AO39** Building height does not exceed 3 storeys.
PO40 Design and articulation of buildings contribute to the creation of the local Magnetic Island character through: (a) climate-responsive design; (b) natural setting of buildings within the landscape; and (c) maximising views to the bay.	No acceptable outcome is nominated.
PO41 Access arrangements are appropriate for the volume, frequency and type of vehicle usage.	**AO41** Access points are limited to Sooning Street, Mandalay Avenue and The Cove with minimal crossovers.
PO42 Convenient and legible connections are provided for pedestrians and cyclists to the site, particularly having regard to linkages to the ferry terminal, foreshore and the open space network.	No acceptable outcome is nominated.

PO43 Mixed use development contributes to the creation of a waterfront promenade. Figure 6.142 — Nelly Bay gateway precinct concept plan.	No acceptable outcome is nominated.

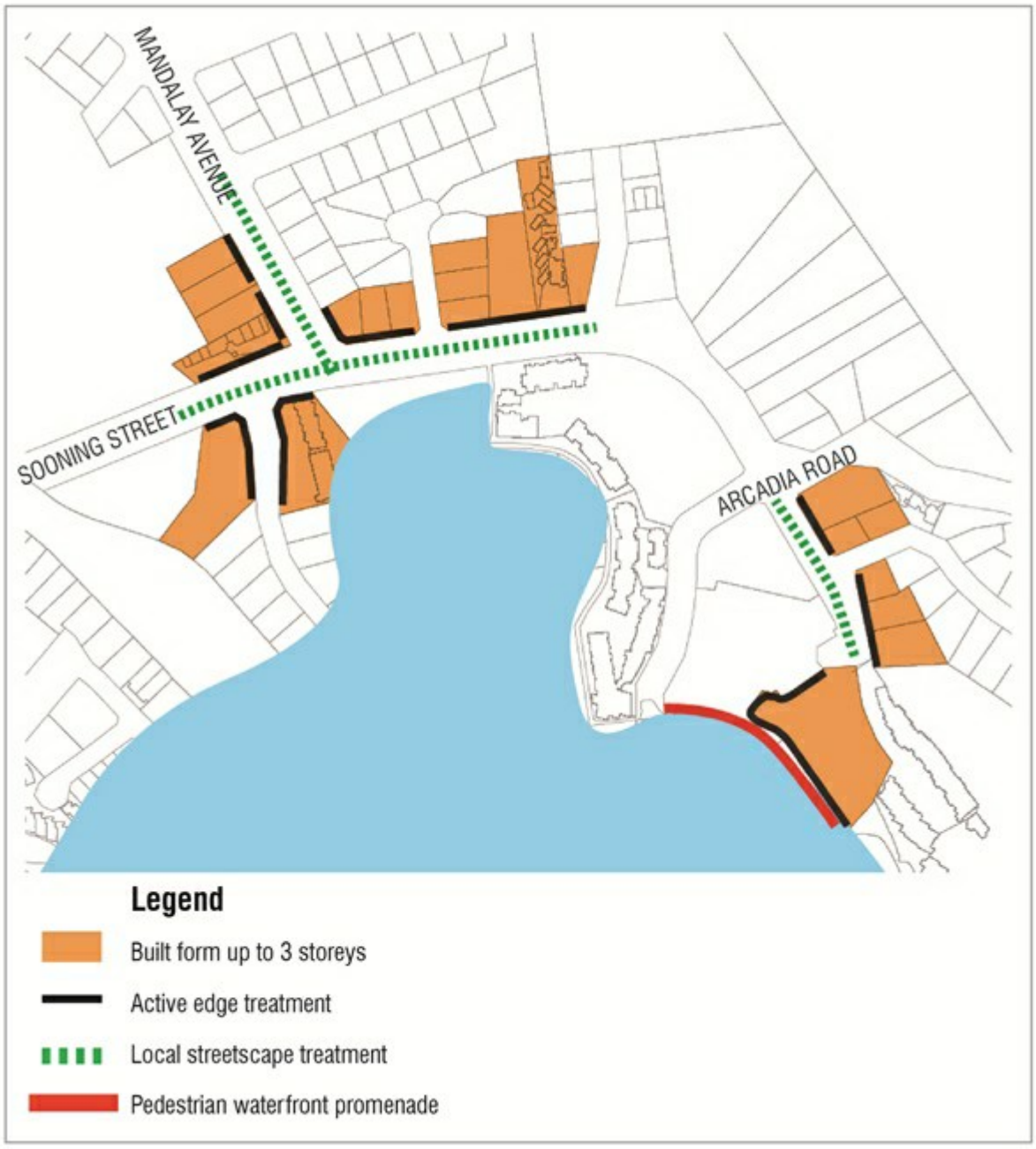

Figure 6.142 – Nelly Bay gateway precinct concept plan

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Kirwan Traders precinct	
PO44 Built form, landscape and streetscape treatment along Thuringowa Drive reinforces the precinct identity as a place for business.	No acceptable outcome is nominated.
PO45 Landscape and streetscape treatments are provided along Tavern Street, Carlton Street, and Laguna Avenue which reflect the intended character of the precinct.	No acceptable outcome is nominated.
PO46 Building size and bulk are consistent with the scale and character of the Kirwan Traders precinct, and retain an appropriate relationship with the established streetscape.	**AO46** Development involves reuse of existing buildings that contribute to the built form character and context of the immediate area.
PO47 Wherever practicable, vehicular access is provided from rear or side streets or facilitates the amalgamation of access points.	**AO47** Access to on-site parking is provided through the rear access lanes connecting to Toohey Street.
PO48 Development on the corner of Thuringowa Road and Burnda Street, and Burnda Street and Toohey Street, creates a gateway to Kirwan Traders precinct. Built form, landscape and streetscape treatment at these corners reinforces a gateway statement.	No acceptable outcome is nominated.
PO49 Development provides mid-block linkages and increased open space for the public on private land, particularly on larger sites and those sites with two street frontages.	No acceptable outcome is nominated.

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note**—Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Charters Towers Road business precinct	
PO50 Development in this precinct supports the transition of the precinct from a predominantly low impact industry area to a mixed business focus.	No acceptable outcome is nominated.
PO51 Development along Woolcock Street contributes positively to the city image.	**AO51** Buildings are setback 4m from Woolcock Street, and incorporate a landscaped buffer along that road frontage.
PO52 Wherever practicable, vehicular access is provided from rear or side streets or facilitates the amalgamation of access points.	**AO52** Access to on-site parking is provided through the rear access lanes connecting to Yeatman Street.
PO53 Development on the corner of Woolcock Street and Charters Towers Road, creates a gateway to Charters Towers Road business area. Built form, landscape and streetscape treatment at these corners reinforces a gateway statement. Figure 6.143 – Charters Towers Road business precinct concept plan	No acceptable outcome is nominated.
PO54 Development provides mid-block linkages and increased open space for the public on private land, particularly on larger sites and those sites with two street frontages.	No acceptable outcome is nominated.
PO55 Development contributes to the boulevard treatment of Ross River Road and Woolcock Street through landscaping and streetscape treatments along the road frontages.	No acceptable outcome is nominated.

Figure 6.143 – Charters Towers Road business precinct concept plan

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
CBD gateway precinct	
PO56 Along Flinders Street (West), development responds to the role of the street as a key entrance to the principal centre (CBD), and presents high quality built form, landscape and streetscape treatment.	No acceptable outcome is nominated.
PO57 Shops primarily service workers within the precinct and are located only at key nodes formed by the intersections of Flinders Street (West) and Knapp and Fletcher Streets.	**AO57** Shops are located at the nominated intersections and include only convenience stores, newsagents and café/takeaway food premises limited to less than 250m^2 gross floor area per tenancy.

PO58 Buildings are generally low to medium rise and ensure the protection of the visual primacy of the principal centre (CBD).	**AO58** Building height does not exceed 6 storeys on the frontage of Flinders Street (West), and transition to 4 storeys where situated to the north of Sturt Street. In accordance with Figure 6.144 — CBD gateway precinct concept plan.
PO59 Development contributes to an attractive, coherent and integrated streetscape, by: (a) ensuring buildings assist in defining and enhancing the Flinders Street (West) frontage; (b) improving the quality and continuity of built form; and (c) using complementary landscaping and streetscape treatments.	No acceptable outcome is nominated.
PO60 Pedestrian links are provided and reinforced in accordance with Figure 6.144 — CBD gateway precinct concept plan.	No acceptable outcome is nominated.

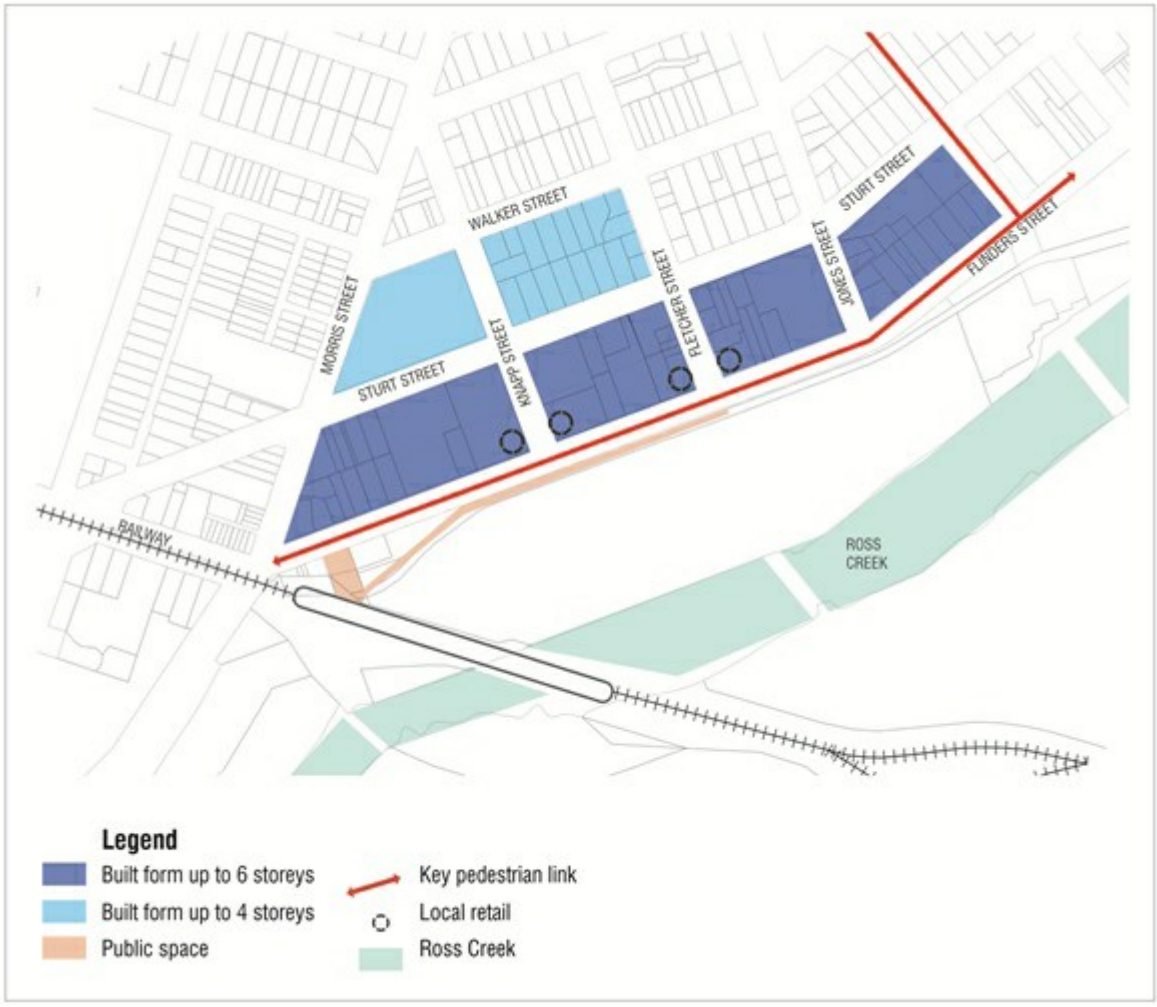

Figure 6.144 – CBD gateway precinct concept plan

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
South Townsville Railyards and Dean Park precinct	
PO61 Development is generally in accordance with Figure 6.145 — South Townsville Railyards and Dean Park precinct concept plan.	No acceptable outcome is nominated.
PO62 Development in the precinct: (a) integrates all aspects of the land use elements through good built form and public realm treatments; and (b) appropriately stages development and particularly the sequencing of supporting infrastructure including transport and access, parking and services.	No acceptable outcome is nominated.
PO63 A new entertainment centre and a range of allied uses are established on the Dean Park site, in accordance with Figure 6.145 — South Townsville Railyards and Dean Park precinct concept plan. The development: (a) incorporates leading tropical design; (b) is oriented to both the Saunders Street and Rooney Street frontages; (c) establishes uses which promote a high level of pedestrian movement and interaction along Saunders Street and Rooney Street, creating an active edge; (d) provides a new public plaza at the Saunders and Rooney Street corner, integrating with the future plaza area for the stadium opposite; and (e) has its primary vehicular and public transport access via a new road alignment extending from Barlow Street. A new bus terminus and driver facilities are provided in this location.	No acceptable outcome is nominated.

PO64 A stadium is established on the northern corner of the existing railyards land, in accordance with Figure 6.145 — South Townsville Railyards and Dean Park precinct concept plan. The development: (a) is capable of being used for multiple events; (b) incorporates leading tropical design; (c) provides extensive public space surrounding the stadium structure; (d) is oriented to both the Saunders Street and Rooney Street frontages; (e) establishes uses which promote a high level of pedestrian movement and interaction along Saunders Street and Rooney Street, creating an active edge; (f) provides a new public plaza at the Saunders and Rooney Street corner, integrating with the future plaza area for the stadium opposite; and (g) facilitates vehicle access by construction of a new public road around the stadium.	No acceptable outcome is nominated.
PO65 Land to the south of the stadium site and backing onto the rail line predominantly consists of service and low impact industry and commercial uses.	No acceptable outcome is nominated.
PO66 Access to and permeability within the precinct are facilitated including: (a) the extension of Barlow Street to provide a new road extension from South Townsville to Saunders Street; (b) an upgrade of the Saunders Street and Rooney Street intersection, with a focus on ensuring pedestrian access and amenity and sense of arrival to the precinct; and (c) improved pedestrian priority and accessibility in street profile and streetscaping for all streets surrounding the stadium site, including Saunders, Rooney, and Morehead Streets and Perkins Street West.	No acceptable outcome is nominated.
PO67 Parking for the entertainment centre and stadium is established sequentially as key components of the precinct occur, and may include a staged program of parking solutions at grade and in various areas of the precinct over time. Ultimately, parking for both facilities is to be incorporated within the built form.	No acceptable outcome is nominated.

Figure 6.145 – South Townsville Railyards and Dean Park precinct concept plan

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Wotton Street precinct	
PO68 The ongoing activities of the low impact industrial area to the north are not compromised.	**AO68** Development provides the following along the common boundary with adjacent industrial uses: (a) a minimum 3m wide landscaped buffer; and (b) a solid 1.8m fence along the full length of the boundary.

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Breakwater precinct	
PO69 Development is generally in accordance with Figure 6.146 — Breakwater precinct concept plan.	No acceptable outcome is nominated.
PO70 A new marina is established on the seaward side of the precinct, and includes a new boat launch facility as shown on Figure 6.146 — Breakwater precinct concept plan.	No acceptable outcome is nominated.
PO71 An open space and pedestrian network is provided as identified on Figure 6.146 — Breakwater precinct concept plan, and includes the provision of a boardwalk adjoining the future marina, pedestrian links along all waterfront areas, and a new park at the north eastern point of the precinct.	No acceptable outcome is nominated.
PO72 Where shown as an 'active frontage' on Figure 6.146 — Breakwater precinct concept plan, new buildings contribute to the creation of an attractive and activated edge to the waterfront by having facades which contain windows, doors, materials and features which generate visual interest and engagement with the water frontage.	No acceptable outcome is nominated.
PO73 Dining, entertainment and tourist-oriented uses occur at the ground storey.	No acceptable outcome is nominated.
PO74 Development within the Breakwater entertainment area shown on Figure 6.146 — Breakwater precinct concept plan supports the consolidation of the casino and allied uses, including short-term accommodation, boat club and market.	No acceptable outcome is nominated.

PO75 Development within the Breakwater living area shown on Figure 6.146 — Breakwater precinct concept plan primarily facilitates high density short or long-term accommodation uses, with local dining and shops at the ground floor where adjoining the future marina.	No acceptable outcome is nominated.
PO76 Building heights ensure the protection of the visual primacy of the principal centre (CBD), the retention of key views to Castle Hill and Melton Hill, and to the sea and Magnetic Island.	**AO76** Building heights are in accordance with Figure 6.146 — Breakwater precinct concept plan.

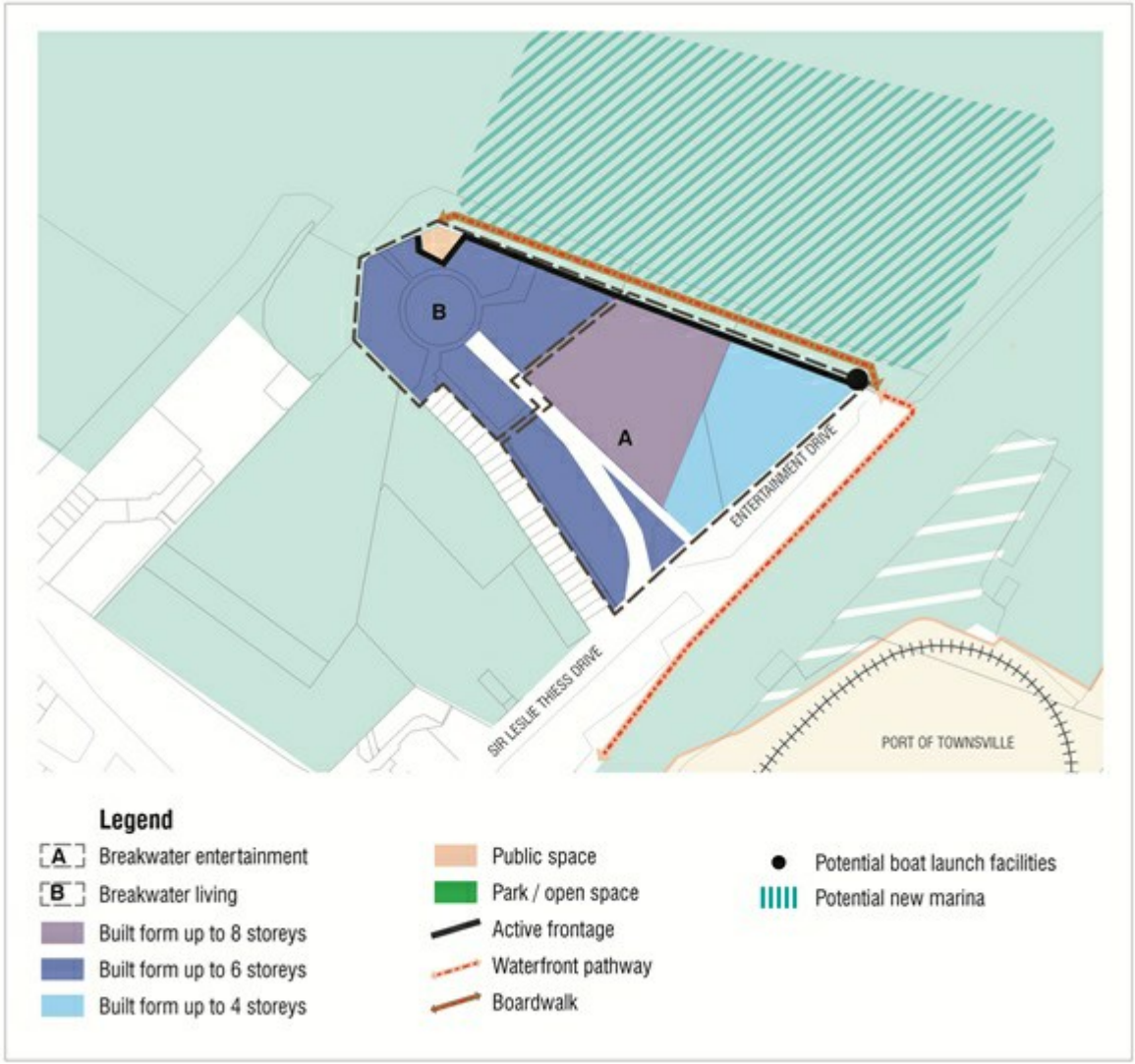

Figure 6.146 – Breakwater precinct concept plan

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
King Street quarter precinct	
PO77 Development is generally in accordance with Figure 6.147 — King Street quarter precinct concept plan.	No acceptable outcome is nominated.
PO78 Development supports a mix of uses, including day and night-time activity.	No acceptable outcome is nominated.
PO79 Café and restaurant uses establish predominantly at the ground floor along the street frontages to Wickham Street, King Street and Flinders Street, and also to Ross Creek frontages.	No acceptable outcome is nominated.
PO80 Residential uses including long and short-term accommodation are predominantly located in the area bounded by Flinders Street, King Street and Wickham Street and The Strand.	No acceptable outcome is nominated.
PO81 Building height is medium rise, and ensures the protection of the visual primacy of the principal centre (CBD). The tallest buildings occur in the centre of the Wickham Street/King Street/Flinders Street/The Strand block.	**AO81** Building heights are in accordance with Figure 6.147 — King Street quarter precinct concept plan.
PO82 An open space and pedestrian network is provided as identified on Figure 6.147 — King Street quarter precinct concept plan, and includes: (a) the provision of, pedestrian links along all waterfront areas; (b) an extension to Anzac Park (following realignment of Sir Leslie Thiess Drive and King Street); (c) a new open space and pedestrian link to the southern end of The Strand linking to a future pedestrian creek crossing; and (d) pedestrian through block links.	No acceptable outcome is nominated.

PO83 Where shown as 'active frontage' on Figure 6.147 — King Street quarter precinct concept plan, new buildings contribute to the creation of an attractive and activated edge to the street frontage by; (a) being built to the street frontage; (b) having facades which contain windows, doors, materials and features which generate visual interest and engagement with the street frontage; (c) providing awnings to all street frontages; and (d) providing a continuous building alignment.	No acceptable outcome is nominated.

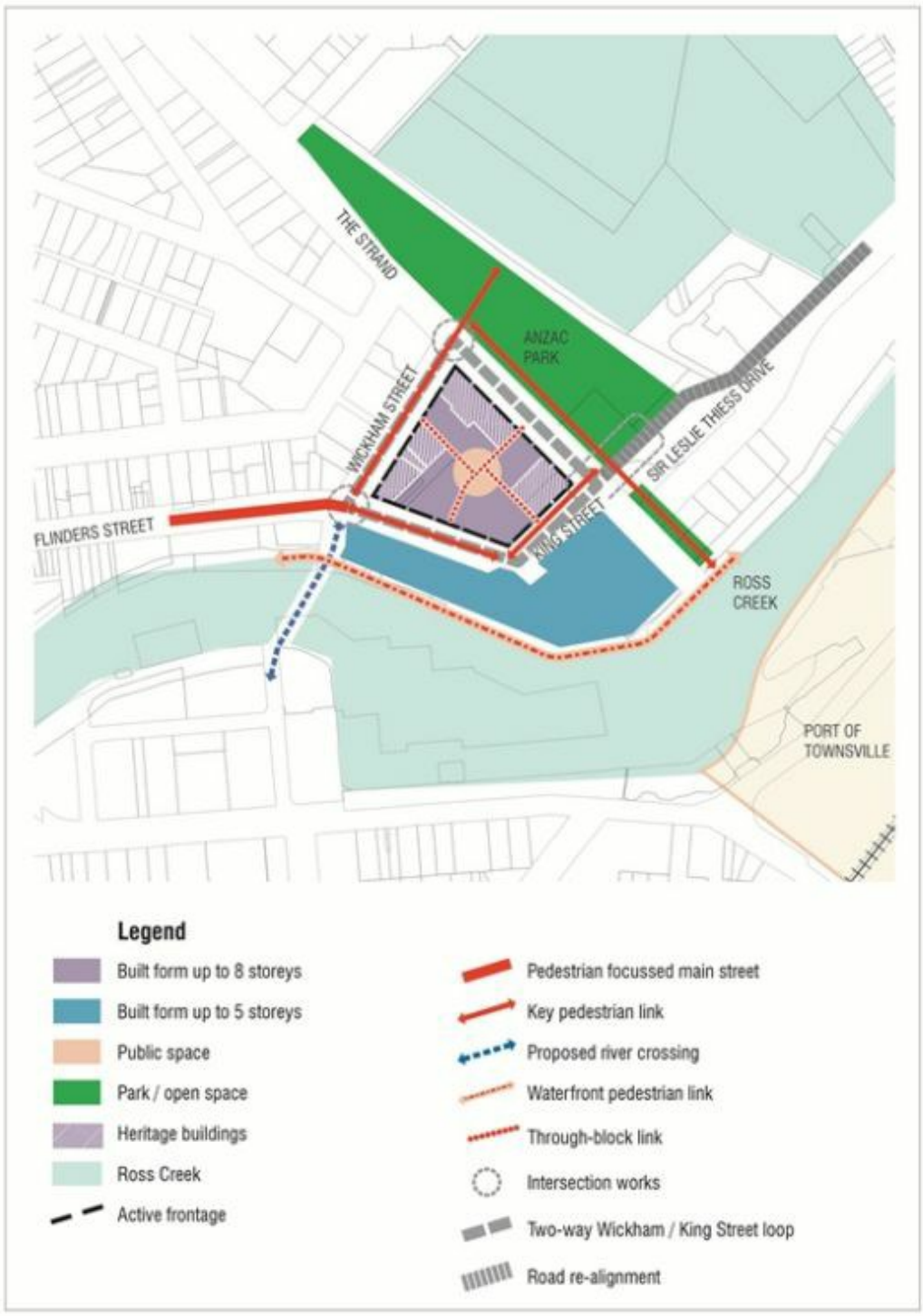

Figure 6.147 – King Street quarter precinct concept plan

Table 6.3.7.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Kings Road precinct	
PO84 Building height creates a medium-rise environment.	**AO84** Building height does not exceed 5 storeys.
PO85 Development provides for enhanced public realm and pedestrian connectivity, in accordance with Figure 6.148 — Kings Road precinct concept plan, including: (a) enhanced north south and east west links through the precinct; (b) a civic node on the lake frontage; (c) enhanced pedestrian access to and along the lake; and (d) a primary pedestrian and cycle pathway along Kings Road.	No acceptable outcome is nominated.
PO86 The civic node at the lake frontage is sleeved by active street level uses.	No acceptable outcome is nominated.
PO87 Residential uses are appropriately buffered from the railway corridor.	No acceptable outcome is nominated.

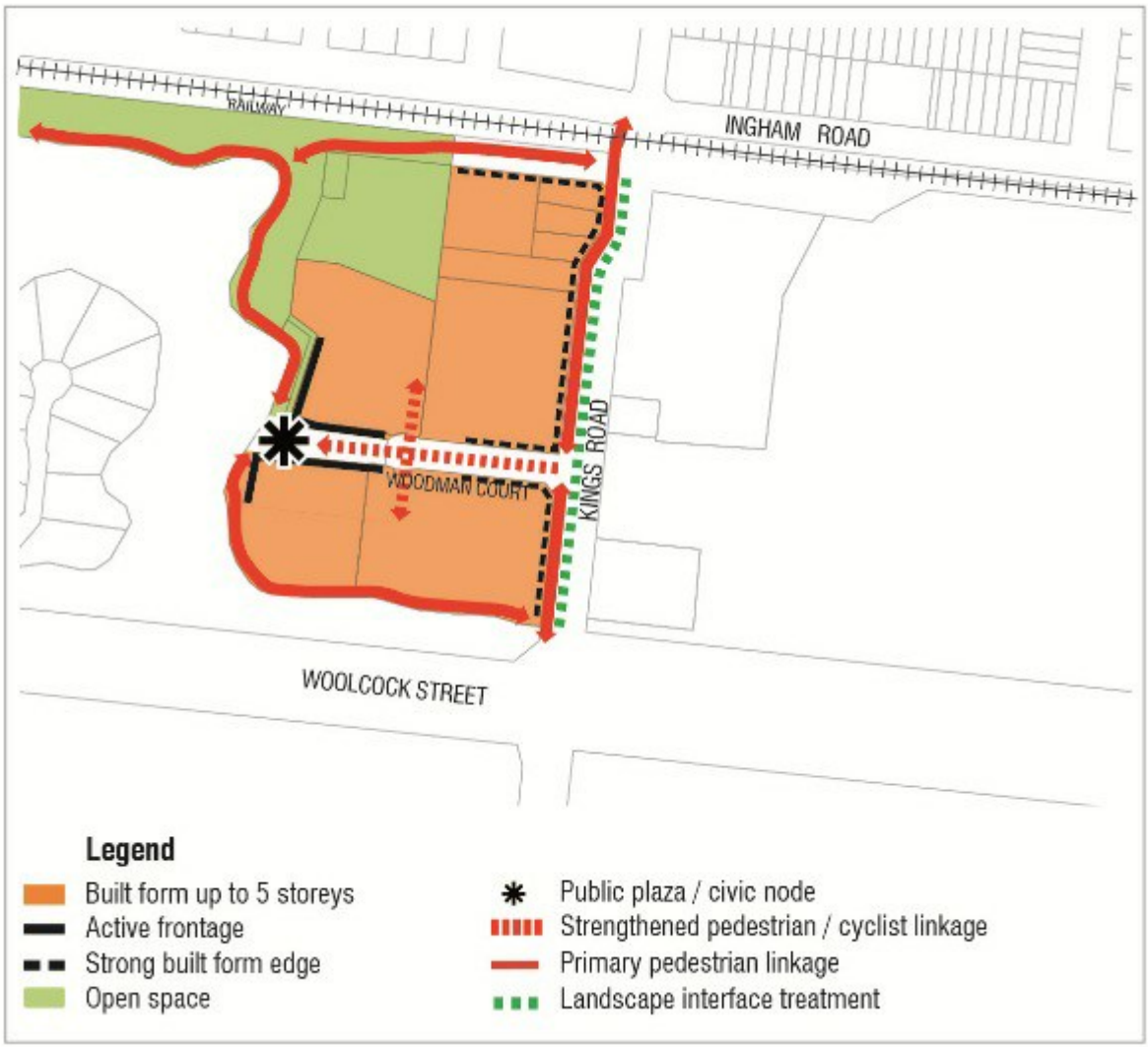

Figure 6.148 – Kings Road precinct concept plan

6.4 Community facilities and open space zone category

6.4.1 Sport and recreation zone code

6.4.1.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.4.1.2 Purpose

(1) The purpose of the Sport and recreation zone code is to provide for a range of organised activities that include sport, cultural and educational activities where the uses require a level of built infrastructure.

It includes built structures, such as clubhouses, gymnasiums, public swimming pools and tennis courts, and infrastructure to support the activities, safe access and essential management, where required to meet community needs.

(2) The particular purpose of the code is to ensure:

(a) residents have convenient access to sport and recreation activities which are safe, attractive and appropriate for the community's needs; and

(b) development minimises impacts on surrounding land.

(3) The purpose of the zone will be achieved through the following overall outcomes:

(a) local, district, regional and specialised sports parks provide for a variety of formal sporting activities and a range of training and competition infrastructure;

(b) development directly supports the primary recreational function of the site or provides for the co-location of a complementary and compatible community-related activity;

(c) development does not restrict public access and does not detract from the primary function of the site for sport and recreation activities;

(d) development provides for safe and convenient internal pedestrian and cyclist pathways and external connections to existing and proposed public transport infrastructure and surrounding activities wherever possible;

(e) design of built form and public spaces facilitates safe and secure environments and discourages antisocial behaviour;

(f) facilities are sited, designed and operated to minimise adverse impacts on surrounding land; and

(g) adverse impacts on any ecological values are avoided where land includes or adjoin natural habitats such as bushland, wetlands or waterways, or act as a buffer between natural and developed areas.

(4) The purpose of the zone will also be achieved by the following additional outcomes for particular precincts:

Balgal Beach golf course precinct:

(a) development of the precinct maintains the golf course and other outdoor recreational facilities and provides an integrated mix of residential and small-scale tourist accommodation;

(b) reconfiguration facilitates a range of lot sizes to accommodate dwelling houses typically on lots with an average size of 600m^2;

(c) the ultimate development of the entire precinct does not result in more than 590 residential lots for dwelling house purposes;

(d) tourist-oriented development may also occur in the form of small-scale, low-rise accommodation and support facilities;

(e) building scale and massing limits the impact on the natural character of Balgal Beach; and

(f) development of the precinct does not compromise the efficient and orderly provision of infrastructure.

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Figure 6.149 - Balgal Beach golf course precinct

Cluden precinct:

(a) Development facilitates the ongoing operation of the Cluden racecourse and is directly associated with or ancillary to horse racing.

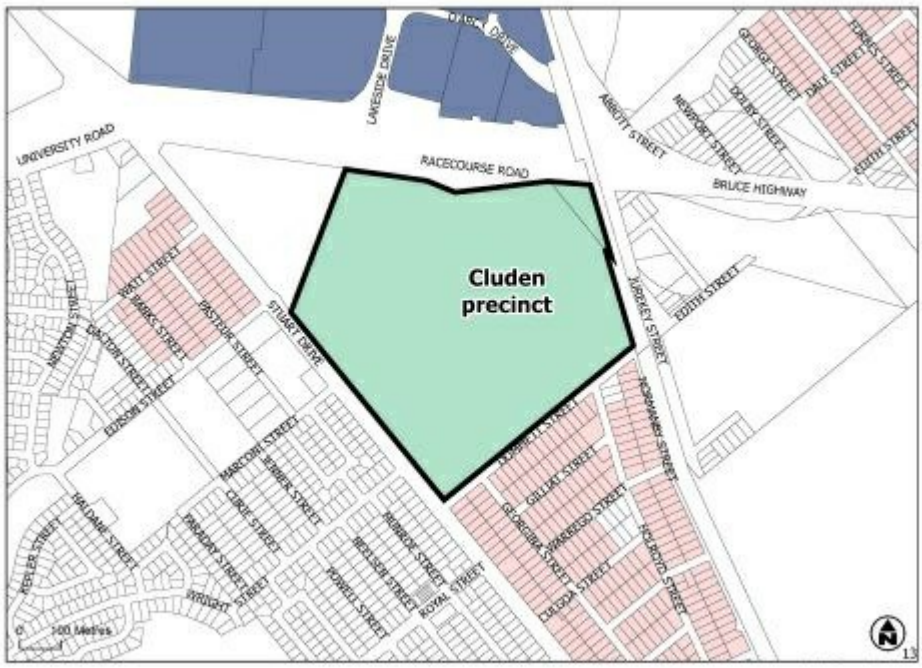

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Figure 6.150 - Cluden precinct

Lansdown motor sport facility precinct:

(a) the precinct accommodates the development of a motor sport facility, which will fulfil an important roles as a required motor sport destination and training ground for driver education ;

(b) the intrusion of incompatible uses, or uses which may be more appropriately accommodated in other zones, is avoided to protect the availability of land in the precinct for motor sport facility purposes;

(c) the impacts of development are managed to ensure public health and safety;

(d) development is safe and legible, and designed to establish safe and efficient movement systems;

(e) development is avoided in environmental corridors and the water resource catchment area to maintain ecological processes, biodiversity values and the quality of waterways;

(f) development provides adequate new infrastructure to support new uses, including roads, stormwater, water and sewer infrastructure;

Editor's note - Conditions of approval or infrastructure agreements will be used (as appropriate) to ensure that infrastructure is provided.

(g) development does not compromise petroleum pipeline infrastructure, and the risks and hazards to people and property associated with petroleum pipeline infrastructure are not further increased through development; and

(h) development avoids impacts on groundwater.

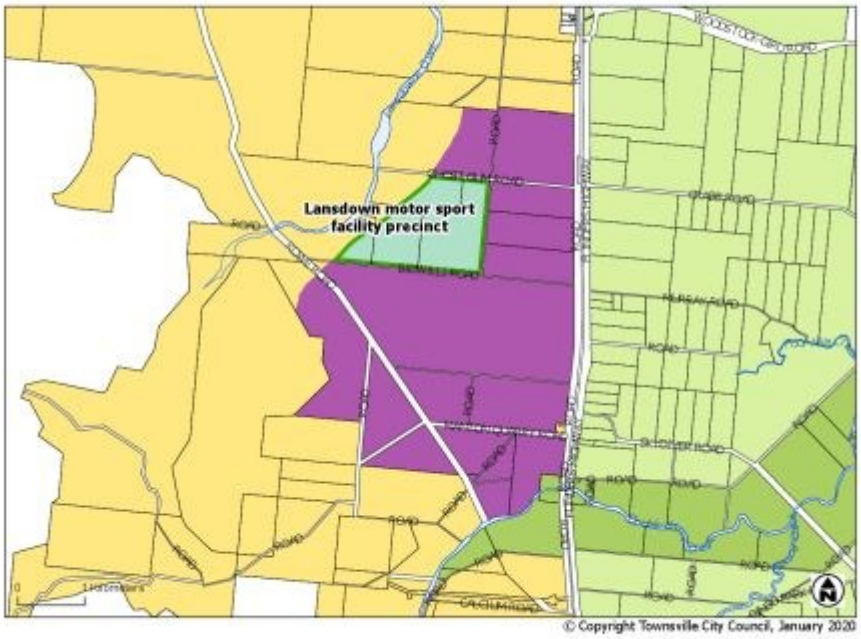

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Figure 6.161 - Lansdown motor sport facility precinct

6.4.1.3 Assessment benchmarks

Table 6.4.1.3 - Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Built form	

PO1 Development does not substantially exceed the height of existing buildings in the area or is designed to sympathetically transition from lower rise neighbouring buildings.	**AO1** Building height does not exceed 3 storeys.
PO2 Building setbacks and orientation provide for an attractive streetscape that is compatible with existing characteristics of the local area.	**AO2** Buildings are set back from street and road frontages: (a) within 20% of the average front setback of adjoining buildings; or (b) where there are no adjoining buildings, 6m.
PO3 Development minimises the bulk of buildings to assist integration with surrounding development.	**AO3** Walls are articulated so that they do not exceed a length of 15m without a change in plane of at least 0.75m depth.

Table 6.4.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Amenity	
PO4 Development provides adequate separation, buffering and screening from residential uses and land within a residential zone so that adverse impacts on privacy and amenity are minimised.	**AO4.1** Buildings and structures are set back 6m or half of the building height, whichever is greater from any boundary shared with a residential use or land within a residential zone.
	AO4.2 Site access and parking, servicing or outdoor storage areas are setback 6m from any boundary shared with a residential use or land within a residential zone.
	AO4.3 Where buildings, parking, servicing or outdoor storage areas are located within 15m of any boundary shared with an residential use or land within a residential zone, the following is provided: (a) a minimum 1.8m high solid screen fence; or (b) a landscaped buffer area consisting of dense screen planting of a minimum 3m width. **Editor's note—**Landscaping is to be provided to a standard specified in the Landscape code.
	AO4.4 Windows that have a direct view into an adjoining residential use are provided with fixed screening that is a maximum of 50% transparent to obscure views and maintain privacy for residents.
PO5 Refuse storage areas and storage of goods or materials in open areas is presented in a manner that does not detract from the visual amenity of the local area.	**AO5** The open area used for the storage of refuse, vehicles, machinery, goods and materials on the site is: (a) located no closer than 3m from any boundary; and (b) are screened from view by a 1.8m high solid screen fence.

Table 6.4.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Caretaker's accommodation	
PO6 Development does not compromise the effective operation of the primary use.	**AO6.1** No more than one (1) caretaker's accommodation unit is provided on the site.
	AO6.2 The caretaker's accommodation unit has a gross floor area of no more than 70m^2.

Table 6.4.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Community use and club	
PO7 Adequate lockable storage space is provided on-site to meet the needs of users.	**AO7** At least one (1) lockable storage space of a minimum of 4m^2 is provided for each room or area that can be hired out or used by community organisations or the public.

Table 6.4.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Uses	
PO8 The site predominantly accommodates sport and recreational activities and facilitates optimum use of the land for the intended sport or recreational purpose.	No acceptable outcome is nominated.
PO9 Non-recreation uses occur only where they: (a) directly support the primary function of the site; or (b) are a compatible community-related activity.	No acceptable outcome is nominated.
PO10 Development does not impede public access to and use of facilities.	No acceptable outcome is nominated.
PO11 Buildings, structures and use areas are designed to ensure efficient use of buildings and facilities, and provide for multiple or shared use of facilities where practicable.	No acceptable outcome is nominated.

Table 6.4.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Amenity	
PO12 Development maintains a high level of general amenity within the site and for surrounding areas, having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) visual impact; (e) signage; (f) odour and emissions; (g) lighting; (h) access to sunlight; (i) privacy; and (j) outlook. **Editor's note—**Applicants may be required to engage specialists to provide detailed investigations into the above matters in order to demonstrate compliance with this performance criterion.	No acceptable outcome is nominated.
PO13 Landscaping is provided to enhance the appearance of the development, screen unsightly components, create an attractive on-site environment and provide shading.	No acceptable outcome is nominated.

Table 6.4.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Crime prevention through environmental design	
PO14 Development facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building design that promotes safety; (c) adequate lighting; (d) appropriate signage and wayfinding; (e) minimisation of entrapment locations; and (f) building entrances, loading and storage areas that are well lit and lockable after hours. **Editor's note—**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.

Table 6.4.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Accessibility	
PO15 Convenient and legible connections are provided for pedestrians and cyclists to and from the site, particularly having regard to linkages with existing and proposed public transport infrastructure, the open space network, centres and other community-related activities.	No acceptable outcome is nominated.
PO16 Safe and convenient pedestrian and cyclist circulation is provided for as an integrated component of the site layout.	No acceptable outcome is nominated.

Table 6.4.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Protection of natural values	
PO17 The site layout and design responds sensitively to on-site and surrounding topography, drainage patterns, ecological values by: (a) minimising earthworks; (b) maximising retention of natural drainage patterns; (c) ensuring existing drainage capacity is not reduced; (d) maximising the retention or enhancement of existing vegetation and ecological corridors; and (e) providing buffers to protect the ecological functions of waterways.	No acceptable outcome is nominated.

Table 6.4.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note -** Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Balgal Beach golf course precinct	
PO18 Development does not reduce the area dedicated to the golf course and other outdoor recreational uses or reduce its amenity or functionality.	No acceptable outcome is nominated.
PO19 Reconfiguration of a lot does not result in more than 590 lots or detached dwelling house purposes across the entire precinct.	No acceptable outcome is nominated.
PO20 Reconfiguration creates lots that have sufficient area and dimension to facilitate residential development.	**AO20** Lots have an average size of 600m^2.
PO21 Tourist-oriented development is small-scale and low rise.	**AO21** Building height does not exceed 2 storeys.
PO22 Design and articulation for tourism-oriented development contributes to the natural character of the locality through tropical architectural design elements and the natural setting of buildings within the landscape.	No acceptable outcome is nominated.
PO23 Development is within the capacity of available infrastructure and is supported by adequate infrastructure, including: (a) connection to reticulated water and sewage networks; (b) connection to stormwater drainage system; and (c) constructed roads.	No acceptable outcome is nominated. **Editor's note -** Council will request an overall area/precinct-scale structure plan - comprising land use, infrastructure, staging, urban design for the entire precinct before development takes place.

Table 6.4.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note-**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Balgal Beach golf course precinct	
PO18 Development does not reduce the area dedicated to the golf course and other outdoor recreational uses or reduce its amenity or functionality.	No acceptable outcome is nominated.
PO19 Reconfiguration of a lot does not result in more than 590 lots or detached dwelling house purposes across the entire precinct.	No acceptable outcome is nominated.

PO20 Reconfiguration creates lots that have sufficient area and dimension to facilitate residential development.	**AO20** Lots have an average size of 600m^2.
PO21 Tourist-oriented development is small-scale and low rise.	**AO21** Building height does not exceed 2 storeys.
PO22 Design and articulation for tourism-oriented development contributes to the natural character of the locality through tropical architectural design elements and the natural setting of buildings within the landscape.	No acceptable outcome is nominated.
PO23 Development is within the capacity of available infrastructure and is supported by adequate infrastructure, including: (a) connection to reticulated water and sewage networks; (b) connection to stormwater drainage system; and (c) constructed roads.	No acceptable outcome is nominated. **Editor's note-**Council will request an overall area/precinct-scale structure plan - comprising land use, infrastructure, staging, urban design for the entire precinct before development takes place.

Lansdown motor sport facility precinct

Table 6.4.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note -** Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Lansdown motor sport facility precinct	
PO24 A motor sport facility is established in accordance with Figure 6.162 Lansdown concept plan.	No acceptable outcome is nominated.
PO25 To maintain the natural environmental values, ecological processes and the quality of waterways development does not establish within the areas identified as 'environmental corridors' and 'water resource catchment area' as shown on Figure 6.162 Lansdown concept plan.	No acceptable outcome is nominated.
PO26 Development is supported by adequate infrastructure, including: (a) connection to reticulated water and sewage networks; (b) connection to a stormwater drainage system; and (c) constructed roads.	No acceptable outcome is nominated **Editor's note -** In accordance with the Act, council may seek to secure the necessary infrastructure through conditions of approval or infrastructure agreements.
PO27 Development does not cause noise nuisance to nearby sensitive land uses. **Editor's note -** Sensitive land uses are those uses defined by the *Planning Regulation 2017*.	**AO27** Development achieves the noise generation levels set out in the Environmental Protection (Noise) Policy 2008 and the *Department of Environment and Heritage Protection Planning for Noise Control Guideline*.
PO28 Development does not: (a) affect the long-term operation of a high pressure gas pipeline; and (b) advesely impact the safety of people and property.	**AO28.1** Development does not occur within 100m of a high-pressure gas pipeline. **AO28.2** Development involving the use, manufacturing or storage of hazardous chemicals does not occur within 300m of a high-pressure gas pipeline.
PO29 Development protects the water quality, ecological values, hydrological processes and other environmental values of any surface water or groundwater.	No acceptable outcome is nominated. **Editor's note -** Applicants should also have regard to Part 9.3.2 Healthy waters code for guidance on how to demonstrate compliance with this performance outcome. To demonstrate compliance with this performance outcome, council may request that a ground and surface water resource assessment be undertaken by a qualified professional.

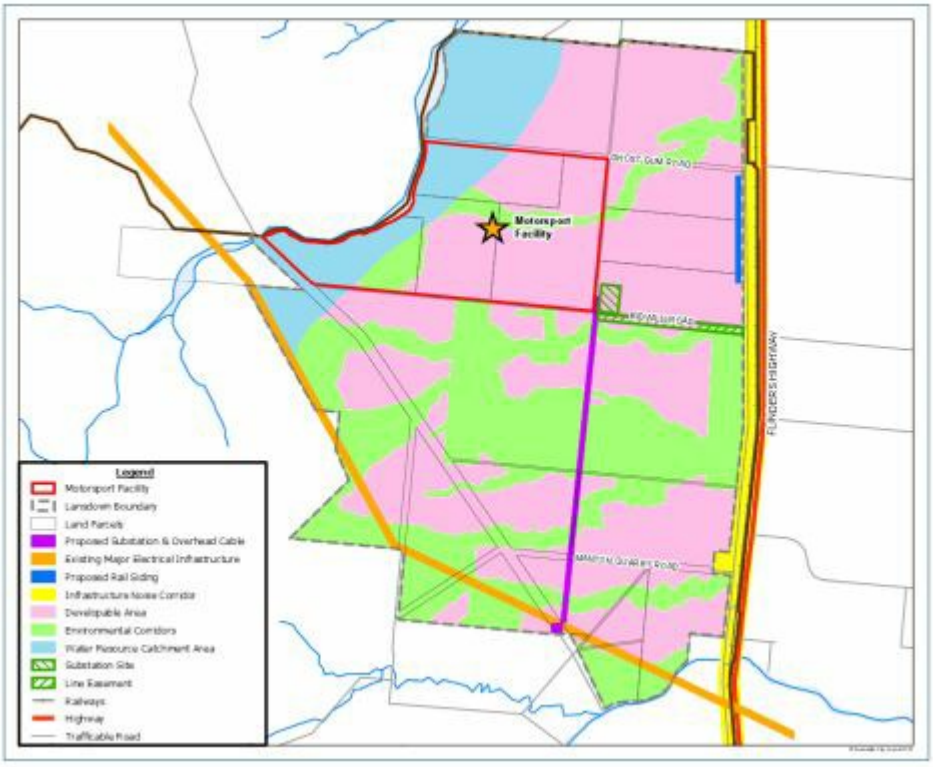

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Figure 6.162 – Lansdown concept plan

Priority Infrastructure Area Map 001

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6.4.2 Open Space zone code

6.4.2.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.4.2.2 Purpose

(1) The purpose of the Open space zone code provides for informal recreation where the built form is not essential to the enjoyment of the space.

It may provide for local, district and regional scale parks which serve the recreational needs of a wide range of residents and visitors.

Where required to meet community needs, development may include shelters, amenity facilities, picnic tables, and playgrounds and infrastructure to support safe access and essential management.

(2) The particular purpose of the code is to ensure:

- (a) residents have convenient access to parks and opportunities for informal outdoor recreation that are safe, attractive and appropriate for the community's needs; and
- (b) places that contribute to the visual amenity and character of the city are protected; and
- (c) the environmental and drainage functions of open space are protected.

(3) The purpose of the zone will be achieved through the following overall outcomes:

- (a) open space is accessible to the general public for a range of informal outdoor recreation activities at local, district and regional levels;
- (b) development directly supports the primary recreational function of the site or provides for the co-location of a complementary and compatible community-related activity;
- (c) development does not restrict public access and does not detract from the site's primary open space function, visual quality or cultural values;
- (d) land within the zone is generally free from buildings other than ancillary structures which enhance the utility and enjoyment of the open space and buildings required for small-scale clubs and community facilities;
- (e) development provides for safe and convenient internal pedestrian and cyclist pathways and external connections to existing and proposed public transport infrastructure and surrounding activities wherever possible;
- (f) facilities are sited, designed and operated to minimise adverse impacts on surrounding land;
- (g) design of built form and public spaces facilitates safe and secure environments and discourages antisocial behaviour;
- (h) the drainage functions of open space are protected and development is compatible with these functions; and
- (i) adverse impacts on any ecological values are avoided where land includes or adjoin natural habitats such as bushland, wetlands or waterways, or act as a buffer between natural and developed areas;

(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts:

Riverway precinct:

- (a) development in Pioneer Park and Riverway is subordinate to, and does not compromise, its primary role and function as a pedestrian-focussed recreational and open space area; and
- (b) connections between Pioneer Park and Riverway and Thuringowa central major centre are reinforced, including the creation of an active entry precinct along Village Boulevard.

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Figure 6.151 - Riverway precinct

6.4.2.3 Assessment benchmarks

Table 6.4.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Built form	
PO1 Built form: (a) is limited in scale and extent; (b) is visually unobtrusive and maintains the open, parkland character; and (c) does not restrict access to utility or enjoyment of the open space.	**AO1.1** Building height does not exceed 1 storey.
	AO1.2 Buildings do not exceed a site cover of 5%.
	AO1.3 Buildings are set back 10m from any site boundary.

Table 6.4.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Community use and club	
PO2 Adequate lockable storage space is provided on-site to meet the needs of users.	**AO2** At least one (1) lockable storage space of a minimum of 4m^2 is provided for each room or area that can be hired out or used by community organisations or the public.

Table 6.4.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Uses	
PO3 Land predominantly accommodates parks and any development facilitates optimum enjoyment and use of the land for informal recreation purposes.	No acceptable outcome is nominated.
PO4 Other than at Riverway precinct, non-recreational uses occur only where: (a) they directly support the primary function of the site or are a compatible community-related activity; and (b) have a built form that is limited in scale and extent.	No acceptable outcome is nominated.
PO5 Development does not impede public access to and use of facilities.	No acceptable outcome is nominated.
PO6 Development does not detract from the site's visual quality or cultural values.	No acceptable outcome is nominated.
PO7 Development is compatible with any drainage function of the land and does not interfere with that function.	No acceptable outcome is nominated.

Table 6.4.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Amenity	
PO8 Development maintains a high level of amenity within the site and for surrounding areas, having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) visual impact; (e) signage; (f) odour and emissions; (g) lighting; (h) access to sunlight; (i) privacy; and (j) outlook. **Editor's note—**Applicants may be required to engage specialists to provide detailed investigations into the above matters in order to demonstrate compliance with this performance criterion.	No acceptable outcome is nominated.
PO9 Landscaping is provided to enhance the appearance of the development and assist in its integration with the open space setting.	No acceptable outcome is nominated.

Table 6.4.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Crime prevention through environmental design	
PO10 Development facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building design that promotes safety; (c) adequate lighting; (d) appropriate signage and wayfinding; (e) minimisation of entrapment locations; and (f) building entrances, loading and storage areas that are well lit and lockable after hours. **Editor's note—**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.

Table 6.4.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Accessibility	
PO11 Convenient and legible connections are provided for pedestrians and cyclists to and from the site, particularly having regard to linkages with existing and proposed public transport infrastructure, other parts of the open space network, sport and recreational activities, centres and community-related activities.	No acceptable outcome is nominated.

Table 6.4.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Protection of natural values	
PO12 The site layout and design responds sensitively to on-site and surrounding topography, drainage patterns and ecological values by: (a) minimising earthworks; (b) maximising retention of natural drainage patterns; (c) ensuring existing drainage capacity is not reduced; (d) maximising the retention or enhancement of existing vegetation and ecological corridors; and (e) providing buffers to protect the ecological functions of waterways.	No acceptable outcome is nominated.

Table 6.4.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Riverway precinct	
PO13 Leisure focussed shops and dining uses are established along Village Boulevard opposite High Range Drive, creating an active link to the town centre heart precinct and a gateway feature for Riverway. This gateway area may incorporate a residential component in the form of shop top housing.	No acceptable outcome is nominated.

6.4.3 Community facilities zone code

6.4.3.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.4.3.2 Purpose

(1) The purpose of the Community facilities zone code is to provide for community-related activities and facilities whether under public or private ownership.

These may include the provision of municipal services, public utilities, government installations, hospitals and schools, transport and telecommunication networks and community infrastructure of an artistic, social or cultural nature.

(2) The particular purpose of the code is to ensure:

(a) the effective location, design and operation of a wide variety of community-related activities and facilities so that these facilities adequately meet the needs of current and future users; and

(b) community-related activities and facilities are provided in a safe, accessible and attractive environment, and minimise impacts on surrounding land uses.

(3) The purpose of the zone will be achieved through the following overall outcomes:

(a) the zone primarily accommodates a variety of community-related activities and facilities such as community uses, educational establishments, emergency services, places of worship and utility installations in a manner that best meets community needs;

(b) other complementary uses may occur within the zone, where community-related activities and facilities remain the dominant use and continue to effectively meet community needs;

(c) development does not prejudice the ongoing operation and expansion of community activities and facilities;

(d) where appropriate, development enables the co-location of community-related activities and facilities;

(e) development facilitates improved accessibility by walking, cycling and public transport, and facilitates easy access by all members of the community, including older and less mobile people and people with disabilities;

(f) unless separation is required due to safety and operational requirements of the use, integration with surrounding areas is strengthened through built form and site layout;

(g) buildings provide for an attractive, pedestrian friendly environment at street level;

(h) design of built form and public spaces facilitates safe and secure environments and discourages antisocial behaviour; and

(i) development is sited, designed and operated to minimise adverse impacts on surrounding land.

(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts:

Picnic Bay community facilities precinct:

(a) the intersection of Birt Street and Nelly Bay Road creates a gateway to Picnic Bay. Built form and streetscape treatments at this intersection reinforces this gateway function;

(b) development of this precinct supports a transition from the existing landfill uses to form a more community-focussed hub including uses such as education, open space, recreation and other community facilities; and

(c) design of built form and public spaces is of high quality and is consistent with the low density Magnetic Island character.

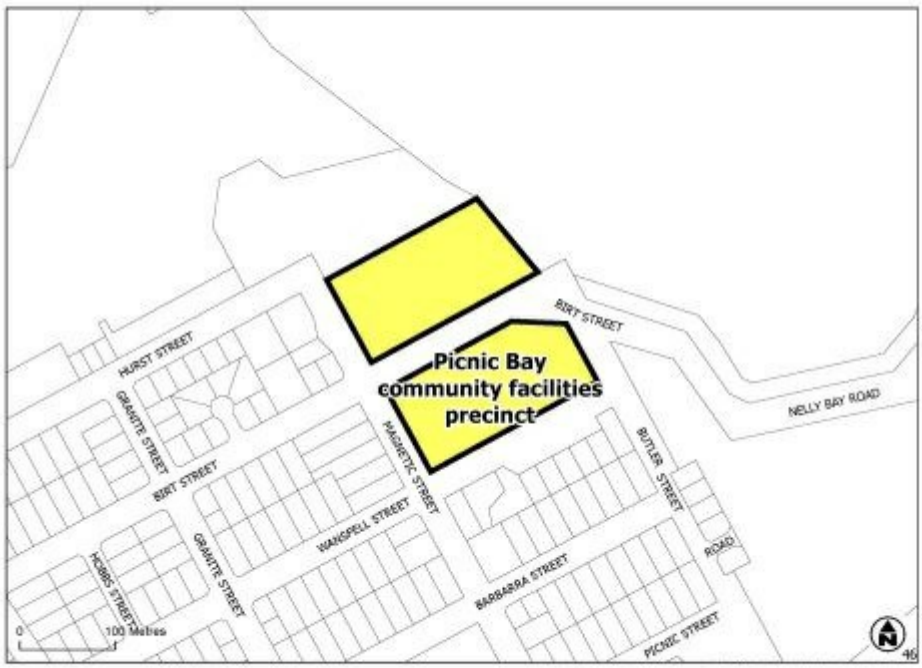

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Figure 6.152 - Picnic Bay community facilities precinct

6.4.3.3 Assessment benchmarks

Table 6.4.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development – where involving a new building or expansion to an existing building	
Built form	
PO1 Development does not substantially exceed the height of existing buildings in the area.	**AO1** Building height does not exceed 3 storeys.
PO2 Building setbacks and orientation provide for an attractive streetscape that is compatible with existing characteristics of the local area.	**AO2** Buildings have their main face to the street and are set back from that frontage: (a) within 20% of the average front setback of adjoining buildings; or (b) where there are no adjoining buildings, 6m.
PO3 Development minimises the bulk of buildings to assist integration with surrounding development.	**AO3** Walls are articulated so that they do not exceed in length of 15m without a change in plane of at least 0.75m depth.

Table 6.4.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development — where involving a new building or expansion to an existing building	
Amenity	
PO4 Development provides adequate separation, buffering and screening from residential uses and land within a residential zone so that adverse impacts on privacy and amenity are minimised.	**AO4.1** Buildings are set back 6m or half the height of that part of the building, whichever is the greater, from any boundary shared with a residential use or land within a residential zone.
	AO4.2.1 A 1.8m high solid screen fence is provided along all boundaries shared with a residential use or land within a residential zone. OR **AO4.2.2** A landscaped buffer with a minimum width of 3m and consisting of dense screen planting is provided along all boundaries shared with a residential use or land within a residential zone. **Editor's note–**landscaping is to be provided to a standard specified in Section 9.3.3 Landscape code.
	AO4.3 Windows that have a direct view into an adjoining residential use are provided with fixed screening that is a maximum of 50% transparent to obscure views and maintain privacy for residents.

Table 6.4.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
General	
PO5 Where provided, outdoor lighting does not adversely affect the amenity of adjoining properties or create a traffic hazard on adjacent roads.	**AO5.1** Light emanating from any source complies with *Australian Standard AS 4282 Control of the Obtrusive Effects of Outdoor Lighting.*
	AO5.2 Outdoor lighting is provided in accordance with *Australian Standard AS1158.1.1 – Road Lighting – Vehicular Traffic (Category V) Lighting – Performance and Installation Design Requirements*.
PO6 Refuse storage areas and storage of goods or materials in open areas is presented in a manner that does not detract from the visual amenity of the local area.	**AO6** The open area used for the storage of refuse, vehicles, machinery, goods and materials used on the site is: (a) located no closer than 3m from any boundary; and (b) are screened from view by a 1.8m high solid screen fence.

Table 6.4.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Caretaker's accommodation	
PO7 Development does not compromise the effective operation of the primary use.	**AO7.1** No more than one (1) caretaker's accommodation unit is provided on the site.
	AO7.2 The caretaker's accommodation unit has a gross floor area of no more than 70m^2.

Table 6.4.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Community uses and clubs	
PO8 Adequate lockable storage space is provided on-site to meet the needs of users.	**AO8** At least one (1) lockable storage space of a minimum of 4m^2 is provided for each room or area that can be hired out or used by community organisations or the public.

Table 6.4.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Uses	
PO9 The site accommodates community-related activities or facilities in a manner that safely and efficiently meet community needs.	No acceptable outcome is nominated.
PO10 Other uses occur on a site where they: (a) support or are otherwise complementary to the community-related activities or facilities on the site; and (b) are subordinate to those activities or facilities.	No acceptable outcome is nominated.
PO11 Development does not prejudice the ongoing operation and expansion of existing uses on the site.	No acceptable outcome is nominated.
PO12 Development facilitates opportunities for appropriate co-location of community-related activities or facilities.	No acceptable outcome is nominated.

Table 6.4.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Amenity	
PO13 Development maintains a level of amenity appropriate to the use and minimises impacts on surrounding land, having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) visual impact; (e) signage; (f) odour and emissions; (g) lighting; (h) access to sunlight; (i) privacy; and (j) outlook. **Editor's note—**Applicants may be required to engage specialists to provide detailed investigations into the above matters in order to demonstrate compliance with this performance outcome.	No acceptable outcome is nominated.
PO14 Landscaping is provided to enhance the appearance of the development, screen unsightly components, create an attractive on-site environment and provide shading.	No acceptable outcome is nominated.

Table 6.4.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Crime prevention through environmental design	
PO15 Development facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building design that promotes safety; (c) adequate lighting; (d) appropriate signage and wayfinding; (e) minimisation of entrapment locations; and (f) building entrances, loading and storage areas that are well lit and lockable after hours. **Editor's note—**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.

Table 6.4.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Accessibility	
PO16 Convenient and legible connections are provided for pedestrians and cyclists to and from the site, particularly having regard to linkages with existing and proposed public transport infrastructure, the open space network, centres and other community-related activities.	No acceptable outcome is nominated.

Table 6.4.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Protection of natural values	
PO17 The site layout and design responds sensitively to on-site and surrounding topography, drainage patterns, ecological values by: (a) minimising earthworks; (b) maximising retention of natural drainage patterns; (c) ensuring existing drainage capacity is not reduced; (d) maximising the retention or enhancement of existing vegetation and ecological corridors; and (e) providing buffers to protect the ecological functions of waterways.	No acceptable outcome is nominated.

Table 6.4.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Picnic Bay community facilities precinct	
PO18 Development in this precinct supports a transition from the existing use as a waste facility to uses which present as a gateway feature and key community node for Picnic Bay.	No acceptable outcome is nominated.
PO19 The existing land fill site is rehabilitated to a standard that is suitable to accommodate a range of community activities.	No acceptable outcome is nominated.
PO20 Building height and massing is consistent with the low density scale of the Magnetic Island character and articulates individual buildings.	**AO20** Building height does not exceed 2 storeys.
PO21 Design of buildings contribute to the creation of the local Magnetic Island character through: (a) climate-responsive design; (b) the natural setting of buildings within the landscape; and-Accepted development subject to requirements (c) maximising views to the bay.	No acceptable outcome is nominated.
PO22 Built form, landscape and streetscape treatment at the intersection of Birt Street and Nelly Bay Road reinforces a gateway statement.	No acceptable outcome is nominated.
PO23 Vehicle access points along Birt Street are minimised.	**AO23** Access points are limited to only one either side of Birt Street within this precinct.

6.4.4 Environmental management and conservation zone code

6.4.4.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.4.4.2 Purpose

(1) The purpose of the Environmental management and conservation zone code is to provide for the protection, restoration and maintenance of areas identified as supporting significant biological diversity and ecological integrity.

(2) The particular purpose of the code is to ensure that areas of conservation value, including land in the protected estate (including council owned or controlled land held for conservation) and some privately owned land are maintained and protected from the impacts of development.

(3) The purpose of the zone will be achieved through the following overall outcomes:

- (a) the conservation values of the land are maintained or enhanced;
- (b) these areas remain undeveloped apart from small-scale facilities that support conservation, low impact nature-based recreational activities on the land and essential infrastructure; and
- (c) adverse impacts on ecological features and processes are avoided.

6.4.4.3 Assessment benchmarks

Table 6.4.4.3—Assessable development

Performance outcomes	Acceptable outcomes
For assessable development only	
PO1 Development is limited to: (a) development that facilitates conservation activities on the land; or (b) development that provides information or education of visitors directly connected to the values of the land; or (c) development that is ancillary to and directly supports visitation to the land for conservation or recreation purposes consistent with (a) or (b), for example through the provision of light refreshments; or (d) the establishment of infrastructure that cannot practicably be located elsewhere; or (e) the establishment of a single dwelling house or caretaker's accommodation unit.	No acceptable outcome is nominated.
PO2 Tourist accommodation is not established.	**AO2** No acceptable outcome is nominated.
PO3 The footprint of any development is minimal and built form is of a low key, low-rise scale.	**AO3.1** Development occurs within existing buildings.
	AO3.2 Development does not involve any clearing of vegetation.

PO4 The land is not further subdivided.	**AO4** No new lots are created.
PO5 Environmental values on the site are maintained or enhanced.	No acceptable outcome is nominated.

6.5 Industry zones category

6.5.1 Low impact industry zone code

6.5.1.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.5.1.2 Purpose

(1) The purpose of the Low impact industry zone code is to provide for service industry and low impact industry uses.

It may include non-industrial and business uses that support the industrial activities where they do not compromise the long-term use of the land for industrial purposes.

Activities considered appropriate in this zone are defined as Low impact industry or Service industry in the schedule of definitions.

(2) The particular purpose of the code is to:

- (a) facilitate the safe, efficient and attractive use of land for smaller scale and lower impacting industries; and
- (b) ensure development does not detract from the function and viability of centres, and minimises impacts on the amenity of nearby sensitive uses.

(3) The purpose of the code will be achieved through the following overall outcomes:

- (a) the zone primarily accommodates a range of generally smaller scale industrial uses which have low levels of potential impacts on surrounding areas and often provide services to the general public;
- (b) the zone also accommodates storage, wholesale and trade supplies, uses requiring significant outdoor sales areas and indoor sport and recreation uses which are difficult to locate elsewhere, where these have low levels of potential impacts on the surrounding area;
- (c) other non-industrial uses occur where they are ancillary to or directly support the industrial functions of the area, and are limited in extent;
- (d) the zone does not accommodate uses which are primarily oriented to retail sales and which are more appropriately located in centres, such as shops, shopping centres, showrooms or retail based hardware supplies;
- (e) the intrusion of incompatible uses, or uses which are more appropriately accommodated in other zones, is avoided to protect the availability of land for industrial purposes and the viability and efficient operation of existing and future industry uses;
- (f) any interface between industrial uses and sensitive land uses is designed and managed to minimise adverse impacts;
- (g) development makes a positive contribution to the public domain, particularly along major roads and near centres; and
- (h) development avoids significant adverse effects on water quality and the natural environment.

(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts:

Nelly Bay low impact industry precinct:

(a) design of built form is of high quality and consistent with the low density Magnetic Island character.

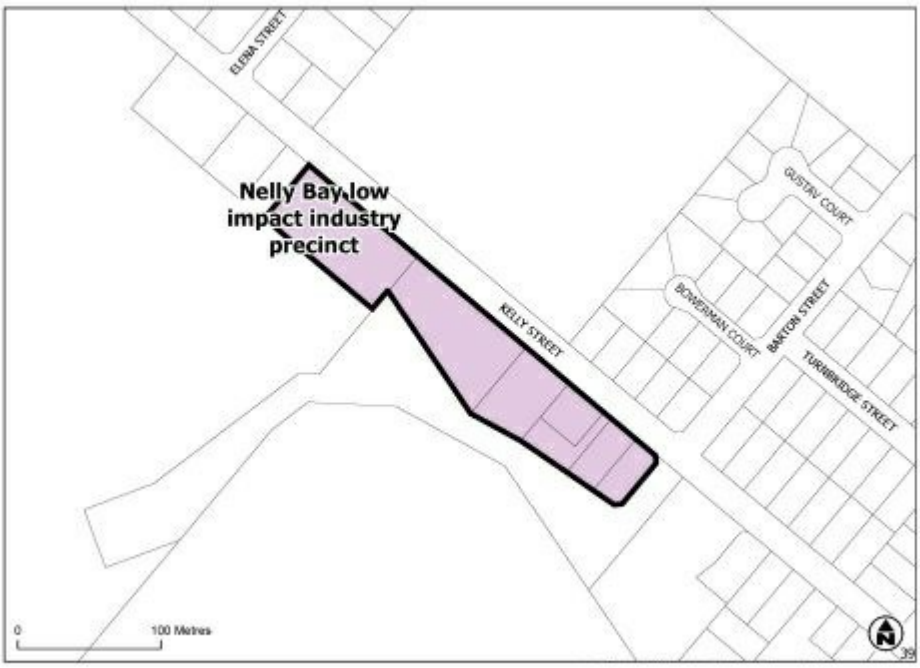

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Figure 6.153 - Nelly Bay low impact industry precinct

6.5.1.3 Assessment benchmarks

Table 6.5.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development — where involving a new building or expansion to an existing building **Note—**The following acceptable outcomes will not apply where the development is a change of use in an existing building that does not involve any expansion of that building.	
Built form	
PO1 Development is consistent with the height and scale of surrounding buildings and includes features that contribute to an attractive streetscape.	**AO1.1** Site cover does not exceed 80%.
	AO1.2 Walls that have frontage to a street or road are articulated so that they do not exceed a length of 15m without a change in plane of at least 0.75m depth.
	AO1.3 New building and structure height does not exceed 12m.
	AO1.4 Buildings are set back from street and road frontages: (a) within 20% of the average front set back of adjoining buildings; or (b) where there are no adjoining buildings, 4m.
	AO1.5 Vehicle manoeuvring and loading and unloading areas are located to the side or behind of the building, and are not located in front of the building.
PO2 Building entrances are legible and safe.	**AO2.1** Pedestrian entries to buildings are visible from the street and visitor parking areas, and are separate to vehicle access points.
	AO2.2 Doorway recesses in building facades are not of a size or configuration that would conceal a person, unless lighting, mirrors, transparent materials or angled approaches are included to offset the potential for impacts on safety.
	AO2.3 Each building or tenancy is provided with a highly visible street and unit number respectively.
	AO2.4 Premises are provided with external lighting sufficient to provide safe ingress and egress for site users.

Table 6.5.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development — where involving a new building or expansion to an existing building **Note—**The following acceptable outcomes will not apply where the development is a change of use in an existing building that does not involve any expansion of that building.	
Amenity	
PO3 Where adjoining a residential zone, development provides adequate buffering and screening so that adverse impacts on privacy and amenity are minimised.	**AO3.1** New buildings, plant and equipment, active outdoor use areas, site access and parking, servicing or outdoor storage areas are set back a minimum of 5m from any boundary adjoining a residential zone.
	AO3.2 Within the setback area adjoining a residential zone, the following are provided: (a) a minimum 1.8m high solid boundary fence; or (b) a densely planted landscape strip, having a minimum depth of 2m and the balance setback area turfed.
	AO3.3 Windows or openings that have direct views into adjoining residential buildings are provided with fixed screening that is a maximum of 50% transparent to obscure views into the adjoining residential building and maintain privacy for those residents.
PO4 Utility elements (including refuse areas, outdoor storage, plant and equipment, loading and unloading areas) are screened from view from the street and land within other zones.	**AO4** Utility elements are: (a) located within or behind the building; or (b) screened by a 1.8m high solid wall or fence; or (c) behind landscaping having the same screening effect as a 1.8m screen fence. **Editor's note—**Screening can be provided by any combination of the above treatments to meet the acceptable outcome.
PO5 Landscaping is provided to create streetscapes which contribute positively to the city image, particularly along major roads and streets.	**AO5** Landscaping is provided along all road frontages of the site for a minimum depth of: (a) 4m along an arterial or sub-arterial road; or (b) 2m along any other road or street frontage.

Table 6.5.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
General	
PO6 Development minimises impacts on surrounding land having regard to noise, vibration, odour, dust, light or other emissions. Adverse impacts on the health, safety or amenity of nearby residential zoned land or other sensitive land uses are minimised. **Editor's note—**Applicants should have regard to relevant legislative, industry and licensing requirements.	**AO6.1** Development achieves the noise generation levels set out in the Environmental Protection (Noise) Policy 2008.
	AO6.2 Development achieves the air quality objectives set out in the Environmental Protection (Air) Policy 2008.
	AO6.3 Materials that are capable of generating air contaminants are wholly enclosed in storage bins.
	AO6.4 All external areas are sealed, turfed or landscaped.
	AO6.5 Light emanating from any source complies with *Australian Standard AS4282 Control of the Obtrusive Effects of Outdoor Lighting*.
	AO6.6 Outdoor lighting is provided in accordance with *Australian Standard AS 1158.1.1 — Road Lighting — Vehicular Traffic (Category V) Lighting — Performance and Installation Design Requirements*.
PO7 Development provides for the collection, treatment and disposal of liquid wastes or sources of contamination such that off-site releases of contaminants do not occur. **Editor's note—**Applicants should also have regard to Section 9.3.7 Works code, Section 9.3.2 Healthy waters code and other relevant legislative, industry and licensing requirements.	**AO7.1** Areas where potentially contaminating substances are stored or used, are roofed and sealed with concrete, asphalt or similar impervious substance and bunded.
	AO7.2 Roof water is piped away from areas of potential contamination.
PO8 The site layout and design: (a) minimises earthworks; (b) maximises retention of natural drainage patterns; and (c) ensures existing drainage capacity is not reduced.	**AO8** Development does not involve earthworks involving more than $100m^3$.

Table 6.5.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Caretaker's accommodation	
PO9 Development does not compromise the viability of the primary use of the site.	**AO9.1** No more than one (1) caretaker's accommodation dwelling is established on the site.
	AO9.2 The caretaker's accommodation dwelling has a gross floor area of no more than 70m2.

Table 6.5.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Ancillary office uses	
PO10 Offices are accommodated within the zone where they are ancillary to the primary use.	**AO10** The area used for an office use does not exceed 250m^2 or 10% of the gross floor area, whichever is the lesser.

Table 6.5.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Uses	
PO11 Development within the zone is of a low impact nature and is either: (a) an industrial activity; or (b) trade related; or (c) difficult to locate in other zones due to land area or operational requirements (such as outdoor sales areas and indoor sport and recreation uses); or (d) small in scale and ancillary to or directly support the industrial functions of the area.	No acceptable outcome is nominated.
PO12 Development is not primarily oriented to retail sales, other than where involving an outdoor sales activity.	No acceptable outcome is nominated.
PO13 Development does not compromise the use of land for industrial purposes.	No acceptable outcome is nominated.
PO14 The zone does not accommodate uses that attract high volumes of heavy vehicle movement or generally involve 24-hour operation.	No acceptable outcome is nominated.

Table 6.5.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Crime prevention through environmental design	
PO15 Site layout facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building designs which promote safety and deter graffiti; (c) adequate definition of uses and ownership; (d) adequate lighting; (e) appropriate signage and wayfinding; (f) minimisation of entrapment locations; and (g) building entrances, loading and storage areas being well lit and lockable after hours. **Editor's note—**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.

Table 6.5.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Community and environmental risk	
PO16 Development is designed and managed so that it provides appropriate protection for community health and safety, and avoids unacceptable risk to life and property.	No acceptable outcome is nominated.
PO17 The site layout and design responds sensitively to on-site and surrounding drainage patterns and ecological values by: (a) maximising retention of natural drainage patterns; (b) ensuring existing drainage capacity is not reduced; (c) maximising the retention or enhancement of existing vegetation and ecological corridors; and (d) providing buffers to protect the ecological functions of waterways.	No acceptable outcome is nominated.

Table 6.5.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Nelly Bay low impact industry precinct	
PO18 Building design and massing is consistent with the low density scale of the Magnetic Island character and articulates individual buildings.	No acceptable outcome is nominated.
PO19 Design and articulation of buildings contribute to the creation of the local Magnetic Island character through: (a) climate-responsive design; and (b) natural setting of buildings within the landscape.	No acceptable outcome is nominated.
PO20 Streetscape and landscape treatments contribute to the creation of the local Magnetic Island character.	No acceptable outcome is nominated.

6.5.2 Medium impact industry zone code

6.5.2.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.5.2.2 Purpose

(1) The purpose of the Medium impact industry zone code is to provide for medium impact industry uses.

It may include non-industrial and business uses that support the industrial activities where they do not compromise the long-term use of the land for industrial purposes.
Activities considered appropriate in this zone are defined as Medium impact industry in the schedule of definitions.

(2) The particular purpose of the code is to:

(a) facilitate the safe and efficient use of land for a range of industrial activities; and

(b) ensure development does not detract from the function and viability of centres, and minimises impacts on the amenity of nearby sensitive uses.

(3) The purpose of the code will be achieved through the following overall outcomes:

(a) the zone accommodates a wide range of industrial uses that are likely to have some potential for off-site impacts, including manufacturing, transport, storage, outdoor sales and other uses which require larger sites in locations separated from sensitive land uses;

(b) other non-industrial uses are those which are ancillary to or directly support the industrial functions of the area, and are limited in extent;

(c) the zone does not accommodate uses which are primarily oriented to retail sales and which are more appropriately located in centres, such as shops, shopping centres, showrooms, or retail based hardware supplies;

(d) the intrusion of incompatible uses, or uses which may be more appropriately accommodated in other zones, is avoided to protect the availability of land for industrial purposes and the viability and efficient operation of existing and future industry uses;

(e) the impacts of development are managed to ensure public health and safety and achieve acceptable levels of amenity for nearby sensitive land uses;

(f) development avoids significant adverse effects on water quality and the natural environment;

(g) development does not adversely affect the safe and efficient operation of nearby Department of Defence landholdings;

(h) development is safe and legible, and designed to establish safe and efficient movement systems;

(i) lot sizes provide for a range of large format industrial uses and discourage take up of land for smaller scale activities better suited to the Low impact industry zone; and

(j) development makes a positive contribution to the public domain, particularly along major roads.

(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts:

Roseneath medium impact industry precinct:

(a) medium impact industries, including those with a transport and logistics focus, occurs in the precinct;

(b) development provides adequate new infrastructure to support new uses, including roads, stormwater, water and sewer infrastructure;

Editor's note—Conditions of approval or infrastructure agreements will be used (as appropriate) to ensure that infrastructure is provided.

(c) development minimises impacts on surrounding land uses, including existing residential uses as far as practicable; and

(d) development protects the hydraulic capacity and environmental qualities of waterways, including Stuart and Stoney Creeks, and unnamed tributaries.

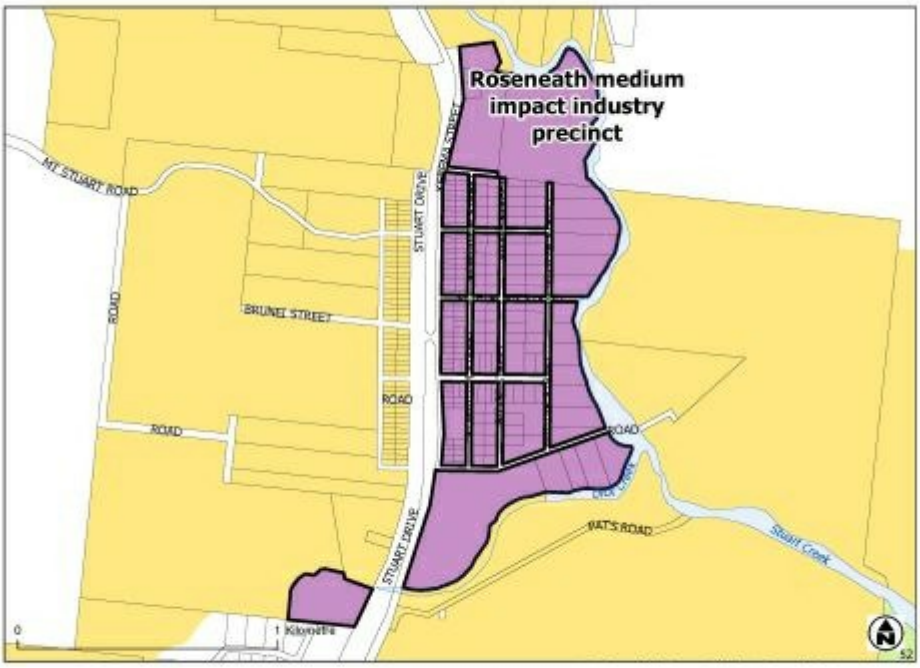

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Figure 6.154 - Roseneath medium impact industry precinct

6.5.2.3 Assessment benchmarks

Table 6.5.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development — where involving a new building or expansion to an existing building **Note—**The following acceptable outcomes will not apply where the development is a change of use in an existing building that does not involve any expansion of that building.	
Built form	
PO1 Development is consistent with the scale of surrounding buildings.	**AO1.1** Site cover does not exceed 80%.
	AO1.2 Buildings are set back from street and road frontages: (a) within 20% of the average front setback of adjoining buildings; or (b) where there are no adjoining buildings, 6m.
PO2 Building entrances are legible and safe.	**AO2.1** Pedestrian entries are visible from the primary street frontage and visitor car parking areas, and are separate to vehicle access points.
	AO2.2 Doorway recesses in building facades are not of a size or configuration that would conceal a person, unless lighting, mirrors, transparent materials or angled approaches are included to offset the potential for impacts on safety.
	AO2.3 Each building or tenancy is provided with a highly visible street and unit number respectively.
	AO2.4 Premises are provided with external lighting sufficient to provide safe ingress and egress for site users.

Table 6.5.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development — where involving a new building or expansion to an existing building **Note—**The following acceptable outcomes will not apply where the development is a change of use in an existing building that does not involve any expansion of that building.	
Amenity	
PO3 Utility elements (including refuse areas, outdoor storage, plant and equipment, loading and unloading areas) are screened from view from the street and sensitive land uses.	**AO3** Utility elements are: (a) located within or behind the building; or (b) screened by a 1.8m high solid wall or fence; or (c) behind landscaping having the same screening effect as a 1.8m screen fence. **Editor's note—**Screening can be provided by any combination of the above treatments to meet the acceptable outcome.
PO4 Landscaping is provided to create streetscapes which contribute positively to the city image, particularly along major roads and streets.	**AO4** Landscaping is provided for a minimum depth of: (a) 4m along an arterial or sub-arterial road; or (b) 2m along any other road or street frontage.

Table 6.5.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
General	
PO5 Development minimises impacts on sensitive land uses having regard to noise, vibration, odour, dust, light or other emissions. Adverse impacts on the health, safety or amenity of nearby residential zoned land or other sensitive land uses are minimised. **Editor's note—**Applicants should have regard to relevant legislative, industry and licensing requirements.	**AO5.1** Development achieves the noise generation levels set out in the Environmental Protection (Noise) Policy 2008.
	AO5.2 Development achieves the air quality objectives set out in the Environmental Protection (Air) Policy 2008.
	AO5.3 Materials that are capable of generating air contaminants are wholly enclosed in storage bins.
	AO5.4 All external areas are sealed, turfed or landscaped.
	AO5.5 Light emanating from any source complies with A*ustralian Standard AS4282 Control of the Obtrusive Effects of Outdoor Lighting*.
	AO5.6 Outdoor lighting is provided in accordance with *Australian Standard AS 1158.1.1 — Road Lighting — Vehicular Traffic (Category V) Lighting — Performance and Installation Design Requirements*.

PO6 Development provides for the collection, treatment and disposal of liquid wastes or sources of contamination such that off-site releases of contaminants do not occur. **Editor's note—**Applicants should also have regard to Section 9.3.7 Works code, Section 9.3.2 Healthy waters code and other relevant legislative, industry and licensing requirements.	**AO6.1** Areas where potentially contaminating substances are stored or used, are roofed and sealed with concrete, asphalt or similar impervious substance and bunded.
	AO6.2 Roof water is piped away from areas of potential contamination.
PO7 The site layout and design: (a) minimises earthworks; (b) maximises retention of natural drainage patterns; and (c) ensures existing drainage capacity is not reduced.	**AO7** Development does not involve earthworks involving more than 100m^3.

Table 6.5.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Defence land	
PO8 Development does not adversely affect the safe and efficient operation of nearby Department of Defence land.	**AO8** All buildings and operational components of a use are setback not less than 100m from the closest boundary of land in the control of or used by the Department of Defence.

Table 6.5.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Caretaker's accommodation	
PO9 Development does not compromise the viability of the primary use of the site.	**AO9.1** No more than one (1) caretaker's accommodation dwelling is established on the site.
	AO9.2 The caretaker's accommodation dwelling has a gross floor area of no more than 70m^2.

Table 6.5.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Ancillary office uses	
PO10 Offices are accommodated where they are ancillary to the primary industrial use on the site.	**AO10** The area used for an office use does not exceed 250m^2 or 10% of the gross floor area, whichever is the lesser.

Table 6.5.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Uses	
PO11 Development within the zone facilitates: (a) industrial activities whose impacts on sensitive land uses and the natural environment can be appropriately managed; or (b) uses which require larger sites in locations that are separated from sensitive land uses, and are not more appropriately accommodated in other zones; or (c) non-industrial uses which are small in scale and ancillary to or directly support the industrial functions of the area.	No acceptable outcome is nominated.
PO12 Development is not primarily oriented to retail sales, other than where involving an outdoor sales activity.	No acceptable outcome is nominated.
PO13 Development does not significantly detract from the availability or utility of land for industry purposes.	No acceptable outcome is nominated.

Table 6.5.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Crime prevention through environmental design	
PO14 Site layout facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building designs which promote safety and deter graffiti; (c) adequate definition of uses and ownership; (d) adequate lighting; (e) appropriate signage and wayfinding; (f) minimisation of entrapment locations; and (g) building entrances, loading and storage areas being well lit and lockable after hours. **Editor's note—**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.

Table 6.5.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Community and environmental risk	
PO15 Development is designed and managed so that it provides appropriate protection for community health and safety, and avoids unacceptable risk to life and property.	No acceptable outcome is nominated.
PO16 The site layout and design responds sensitively to on-site and surrounding drainage patterns and ecological values by: (a) maximising retention of natural drainage patterns; (b) ensuring existing drainage capacity is not reduced; (c) maximising the retention or enhancement of existing vegetation and ecological corridors; and (d) providing buffers to protect the ecological functions of waterways.	No acceptable outcome is nominated.

Table 6.5.2.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts	
Roseneath medium impact industry precinct	
PO17 Development is supported by adequate infrastructure, including: (a) connection to reticulated water and sewage networks; (b) connection to a stormwater drainage system; and (c) constructed roads.	No acceptable outcome is nominated. **Editor's note—**In accordance with the Act, council may seek to secure the necessary infrastructure through conditions of approval or infrastructure agreements.
PO18 Development protects the environmental quality, existing riparian vegetation and hydraulic capacity of waterways including Stuart and Stoney Creeks.	No acceptable outcome is nominated.
PO19 Development does not compromise the safe use of the nearby magazine reserve.	**AO19** The development does not compromise the protective works safety distance from explosive storage stipulated in *AS2187-1 Explosives — Storage, transport and use* and is otherwise consistent with that standard. **Editor's note—**The magazine reserve is located on the following property descriptions, Lot 103 Plan EP2187 and Lot 220 Plan SP138418.
PO20 Impacts on nearby residential uses are minimised as far as practicable. **Editor's note—**Applicants should have regard to relevant legislative, industry and licensing requirements.	No acceptable outcome is nominated.

6.5.3 High impact industry zone code

6.5.3.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.5.3.2 Purpose

(1) The purpose of the High impact industry zone code is to provide for high impact industry uses.

It may include non-industrial and business uses that support the industrial activities where they do not compromise the long-term use of the land for industrial purposes.

Activities considered appropriate in this zone are defined as High impact industry in the schedule of definitions.

(2) The particular purpose of the code is to:

- (a) facilitate the safe and efficient use of land for a range of higher impacting industrial activities; and
- (b) ensure development does not detract from the function and viability of centres, and minimises impacts on the amenity of nearby sensitive uses.

(3) The purpose of the code will be achieved through the following overall outcomes:

- (a) the zone accommodates industrial uses that are likely to have a higher potential for off-site impacts and other uses that are of a similar nature or scale and are compatible with the impacts and risks associated with the zone;
- (b) the zone does not accommodate uses which attract visitation by members of the public.
- (c) the intrusion of incompatible uses, or uses which may be more appropriately accommodated in other zones, is avoided to protect the availability of land for industrial purposes and the viability and efficient operation of existing and future industry uses;
- (d) the impacts of development are managed to ensure public health and safety;
- (e) development avoids significant adverse effects on water quality and the natural environment;
- (f) development does not adversely affect the safe and efficient operation of Department of Defence landholdings;
- (g) development is safe and legible and designed to facilitate large format industrial uses.
- (h) development makes a positive contribution to the public domain, particularly along major roads.

(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts:

Lansdown high impact industry precinct:

- (a) medium and high impact industrial uses are accommodated in this precinct;
- (b) development provides adequate new infrastructure to support new uses, including roads, stomwater, water and sewer infrastructure;

  Editor's note - Conditions of approval or infrastructure agreements will be used (as appropriate) to ensure that infrastructure is provided.
- (c) development is avoided in environmental corridors and the water resource catchment area to maintain ecological processes, biodiversity values and the quality of waterways;
- (d) development avoids impacts on groundwater;
- (e) development provides strong landscape amenity to all boundaries fronting a road and land external to the zone;
- (f) development minimises impacts on surrounding land uses, including existing sensitive land uses; and
- (g) development does not compromise petroleum pipeline infrastructure, and the risks and hazards to people and property associated with petroleum pipeline infrastructure are not further increased through development.

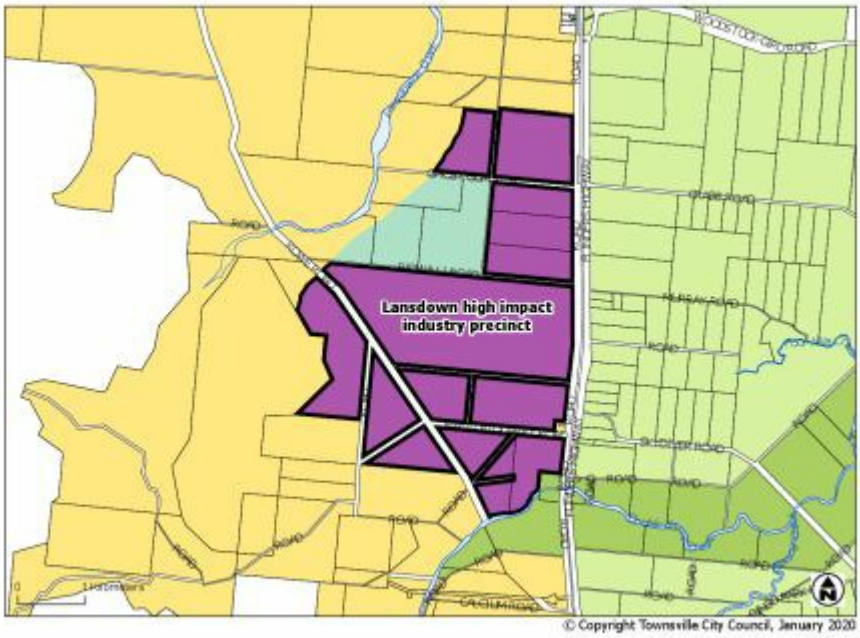

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Figure 6.163 - Lansdown high impact industry precinct

6.5.3.3 Assessment benchmarks

Table 6.5.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development — where involving a new building or expansion of an existing building **Note—**The following acceptable outcomes will not apply where the development is a change of use in an existing building that does not involve any expansion of that building.	
Built form	
PO1 Development is consistent with the scale of surrounding buildings.	**AO1.1** Site cover does not exceed 80%.
	AO1.2 Buildings are set back from street frontages: (a) within 20% of the average front setback of adjoining buildings; or (b) where there are no adjoining buildings, 6m.
PO2 Building entrances are legible and safe.	**AO2.1** Pedestrian entries are visible from the primary street frontage and visitor parking areas, and are separate to vehicle access points.
	AO2.2 Doorway recesses in building facades are not of a size or configuration that would conceal a person, unless lighting, mirrors, transparent materials or angled approaches are included to offset the potential for impacts on safety.
	AO2.3 Each building or tenancy is provided with a highly visible street and unit number respectively.
	AO2.4 Premises are provided with external lighting sufficient to provide safe ingress and egress for site users.

Table 6.5.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development — where involving a new building or expansion of an existing building **Note—**The following acceptable outcomes will not apply where the development is a change of use in an existing building that does not involve any expansion of that building.	
Amenity	
PO3 Utility elements (including refuse areas, outdoor storage, plant and equipment, loading and unloading areas) are screened from view from major roads.	**AO3** Utility elements are: (a) located within or behind the building; or (b) screened by a 1.8m high solid wall or fence; or (c) behind landscaping having the same screening effect as a 1.8m screen fence. **Editor's note—**Screening can be provided by any combination of the above treatments to meet the acceptable outcome.

PO4 Landscaping is provided to create streetscapes which contribute positively to the city image, particularly along major roads and streets.	**AO4** Landscaping is provided along all road frontages of the site for a minimum depth of: (a) 4m along an arterial or sub-arterial road; or (b) 2m along any other road or street frontage.

Table 6.5.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
General	
PO5 Development minimises impacts on sensitive land uses having regard to noise, vibration, odour, dust, light or other emissions. Adverse impacts on the health, safety or amenity of nearby residential zoned land or other sensitive land uses are minimised. **Editor's note -** Applicants should have regard to relevant legislative, industry and licensing requirements. **Editor's note** - A report by a qualified air quality expert may be required to allow an assessment to be made of the air quality or impacts. The Queensland Odour Impact Assessment Guidelines provides a methodology for assessing impact. **Editor's note** - Sensitive land uses are those uses defined by the *Planning Regulation 2017*.	**AO5.1** Development achieves the noise generation levels set out in the Environmental Protection (Noise) Policy 2008.
	AO5.2 Development achieves the air quality objectives set out in the Environmental Protection (Air) Policy 2008.
	AO5.3 Materials that are capable of generating air contaminants are wholly enclosed in storage bins.
	AO5.4 All external areas are sealed, turfed or landscaped.
	AO5.5 Light emanating from any source complies with *Australian Standard AS 4282 Control of the Obtrusive Effects of Outdoor Lighting*.
	AO5.6 Outdoor lighting is provided in accordance with Australian Standard *AS 1158.1.1 — Road Lighting — Vehicular Traffic (Category V) Lighting — Performance and Installation Design Requirements*.
	AO5.7 Development achieves the human comfort vibration limits set out in Table 1 at all nearby sensitive land uses.
PO6 Development provides for the collection, treatment and disposal of liquid wastes or sources of contamination such that off- site releases of contaminants do not occur. **Editor's note—**Applicants should also have regard to Section 9.3.7 Works Code, Section 9.3.2 Healthy waters code and other relevant legislative, industry and licensing requirements.	**AO6.1** Areas where potentially contaminating substances are stored or used, are roofed and sealed with concrete, asphalt or similar impervious substance and bunded.
	AO6.2 Roof water is piped away from areas of potential contamination.
PO7 The site layout and design: (a) minimises earthworks; (b) maximises retention of natural drainage patterns; and (c) ensures existing drainage capacity is not reduced.	**AO7** Development does not involve earthworks involving more than $100m^3$.

Table 6.5.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Defence land	
PO8 Development does not adversely affect the safe and efficient operation of Department of Defence land.	**AO8** All buildings and operational components of a use are setback not less than 100m from the closest boundary of land in the control of or used by the Department of Defence.

Table 6.5.3.3 - Self-assessable and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Caretaker's accommodation	
PO9 Development does not compromise the viability of the primary use of the site.	**AO9.1** No more than one caretaker's accommodation dwelling is established on the site.
	AO9.2 The caretaker's accommodation dwelling has a gross floor area of no more than 70m^2.

Table 6.5.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Uses	
PO10 The zone predominantly accommodates industrial uses with potential for higher impacts.	No acceptable outcome is nominated.
PO11 Other uses are accommodated where they: (a) are uses which: (i) require larger sites in locations that are separated from sensitive land uses; (ii) are not more appropriately accommodated in other zones; and (iii) are compatible with the impacts and risks associated with the zone; or (b) are small in scale and ancillary to or directly support the industrial functions of the area.	No acceptable outcome is nominated.
PO12 The zone does not accommodate uses that attract members of the public who are not employed in the zone.	No acceptable outcome is nominated.
PO13 Development does not significantly detract from the availability or utility of land for industrial purposes.	No acceptable outcome is nominated.

Table 6.5.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Crime prevention through environmental design	
PO14 Site layout facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building designs which promote safety and deter graffiti; (c) adequate definition of uses and ownership; (d) adequate lighting; (e) appropriate wayfinding mechanisms; (f) minimisation of entrapment locations; and (g) building entrances, loading and storage areas being well lit and lockable after hours. **Editor's note—**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.

Table 6.5.3.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Community and environmental risk	
PO15 Development is designed and managed so that it provides appropriate protection for community health and safety, and avoids unacceptable risk to life and property.	No acceptable outcome is nominated.
PO16 The site layout and design minimises impacts of on-site and surrounding drainage patterns and ecological values by: (a) maximising retention of natural drainage patterns; (b) ensuring existing drainage capacity is not reduced; (c) maximising the retention or enhancement of existing vegetation and ecological corridors; and (d) providing buffers to protect the ecological functions of waterways.	No acceptable outcome is nominated.

Table 6.5.3.3-Accepted development subject to requirements and assessable development

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note - Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes takes precedence.**	
Lansdown high impact industry precinct	
PO17 Development areas are to be created generally in accordance with Figure - 6.164 Lansdown concept plan.	No acceptable outcome is nominated.
PO18 To maintain the natural environmental values ecological processes and the quality of waterways development does not establish within the areas identified as 'environmental corridors' and 'water resource catchment area' as shown on Figure - 6.164 Lansdown concept plan.	No acceptable outcome is nominated.
PO19 Development does not discharge waste water into the Ross River Dam catchment. **Editor's note** - Applicants should also refer to the Healthy waters code, and the Natural assets overlay code and Water catchment overlay code for additional requirements regarding water and waterway related matters.	No acceptable outcome is nominated.
P020 Development is supported by adequate infrastructure, including: (a) connection to reticulated water and sewerage networks; (b) provision of stormwater quality and quantity management systems; (c) constructed roads; and (d) on-site water quality treatment infrastructure or water detention basins located outside environmental corridors. **Editor's note** - Applicants should also have regard to Section 9.3.7 Works code and Section 9.3.2 Healthy waters code.	No acceptable outcome is nominated. **Editor's note -** In accordance with the Act, council may seek to secure the necessary infrastructure through conditions of approval or infrastructure agreements.
PO21 Development does not: (a) affect the long-term operation of a high-pressure gas pipeline; and (b) adversely impact the safety of people and property.	**AO21.1** Development does not occur within 100m of a high-pressure gas pipeline.
	AO21.2 Development involving the use, manufacturing or storage of hazardous chemicals does not occur within 300m of a high-pressure gas pipeline.
PO22 Development protects the water quality, ecological values, hydrological processes and other environmental values of any surface water or groundwater.	No acceptable outcome is nominated. **Editor's note** – Applicants should also have regard to Part 9.3.2 Healthy waters code for guidance on how to demonstrate compliance with this performance outcome. To demonstrate compliance with this performance outcome, council may request that a ground and surface water resource assessment be undertaken by a qualified person.

PO23 Landscaping is provided to mitigate the visual impact of development and screen unsightly components and creates streetscapes which contribute positively to the city image, particularly along roads and land in another zone. **Editor's Note** – Applicants will need to address 9.3.3 Landscaping Code and SC6.4.3.6 Landscape Policy.	**AO23** Landscaping is provided for a minimum depth of: (a) 4m along any arterial or sub-arterial road or any other road; or (b) 4m along any land in another zone.
PO24 In addition to meeting PO5, development in the Lansdown high impact industry precinct maintains a high level of noise amenity for nearby rural zoned land and sensitive land uses.	AO24 Development achieves the noise levels set out in the *Department of Environment and Heritage Protection Planning for Noise Control Guideline.*

(1) The PIA is shown (small scale) in the following PIA map index.

3.8.1 PIA map index

SC3.7 Existing and projected infrastructure demand

The assumed demand summary for each service catchment is based upon the population and employment projections summarised in Schedule 3, section SC3.5 and the unit rates of demand specified in Part 4 - Priority infrastructure plan, Section 4.2.11.2 - Development and demand generation rates.

6.6 Rural zones category

6.6.1 Rural zone code

6.6.1.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.6.1.2 Purpose

(1) The purpose of the Rural zone code is to:

(a) provide for a wide range of rural uses including cropping, intensive horticulture, intensive animal industries, animal husbandry, animal keeping and other primary production activities;

(b) provide opportunities for non-rural uses that are compatible with agriculture, the environment, and the landscape character of the rural area where they do not compromise the long-term use of the land for rural purposes; and

(c) protect or manage significant natural features, resources, and processes, including the capacity for primary production.

(2) The particular purpose of the code is to ensure:

(a) the productive capacity of all rural land and opportunities to diversify and add value to rural production are maximised, within the ecological constraints of the land;

(b) the character and landscape values of non-urban land are maintained; and

(c) urban or rural residential development does not expand into rural zoned land.

(3) The purpose of the code will be achieved through the following overall outcomes:

(a) the zone primarily accommodates cropping or animal husbandry and ancillary detached houses;

(b) all rural land is protected from further fragmentation. A lack of viability for existing farm units and small holdings does not justify their further subdivision or use for non-rural purposes;

(c) housing in the rural zone only occurs to the extent that it supports the productive use of the land. Urban and rural residential development is contained within designated growth areas and does not expand into the rural zone;

(d) other new enterprises, including rural industries and tourism activities, are accommodated where:

(i) they are directly associated with rural production, a natural resource or the natural environment or need to be remote from urban uses as a result of their impacts;

(ii) the productive capacity of the land is not diminished and conflicts with existing and intended activities in the surrounding area are avoided;

(iii) the existing landscape and natural resource values of the land are maintained; and

(iv) the development is not more appropriately located in another zone;

(e) extractive resources and existing extractive operations on rural land are protected from encroachment by incompatible uses;

(f) the environmental, character and landscape values of all rural land are maintained; and

(g) adequate separation and buffering is provided by new development in nearby urban or rural residential zoned land to ensure the encroachment by more intensive residential and other sensitive uses is avoided.

(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts:

Horticulture precinct:

(a) this precinct contains the most productive areas in the Townsville region, in which cropping is the predominant land use. The productive capacity of this land is maximised;

(b) rural industries which have a direct nexus with the rural production in the immediate locality and only small-scale farm stay or bed and breakfast accommodation are established in this precinct;

(c) forestry does not adversely affect horticultural production, natural or scenic values on nearby land;

(d) permanent plantations, animal keeping (being kennels and catteries), intensive animal industries and aquaculture are not established in this precinct; and

(e) subdivision of lots below 40ha generally does not occur.

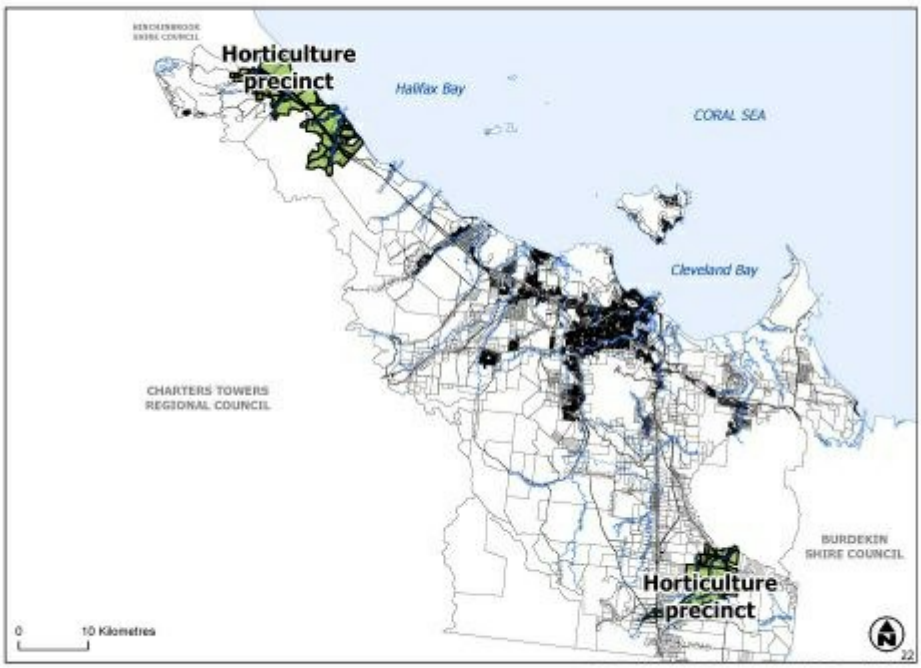

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Figure 6.155 - Horticulture precinct

Mixed farming precinct:

(a) this precinct contains low intensity animal husbandry with some potential for cropping.

(b) animal keeping (being kennels and catteries), intensive animal industries, aquaculture and rural industries establish where they:

  (i) are able to be located on less productive land within the precinct;

  (ii) are adequately separated from rural dwellings and other sensitive land uses;

  (iii) do not diminish the productive capacity of other land nearby; and

  (iv) do not diminish water quality, natural, scenic or environmental values, including remnant vegetation;

(c) subdivision of lots below 400ha in the Ross River Dam catchment and 40ha elsewhere generally does not occur.

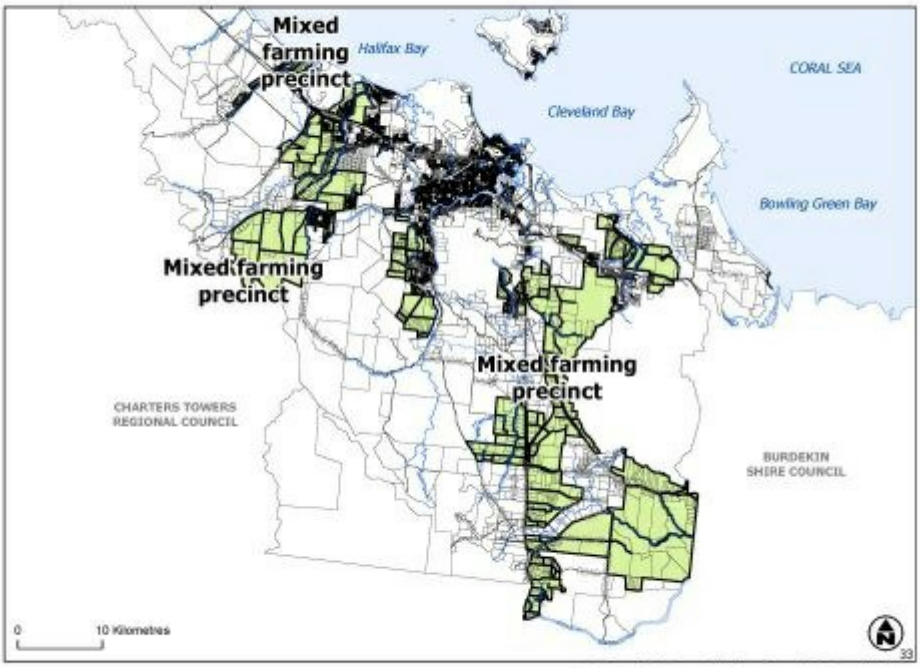

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Figure 6.156 - Mixed farming precinct

Grazing precinct:

(a) this precinct predominantly contains broad hectare grazing;

(b) the landscape character of elevated areas with high landscape significance is protected;

(c) animal keeping (being kennels and catteries), intensive animal industries, aquaculture and rural industries establish where they:

  (i) are able to be located on less productive land within the precinct;

  (ii) are adequately separated from rural dwellings and other sensitive land uses;

  (iii) do not diminish the productive capacity of other land nearby; and

  (iv) do not diminish water quality, natural, scenic or environmental values, including remnant vegetation;

(d) development does not prejudice the long-term potential of the Lansdown high impact industry precinct and the Lansdown motor sport facility precinct to accommodate development consistent with the relevant zone code; and

(e) subdivision of lots below 400ha generally does not occur.

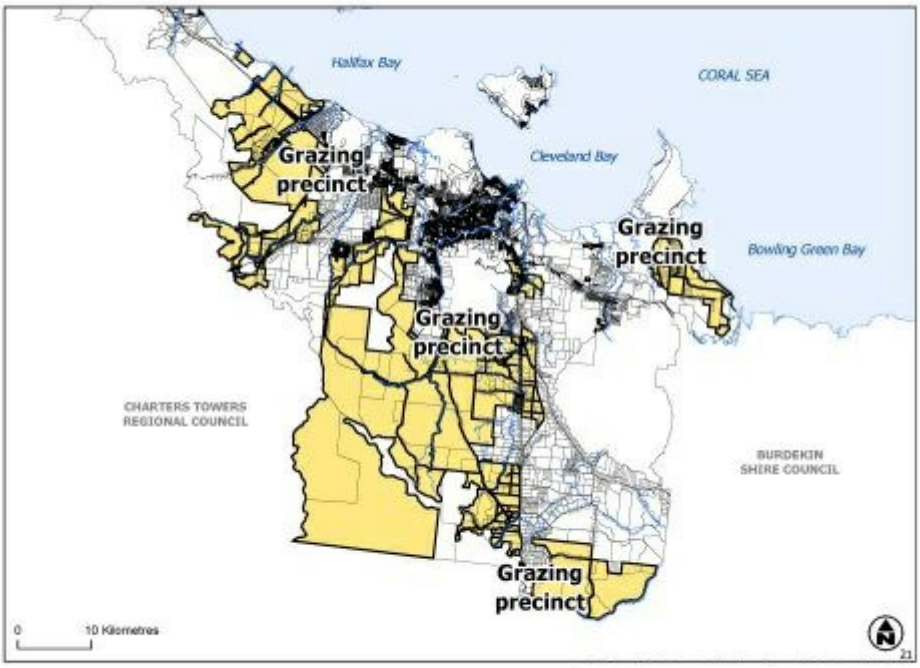

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Figure 6.157 - Grazing precinct

Cungulla precinct:

(a) rural land in the Cungulla precinct includes smaller lots used for primarily residential purposes. Agricultural uses are of lesser importance at Cungulla;

(b) houses are established on rural zoned land at Cungulla, providing that appropriate residential amenity and safety can be maintained, with particular regard to nearby extractive industry activities;

(c) houses are provided with adequate water supply and sewage treatment and disposal can be provided; and

(d) subdivision of lots below 10ha generally does not occur.

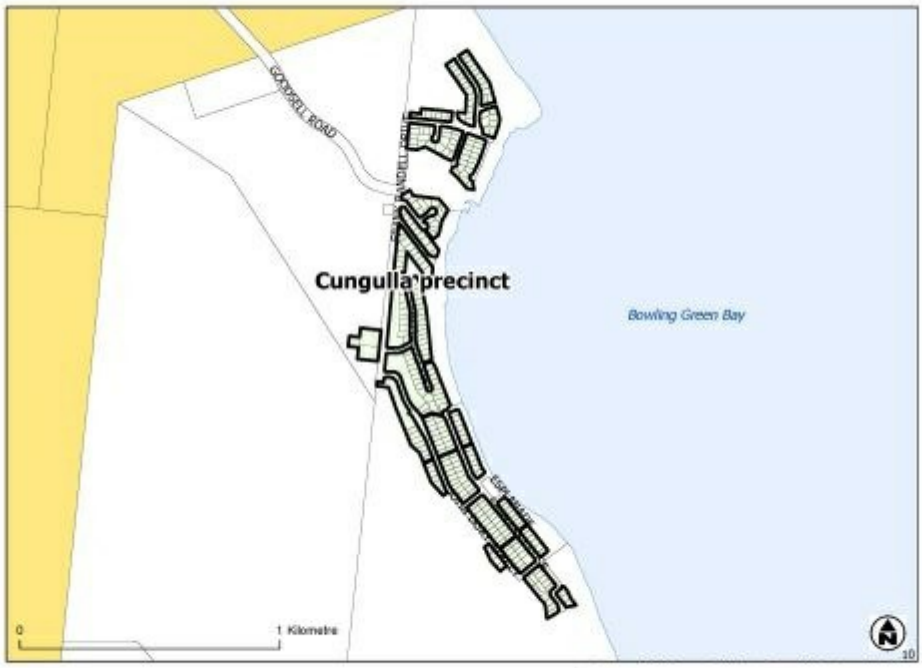

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Figure 6.158 - Cungulla precinct

Jensen precinct:

(a) this precinct contains smaller rural living lots with some potential for cropping;

(b) houses are provided with reticulated water supply, and on-site sewerage treatment and disposal; and

(c) subdivision of lots below 10ha generally does not occur.

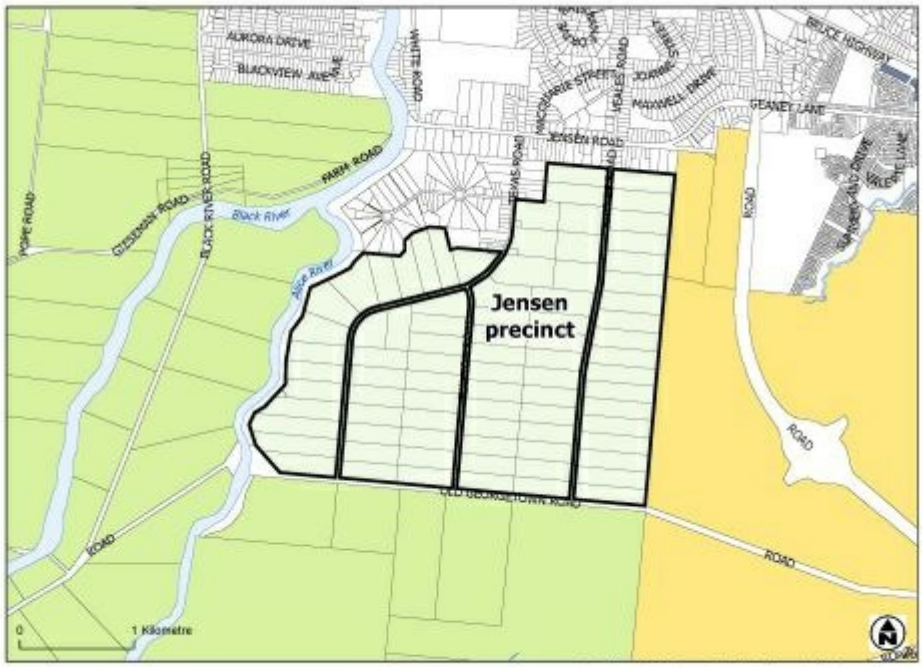

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Figure 6.159 - Jensen precinct

6.6.1.3 Assessment benchmarks

Table 6.6.1.3-Accepted development subject to requirements and assessable development (Part)

Editor's note—Dwelling houses may also be accepted development subject to requirements against the Water resources catchment overlay code.

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Caretaker's accommodation, community residence or dwelling house	
PO1 Development does not detract from the effective operation of the primary use or the rural landscape character and amenity of site.	**AO1.1** Dwellings are not established on lots less than 1ha in size, other than in the Cungulla precinct.
	AO1.2.1 Where on a lot less than 1ha (in accordance with AO1.1), no more than 1 dwelling is established. OR **AO1.2.2** On lots greater than 1ha, no more than 2 dwellings are established.
PO2 Dwellings have adequate access to basic services to ensure the safety and wellbeing of residents and the protection of water quality and other environmental values.	**AO2** A dwelling: (a) has a legal access to a constructed road; (b) has a legal connection to either: (i) reticulated water supply; or (ii) a water tank with a minimum capacity of 45,000 liters; and (c) if in the Cungulla precinct, does not rely on bore water.
PO3 Dwellings are sufficiently separated from existing lawful activities in the locality in order to protect the safety and amenity of residents and to ensure the ongoing operation of those activities is not prejudiced.	**AO3.1** Dwellings are separated from: (a) an existing or approved intensive animal industry use by at least 1km; (b) an existing or approved extractive industry operation or a resource/processing area shown on overlay map OM-05 by: (i) 500m from a hard rock extractive industry; (ii) 200m from a sand and gravel extractive industry; and (iii) 100m from a haul route used by any existing operation.
	AO3.2 Dwellings are set back from all site boundaries by 20m, other than in the Cungulla precinct where dwellings and ancillary structures are set back a minimum of 6m from front boundaries, 3m from side boundaries where adjoining a road or 1.5m otherwise for side and rear boundaries.

Table 6.6.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Home based business	
PO4 Development does not detract from the effective operation of the primary use or the rural landscape character and amenity of site. **Editor's note—**A heavy vehicle is a vehicle with more than 4.5 tonnes GVM (gross vehicle mass), GCM (gross combination mass) or more than 2 tonnes ATM (aggregate trailer mass).	**AO4.1** The home based business does not: (a) require more than the owner and 2 employees on-site at any one time; (b) does not generate more than 28 vehicle trips per day by other vehicles, where one trip includes arriving at the site and a second trip is departing the site. These trips are additional to normal trips associated with the dwelling or rural use; (c) include an area exceeding 20m^2 used for the sale of the goods made on the site; (d) involve hiring out of materials, goods, appliances or vehicles; and (e) involve the repair or maintenance of vehicles, other than minor maintenance of vehicles used in conjunction of the home business or rural use on the site.
	AO4.2 Bed and breakfast or farm stay accommodation does not exceed three bedrooms or three cabins.
PO5 Heavy vehicle parking: (a) has a direct nexus with a home based business or rural use carried out on the site; and (b) does not adversely affect the amenity of neighbouring properties.	**AO5.1** Not more than two heavy vehicles are parked on the site.
	AO5.2 While on-site, vehicles: (a) are not operated between the hours of 10pm and 6am; (b) are not left idling for more than 5 minutes at any one time; and (c) do not have a refrigeration unit running.

Table 6.6.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Roadside stall	
PO6 Roadside stalls are small in scale and do not impact negatively upon the amenity, character or safety of rural areas and the safety and efficiency of roads.	**AO6.1** Any structure used for the sale of goods or produce is limited to 20m^2 gross floor area.
	AO6.2 Access to the structure is via the primary property access point.
	AO6.3 Produce or goods sold is grown, made or produced on the land on which the road side stall is erected.

Table 6.6.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Rural industry, community use, wholesale nursery	
PO7 Development does not impact negatively upon the amenity, character or safety of surrounding areas.	**AO7.1** Non-residential buildings, animal enclosures storage facilities and waste disposal areas are set back: (a) 100m from the boundary of any land included in residential zone or the rural residential zone; or (b) 50m from other site boundaries.
	AO7.2 Buildings are set back 20m from any road frontage.
	AO7.3 Building height does not exceed 2 storeys.

Table 6.6.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
General benchmarks	
PO8 Development: (a) is located on the least productive parts of a site; (b) does not restrict the ongoing safe and efficient use of nearby rural uses; and (c) is adequately separated or buffered where it is likely to be sensitive to the operational characteristics associated with rural uses, rural industries, extractive industries or other lawful use.	No acceptable outcome is nominated.
PO9 Tourism-related uses are established only where they are directly associated and compatible with rural production, natural resources or landscape amenity in the immediate vicinity.	No acceptable outcome is nominated.

PO10 Uses that require isolation from urban areas are accommodated only where: (a) they cannot be more appropriately located in an industrial or other relevant zone; (b) they can be adequately separated from sensitive uses (whether or not in the rural zone); (c) they can be adequately separated from land in the Horticulture precinct; and (d) potential impacts can be appropriately managed. **Editor's note—**Applicants seeking approval for intensive animal industries should refer to the *'National Guidelines for Beef Cattle Feedlots in Australia, National Beef Cattle Feedlot Environmental Code of Practice'*, 'Queensland Dairy Farming Environmental Code of Practice', *'National Environmental Guidelines for Piggeries'* and *'Queensland Guidelines Meat Chicken Farms* and that applicants consult with the relevant State government department prior to the lodgement of a development application. For other uses council may require a study that, amongst other matters, identifies how the development is in accordance with Environmental Protection (Air) Policy 1997 or Environmental Protection (Noise) Policy 1997.	No acceptable outcome is nominated.
PO11 Development is designed and managed so that it provides appropriate protection for community health and safety, and avoids unacceptable risk to life and property.	No acceptable outcome is nominated.
PO12 Development does not adversely impact on the character, amenity or scenic values of the locality, having regard to: (a) the scale, siting and design of buildings; (b) the visibility of buildings, structures and infrastructure; (c) likely emissions including water-borne contaminants, noise, dust, lighting and odour; and (d) the nature or volume of traffic generated.	No acceptable outcome is nominated.
PO13 Ecological values, habitat corridors and soil and water quality are protected, having regard to: (a) maximisation of vegetation retention and protection of vegetation from the impacts of development; (b) avoidance of potential for erosion and minimisation of earthworks; (c) retention and protection of natural drainage lines and hydrological regimes; and (d) avoidance of leeching by nutrients, pesticides or other contaminants, or potential for salinity.	No acceptable outcome is nominated.

Table 6.6.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Horticulture precinct	
PO14 Productive land within this precinct is maintained.	No acceptable outcome is nominated.
PO15 Rural industries are established only where associated with rural production in the immediate vicinity.	No acceptable outcome is nominated.
PO16 Tourist related uses are limited to small-scale bed and breakfast and farm stay which do not detract from the ongoing productive use of the site.	No acceptable outcome is nominated.
PO17 Reconfiguration is limited to protect the ongoing viability of existing and potential horticulture.	**AO17** The minimum lot size in the precinct is 40ha.

Table 6.6.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Mixed farming precinct	
PO18 Reconfiguration is limited to protect the ongoing viability of existing and potential horticulture uses, water quality and ecological and landscape values.	**AO18** The minimum lot size in the precinct is 40ha, except in the Ross River Dam Catchment area where the minimum lot size is 400ha. **Editor's note—**The Ross River Dam catchment area is depicted on the Water resource catchment overlay map OM-09.

Table 6.6.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Grazing precinct	
PO19 Development in the vicinity of the Lansdown high impact industry precinct and the Lansdown motor sport facility precinct is to accommodate development consistent with the relevant zone code.	No acceptable outcome is nominated.
PO20 Reconfiguration is limited to reflect the suitability of the land for primarily grazing purposes and to protect water quality and ecological and landscape values.	**AO20** The minimum lot size in the precinct is 400ha.

Table 6.6.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional benchmarks for assessable development in precincts **Note—**Where acceptable outcomes in this section vary from those provided earlier in this code, the precinct-based acceptable outcomes take precedence.	
Cungulla precinct	
PO21 Development is compatible with the residential amenity of the locality and avoids adverse impacts on surrounding dwellings.	No acceptable outcome is nominated.

6.7 Other zones category

6.7.1 Emerging community zone code

6.7.1.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.7.1.2 Purpose

(1) The purpose of the Emerging community zone code is to:

- (a) identify land that is suitable for urban purposes and conserve land that may be suitable for urban development in the future;
- (b) manage the timely conversion of non-urban land to urban purposes; and
- (c) prevent or discourage development that is likely to compromise appropriate longer term land use.

(2) The particular purpose of the code is:

- (a) to ensure that future development:
  - (i) creates an integrated and compact urban form;
  - (ii) establishes safe, attractive and walkable communities;
  - (iii) provides for a wide choice of housing, employment and accessible community services; and
  - (iv) avoids areas within the Emerging community zone that are unsuited to urban development because of their natural, scenic or cultural values; and
- (b) to ensure that any development which occurs prior to urbanisation of an area maintains the suitability and capacity for future urban development.

(3) The purpose of the zone will be achieved through the following overall outcomes:

- (a) structure planning of areas within the zone is undertaken in advance of development of the land for urban purposes;
- (b) land is developed in a logical pattern that facilitates the efficient provision of infrastructure;
- (c) a high level of integration with existing and future urban development is achieved having regard to movement networks, open space and recreational facilities, centres and community infrastructure;
- (d) development facilitates the establishment of new residential communities together with an appropriate level of supporting land uses such as centres, industry and community activities;
- (e) residential development provides for a range of housing types and achieves a minimum dwelling yield of 15 dwellings per hectare net;
- (f) movement networks are established to promote active transport (walking and cycling) and public transport;
- (g) development retains and protects significant environmental, topographic, scenic and cultural features and values;
- (h) development provides for sufficient buffering to existing or intended non-urban or incompatible uses in surrounding areas; and
- (i) development which is, or has the potential to become, incompatible with future urban development of the area does not occur.

(4) The purpose of the zone will also be achieved through the following additional overall outcomes for particular precincts.

Burdell precinct:

- (a) creates an identifiable community, which is developed through detailed subdivision design, focused land use provision and clear building requirements;
- (b) provides housing diversity to meet the evolving needs of various household types and lifestyles;
- (c) development is integrated and respects the site's character and provides access to open space

and community facilities;

(d) provides a defined open space system that protects wetland and riparian environmental values and provides various recreational opportunities;

(e) development facilitates safe and functional access within the precinct and to external connections;

(f) is designed to achieve tropical urban design outcomes;

(g) is developed for community and commercial facilities to:

(A) service the residents of the precinct, residents of the region, and the travelling public; and

(B) ensure that residential amenity is not detrimentally affected;

(h) provides for an integrated linear open space system along the major drainage paths with linkages to the Bohle River; and

(i) provides for innovative development over the life of the development of the precinct area, to account for technological development and changing patterns in the community.

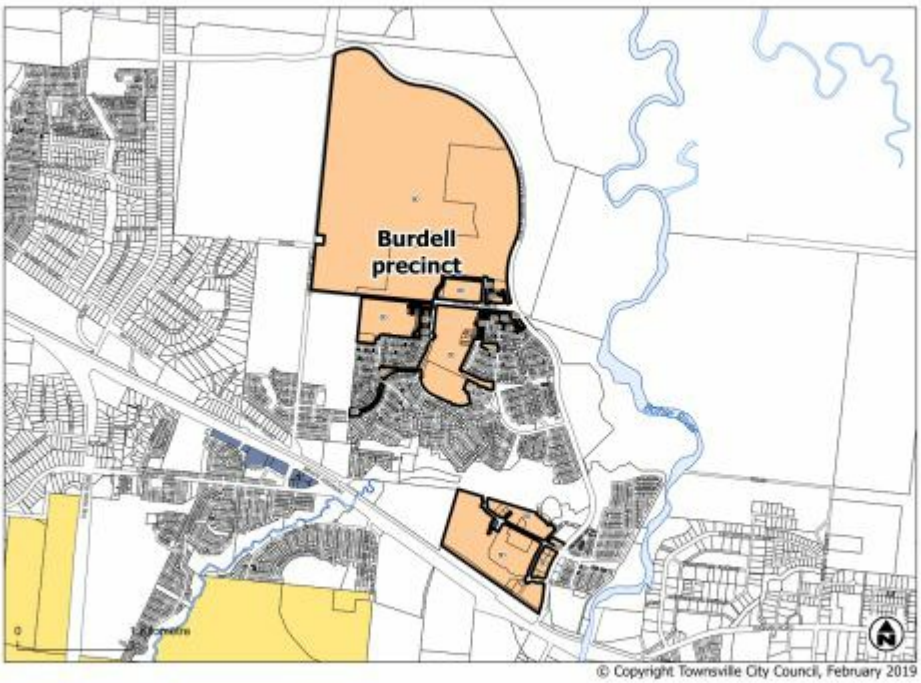

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Figure 6.160 - Burdell precinct

6.7.1.3 Assessment benchmarks

Table 6.7.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Home based business	
PO1 The use does not adversely impact on the amenity of the surrounding residential land uses and local character.	**AO1.1** The home based business: (a) is carried out in an existing building or structure; (b) does not use more than 60m² of the gross floor area of the building or structure; (c) involves at least one or more residents of the dwelling house; (d) involves not more than one non-resident employee; (e) where bed and breakfast or farm stay accommodation does not exceed three bedrooms or cabins; (f) does not generate more than 1 heavy vehicle trip per week; **Editor's note—**A heavy vehicle is a vehicle with more than 4.5 tonnes gross vehicle mass. (g) does not generate more than 14 vehicle trips per day by other vehicles, where one trip includes arriving and departing the site. These trips are additional to normal domestic trips associated with the dwelling; (h) contains visitor parking within the site; (i) does not involve hiring out of materials, goods, appliances or vehicles; and (j) does not involve the repair or maintenance of vehicles, other than minor maintenance of vehicles used in conjunction of the home business on the site. **Editor's note—**home based business operators should also refer to signage requirements under Table 5.8.2 -Operational work being placing an advertising device on a premises and Section 9.3.1-Advertising devices code.
	AO1.2 Functional aspects of the use such as service areas, material storage or use activities are not visible from the street.
	AO1.3 Other than where a bed and breakfast, farm stay or home based childcare, the business use does not operate outside the hours of 8am to 5pm Monday to Friday, 8am to 2pm Saturday and does not operate on Sunday.
	AO1.4 Noise levels do not exceed acoustic quality objectives under the Environmental Protection (Noise) Policy 2008.

Table 6.7.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Sales office	
PO2 The use does not adversely impact on the amenity of the surrounding land uses and local character.	**AO2** Development of the sales office is in place for no more than five years.

Table 6.7.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Interim land uses	
PO3 Development does not reduce or preclude the long-term use of the site or nearby land for urban purposes, having regard to the scale and nature of the activity and its likely impacts, and would not compromise the implementation of a future structure plan over the site.	No acceptable outcome is nominated.

Table 6.7.1.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Creating new communities	
PO4 New development of an urban nature: (a) contributes to a logical pattern and sequence of development; (b) facilitates efficient use of land and infrastructure; (c) facilitates integration with existing and future urban development, having regard to movement networks, open space networks and accessibility to community infrastructure; (d) provides accessibility for all modes of transport including pedestrian, cyclist, public transport and private car; (e) creates clear, direct pedestrian and cycle access to centres, local parks and public transport stops; (f) achieves an average net residential density of at least 15 dwellings per hectare; (g) locates higher density residential development in and around centres, along connector streets and close to transit nodes; (h) locates community facilities requiring high levels of accessibility within or adjoining centres; (i) responds to constraints and natural values on the site and avoids or minimises any impacts on areas of environmental significance; (j) facilitates integrated water cycle management; (k) orients major streets and vistas to landmarks; (l) provides a road network with a capacity adequate for current and future demand; (m) does not increase hazard or risk to existing or future residents; and (n) provides an open space network suitable for current and future needs.	No acceptable outcome is nominated. **Editor's note—**Emerging community planning scheme policy no. SC6.6 provides guidance to applicants on expected structure planning processes to facilitate development that complies with this code and Section 9.3.4 Reconfiguring a lot code.
PO5 Emerging communities are provided with the range of supporting services and uses, including those that provide local employment opportunities, that: (a) are commensurate to the size of the relevant emerging community; (b) do not detract from planning scheme intentions for other parts of the city; and (c) are planned as an integrated and compatible component of the emerging community they serve.	No acceptable outcome is nominated. **Editor's note—**Emerging community planning scheme policy no. SC6.6 provides guidance to applicants on expected structure planning processes to facilitate development that complies with this code and Section 9.3.4 Reconfiguring a lot code.

PO6 New centres are designed to create: (a) a coherent and integrated built form, public realm and circulation networks; (b) central, accessible and attractive public spaces for people to congregate and interact; (c) continuity of streetscape and landscape characteristics; (d) pedestrian friendly and visually interesting frontages to streets and public spaces; (e) active primary frontages with parking areas sleeved by buildings; (f) optimum energy efficiency; (g) a well-integrated mix of uses; (h) connectivity of pedestrian and cyclist paths and spaces internal and external to the centre; (i) connectivity to public transport services; and (j) sensitive transitioning to surrounding land and uses.	No acceptable outcome is nominated. **Editor's note—** Emerging community planning scheme policy no. SC6.6 provides guidance to applicants on expected structure planning processes to facilitate development that complies with this code and Section 9.3.4 Reconfiguring a lot code.
PO7 Where centre development is proposed, development is consistent with the centres hierarchy and does not compromise the intended role or successful functioning of other centres in the network. The growth of floor space within centres is balanced with anticipated growth within their primary catchment and does not substantively impact on the trading of other centres for an extended period of time or unduly undermine the potential for another centre to expand into its intended role.	No acceptable outcome is nominated. **Editor's note—**Emerging community planning scheme policy no. SC6.6 provides guidance to applicants on expected structure planning processes to facilitate development that complies with this code and Section 9.3.4 Reconfiguring a lot code. **Editor's note—** Applicants should have regard to Economic impact assessment planning scheme policy SC6.5 for guidance on how to demonstrate compliance with this performance outcome.

Table 6.7.1.3 - Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
For assessable development	
Crime prevention through environmental design	
PO8 Development facilitates the security of people and property having regard to: (a) opportunities for casual surveillance and sight lines; (b) exterior building design that promotes safety; (c) adequate lighting; (d) appropriate signage and wayfinding; (e) minimisation of entrapment locations; and (f) building entrances, loading and storage areas that are well lit and lockable after hours. **Editor's note—**Applicants should have regard to Crime Prevention through Environmental Design Guidelines for Queensland.	No acceptable outcome is nominated.

Table 6.7.1.3 - Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Burdell precinct	
PO9 A site is to be suitable in size and configuration for the intended use.	**AO9** A variety of lot sizes and configurations are provided to facilitate a well-connected master planned community.

6.7.2 Special purpose zone code

6.7.2.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

6.7.2.2 Purpose

(1) The purpose of the Special purpose zone code is to facilitate industrial development that is of regional, state and national significance.

(2) The particular purpose of the code is to:

- (a) recognise and facilitate reconfiguration of land in the Townsville State Development Area;
- (b) protect the area's suitability for industrial development and the expansion of existing industrial uses;
- (c) facilitate and maintain linkages to the Port of Townsville and major freight routes;
- (d) protect environmental values in the Townsville State Development Area; and
- (e) ensure development minimises impacts on the amenity of nearby sensitive land uses.

Editor's note—Material change of use applications in the Townsville State Development Area are administered by the Coordinator-General through the Development Scheme for the Townsville State Development Area. In this area, only development applications for reconfiguration of a lot and operational works will be assessed by Townsville City Council.

(3) The purpose of the code will be achieved through the following overall outcomes:

- (a) the Townsville State Development Area accommodates a wide range of large-scale industry uses, particularly those which support or have a nexus with the Port of Townsville and minerals processing;
- (b) other non-industrial uses are those which are ancillary to or directly support the industrial functions of the area, and are limited in extent;
- (c) the intrusion of incompatible uses, or uses which may be more appropriately accommodated in other zones, is avoided to protect the availability of land for industrial purposes and the viability and efficient operation of existing and future industry uses;
- (d) the impacts of development are managed to ensure public health and safety;
- (e) development avoids significant adverse effects on water quality and the natural environment;
- (f) development does not adversely affect the safe and efficient operation of Department of Defence landholdings;
- (g) development is safe and legible, and designed to establish safe and efficient movement systems;
- (h) lot sizes provide for a range of large format industrial uses and discourage take up of land for smaller scale activities better suited to other zones;
- (i) development makes a positive contribution to the public domain, particularly along major roads;
- (j) opportunities for energy efficiency through groupings and relationships between industries are accommodated where possible; and
- (k) development is adequately serviced by infrastructure and maximises the efficient use of existing and planned infrastructure.

6.7.2.3 Assessment benchmarks

Table 6.7.2.3 - Assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
General	
PO1 The site layout and design: (a) minimises earthworks; (b) maximises retention of natural drainage patterns; and (c) ensures existing drainage capacity is not reduced.	**AO1** Development does not involve: (a) earthworks involving more than 100m^3; and (b) any changes to existing drainage lines and wetlands.

Table 6.7.2.3 - Assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Defence land	
PO2 Development does not adversely affect the safe and efficient operation of nearby Department of Defence land.	**AO2** All buildings and operational components of a use are setback not less than 100m from the closest boundary of land in the control of or used by the Department of Defence.

Table 6.7.2.3 - Assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Uses	
PO3 Development does not significantly detract from the availability or utility of land for industrial purposes.	No acceptable outcome is nominated.

Table 6.7.2.3 - Assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Community and environmental risk	
PO4 Development is designed and managed so that it provides protection for community health and safety, and avoids unacceptable risk to life and property.	No acceptable outcome is nominated.
PO5 The site layout and design minimises impacts of on-site and surrounding drainage patterns and ecological values by: (a) maximising retention of natural drainage patterns; (b) ensuring existing drainage capacity is not reduced; (c) maximising the retention or enhancement of existing vegetation and ecological corridors; and (d) providing buffers to protect the ecological functions of waterways.	No acceptable outcome is nominated.

Part 7 Local plans

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Part 8 Overlays

8.1 Preliminary

(1) Overlays identify areas in the planning scheme that reflect state or local level interests and that have one or more of the following characteristics:

(a) there is a particular sensitivity to the effects of development;

(b) there is a constraint on land use or development outcomes;

(c) there is the presence of valuable resources; and

(d) there are particular opportunities for development.

(2) Overlays are mapped and included in Schedule 2.

(3) The changed category of development and assessment, if applicable, for development affected by an overlay are stated in Part 5.

(4) Some overlays may be included for information purposes only. This will not result in a change to the category of development and assessment or any additional assessment benchmarks.

(5) Assessment benchmarks for an overlay may be contained in one or more of the following:

(a) a map for an overlay;

(b) a code for an overlay;

(c) a zone code; and

(d) a development code.

Editor's note—In this planning scheme all assessment benchmarks for an overlay are contained in an overlay code.

(6) Where development is proposed on premises partly affected by an overlay, the assessment benchmarks for the overlay only relate to the part of the premises affected by the overlay.

(7) The overlays for the planning scheme are:

(a) Airport environs overlay;

(b) Bushfire hazard overlay;

(c) Coastal environment overlay;

(d) Cultural heritage overlay;

(e) Extractive resources overlay;

(f) Flood hazard overlay;

(g) Landslide hazard overlay;

(h) Natural assets overlay; and

(i) Water resource catchment overlay.

(8) The following overlays for the planning scheme are for information purposes only:

(a) Infrastructure noise corridors overlay.

Editor's note—The Infrastructure noise corridors identify land affected by transport noise in accordance with Chapter 8B of the *Building Act 1975*. In these areas building work will be assessable against the Queensland Development Code Part 4.4 – Buildings in a Transport Noise Corridor.

8.2 Overlay codes

8.2.1 Airport environs overlay code

8.2.1.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment for the Airport environs overlay. When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

8.2.1.2 Purpose

(1) The purpose of the Airport environs overlay code is to ensure the safe and efficient operations of the airport, RAAF base and aviation facilities are protected.

(2) The purpose of the code will be achieved through the following overall outcomes:

(a) development avoids adversely affecting the safety and efficiency of an airport's operational airspace or the functioning of aviation facilities;

(b) large increases in the numbers of people adversely affected by significant aircraft noise are avoided; and

(c) development does not increase the risk to public safety near airport runways.

8.2.1.3 Assessment benchmarks

Table 8.2.1.3 - Accepted development subject to requirements and assessable development (Part)

Editor's note—This code will apply to accepted development subject to requirements as well as assessable development.

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Operational airspace (overlay map OM-01.1)	
PO1 Development does not involve permanent or temporary physical obstructions that will adversely affect the airport's operational airspace area identified on overlay map OM-01.1. **Editor's note—**The *Defence (Areas Control) Regulation* (DACR) is a Commonwealth regulation under the *Defence Act 1903*. Development in the area covered by this regulation which exceeds certain heights will require a separate assessment process under Regulation 8 of the DACR by the Department of Defence. The Department of Defence also requires that all tall structures (30m high within 30km of the airport and 45m high elsewhere) are registered by forwarding "as constructed" information to Airservices Australia at the following email address: vod@airservices.com.	**AO1.1** Development involving a permanent or temporary building, structure or landscaping does not enter operational airspace areas identified on overlay map OM-01.1. **Editor's note-**Alternative heights which enter the operational airspace areas may be possible. In particular, building heights which meet the acceptable outcomes for a particular zone or precinct under this planning scheme. However, applicants should note the requirement for assessment under the Defence (Areas Control) Regulation (DACR) for development which exceed AO1 above.
	AO1.2 Development on land within the area identified on overlay map OM-01.1 as operational airspace areas does not involve transient intrusions within the operational airspace.
PO2 Emissions do not significantly affect air turbulence, visibility or aircraft engine operation in the airport's operational airspace area identified on overlay map OM-01.1.	**AO2** Development does not generate: (a) a gaseous plume with a velocity exceeding 4.3m per second; or (b) smoke, dust, ash or steam that will penetrate operational airspace areas identified on overlay map OM-01.1.

Table 8.2.1.3 - Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Wildlife hazard buffer zones (overlay map OM-01.2)	
PO3 Development does not attract a significant number of flying vertebrates, such as birds and bats, into areas identified on overlay map OM-01.2.	**AO3.1** Within 13km of airport runways, development does not involve a putrescible waste disposal facility.
	AO3.2 Within 8km of airport runways, development does not involve: (a) aquaculture; or (b) food handling or processing of an industrial nature; or (c) stock handling or slaughtering; or (d) pig production; or (e) fruit production; or (f) turf production; or (g) the keeping or protection of wildlife outside enclosures.
	AO3.3 Within 3km of airport runways, development does not involve: (a) the keeping, handling or racing of horses; or (b) outdoor dining, food handling or food consumption.

Table 8.2.1.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Public safety areas (overlay map OM-01.2)	
PO4 A significant increase in the numbers of people living, working or congregating in public safety areas identified on overlay map OM-01.2 is avoided.	**AO4** Within a public safety area identified on overlay map OM-01.2, development does not involve the following: (a) residential uses; or (b) a new building or an increase in the gross floor area of an existing building accommodating a non-residential use, other than an industrial use; or (c) any activities involving the manufacture or bulk storage of hazardous or flammable materials.

Table 8.2.1.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Aviation facilities (overlay map OM-01.3)	
PO5 Development within the area identified on overlay map OM-01.3 is located and designed to protect the function of aviation facilities from physical obstructions, electrical or electromagnetic interference and deflection of signals.	**AO5.1** No building, structures or other works which exceed 7.9m in height are located between 150m and 500m of non-directional beacon (NDB) site (as depicted on overlay map OM-01.3).
	AO5.2 Within the buffer area of the Townsville Airport distance measuring equipment (DME) site (as depicted on overlay map OM-01.3), no building, structure or other works involving a change to, or a physical projection above, the ground level are located: (a) within 115m of the DME site; or (b) between 115m and 230m of the DME site if exceeding 1m in height; or (c) between 230m and 500m of the DME site if exceeding 2m in height; or (d) between 500m and 1,000m of the DME site if exceeding 4m in height; or (e) between 1,000m and 1,500m of the DME site if exceeding 8.5m in height.
	AO5.3 Within the buffer area of the Townsville Airport VHF omni-directional radio range (VOR) site (as depicted on overlay map OM-01.3): (a) no building, structures or other works involving a change to, or a physical projection above, the ground level are located within 300m of the site; and (b) the following are not located between 300m and 1,000m of the site: (i) fences exceeding 2.5m in height; or (ii) overhead lines exceeding 5m in height; or (iii) metallic structures exceeding 8m in height; or (iv) trees and open lattice towers exceeding 10m in height; or (v) wooden structures exceeding 13m in height.

	AO5.4 Within the buffer area of the Townsville Airport Glidepath site (as depicted on overlay map OM-01.3), no building, structures or other works involving a change to, or a physical projection above, the ground level are located between: (a) 700m and 1,000m of the site if exceeding 6m in height; or (b) 1,000m and 1,500m of the site if exceeding 8.7m in height.
	AO5.5 Within the buffer area of the Townsville Airport middle marker site (as depicted on overlay map OM-01.3, no buildings, structures or other works involving a change to, or a physical projection above, the ground level occurs that exceed 20m in height.
	AO5.6 No buildings, fences or landscaping are established within the buffer area of the Townsville Airport localiser (as depicted on overlay map OM-01.3).

Table 8.2.1.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
For accepted development subject to requirements and assessable development	
Australian noise exposure forecast contours (overlay map OM-01.4)	
PO6 Development within the area identified on overlay map OM-01.4 is compatible with forecast levels of aircraft noise unless there is an overriding need in the public interest and there is no reasonable alternative site available for the use. **Editor's note—**Where the acceptable outcomes cannot be met, an appropriately qualified acoustic practitioner may be required to be engaged in order to demonstrate compliance with this performance outcome.	**AO6.1** Above the 25 ANEF contour (as depicted on overlay map OM-01.4), development does not involve the following: (a) child care centre; (b) educational establishment; or (c) hospital.
	AO6.2 Above the 30 ANEF contour (as depicted on overlay map OM-01.4), development does not involve a community use or community care centre.
	AO6.3 Above the 35 ANEF contour areas (as depicted on overlay map OM-01.4), development does not involve residential uses.
	AO6.4 The siting and design of any building is in accordance with Australian Standard AS2021 and Australian Standard AS/NZS2107.

Table 8.2.1.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Lighting area buffer zones (overlay map OM-01.5)	
PO7 Development within the area identified on overlay map OM-01.5 does not involve external lighting or reflective surfaces that could distract or confuse pilots. **Editor's note—**The standards specified in CASA Guidelines: Lighting in the vicinity of aerodromes: Advice to lighting designers, may be used to demonstrate compliance with this performance outcome.	**AO7.1** Development within the 6km radius shown on overlay map OM-01.5 does not involve: (a) straight parallel lines of lighting 500m to 1000m long; or (b) lighting which extends more than 3 degrees above the horizon; or (c) flare plumes; or (d) buildings with reflective cladding; or (e) upward-shining lights; or (f) flashing lights; or (g) sodium lights.
	AO7.2 In zone A shown on overlay map OM-01.5, lighting does not exceed 0 candela.
	AO7.3 In zone B shown on overlay map OM-01.5, lighting does not exceed 50 candela.
	AO7.4 In zone C shown on overlay map OM-01.5, lighting does not exceed 150 candela.
	AO7.5 In zone D shown on overlay map OM-01.5, lighting does not exceed 450 candela.

8.2.2 Bushfire hazard overlay code

8.2.2.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment for the Bushfire hazard overlay. When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

8.2.2.2 Purpose

(1) The purpose of the Bushfire hazard overlay code is to ensure that development does not:

- (a) increase the extent or the severity of bushfire hazard; or
- (b) increase the risk to life, property, community and the environment.

(2) The purpose of the code will be achieved through the following overall outcomes:

- (a) development is compatible with the nature of the bushfire hazard except where there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal;
- (b) where development is not compatible with the nature of the bushfire hazard and there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal; and
- (c) wherever practicable, facilities with a role in emergency management and vulnerable community services are located and designed to function effectively during and immediately after bushfire hazard events.

8.2.2.3 Assessment benchmarks

Table 8.2.2.3-Assessable development

Table 8.2.2.3 - Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
General — all development **Editor's note —** Applicants should also refer to the Mitigating bushfire hazard planning scheme policy no. SC6.8 for additional information.	
PO1 Development maintains the safety of people and property.	No acceptable outcome is nominated.
PO2 Highly vulnerable development does not occur in high hazard areas unless there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal.	**AO2** The following uses are not located in a high bushfire hazard area: (a) child care centre; or (b) detention facility; or (c) educational establishment; or (d) emergency services; or (e) hospital; or (f) industry activities involving manufacture or storage of hazardous materials in bulk; or (g) multiple dwelling; or (h) residential care facility; or (i) retirement facility; or (j) relocatable home park; or (k) rooming accommodation; or (l) shopping centre; or (m) short-term accommodation; or (n) telecommunications facility; or (o) tourist park; or (p) tourist attraction; or (q) transport depot; or (r) utility installation.
PO3 Development mitigates the risk of bushfire hazard through the siting and design of the development. **Editor's note—**In demonstrating compliance with this performance outcome, applicants should be aware that setbacks and buffers for fire management purposes are in addition to any buffers or setbacks required for ecological purposes and are located outside of areas of ecological significance to the greatest extent possible.	No acceptable outcome is nominated.

PO4 Development provides for an adequate and accessible water supply for firefighting purposes.	**AO4.1.1** The development is connected to a reticulated water supply where within a water supply area. OR **AO4.1.2** Where outside a water supply area a tank water supply is provided, at least one tank is within 100m of a class 1, 2, 3 or 4 building which has fire brigade fittings. **Editor's note -** Applicant should also refer to the Development manual planning scheme policy SC6.4 - SC6.4.11.7 On-Site Water Supply for additional information.
PO5 Public safety and the environment are not adversely affected by the detrimental impacts of bushfire on hazardous materials manufactured or stored in bulk.	**AO5** Development does not involve the manufacture or storage of hazardous materials within a high or medium bushfire hazard area as identified on overlay map OM-02.
PO6 Facilities with a role in emergency management and vulnerable community services are able to function effectively during and immediately after bushfire events.	No acceptable outcome is nominated.
PO7 Additional lots are not created in bushfire hazard areas.	**AO7** Development does not involve the creation of additional lots in areas mapped as high or medium hazard on overlay map OM-02.
PO8 Development is designed to allow for efficient emergency access to buildings for firefighting appliances, including by avoiding long, narrow access arrangements.	No acceptable outcome is nominated.
PO9 Development provides a fire break which also facilitates adequate access for firefighting and emergency vehicles, and safe evacuation.	**AO9.1** Lot boundaries and development sites are separated from hazardous vegetation by a distance of 20m where adjacent to high hazard areas and 10m where adjacent to medium hazard.
	AO9.2 The separation area mentioned in AO9.1 contains a fire access trail that: (a) has a minimum cleared and formed width of 6m; (b) has vehicular access at each end; (c) provides passing bays and turning areas for fire-fighting appliances; and (d) are either located on public land, or within an access easement that is granted in favour of council and QFRS.
	AO9.3 Roads and trails: (a) have a maximum gradient of 12.5%; and (b) do not involve a cul-de-sac. **Editor's note—**Applicants should also be aware that Part 9 of the planning scheme sets out additional requirements for the construction of roads and other operational works associated with reconfiguration.

8.2.3 Coastal environment overlay code

8.2.3.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment for the Coastal environment overlay. When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

8.2.3.2 Purpose

(1) The purpose of the Coastal environment overlay code is to ensure development in the coastal zone is planned, designed, constructed and operated to:

(a) avoid risk to people and property from coastal hazards, including storm tide inundation and coastal erosion, and taking into account the predicted effects of climate change; and

(b) manage the coast to protect coastal resources and allow for the natural fluctuations of coastal processes as far as possible.

(2) The purpose of the code will be achieved through the following overall outcomes:

(a) the foreshore and foreshore ecosystems are protected and managed to maintain their protective functions and allow for natural fluctuations to continue as far as possible;

(b) the exposure of communities and development to coastal hazards is minimised;

(c) urban and rural residential development does not expand into coastal hazard areas beyond areas zoned for urban and rural residential purposes;

Editor's note—To remove any doubt areas zoned for urban purposes includes the Emerging community zone.

(d) in areas zoned for urban and rural residential purposes and located in a coastal hazard area, the risks of storm tide inundation and erosion are avoided, or are mitigated and managed;

(e) opportunities for sustainable coastal-dependent development are protected;

(f) coastal-dependent development is undertaken in a manner that minimises impacts on coastal resources;

(g) public access to the foreshore is maintained and enhanced for current and future generations; and

(h) wherever practicable, facilities with a role in emergency management and vulnerable community services are located and designed to function effectively during and immediately after coastal hazard events.

8.2.3.3 Assessment benchmarks

Table 8.2.3.3(a) -Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements	
Development in coastal hazard areas	
PO1 Development is designed and located to minimise susceptibility to, and the potential impacts of, storm tide inundation and erosion. **Editor's note—**Applicants must be aware that in some areas flood hazard areas will also co-exist with storm tide hazard areas. In these instances, the floor levels and other design responses will need to be sufficient to comply with both this code and the *Building Regulation 2006*.	**AO1.1** Floor levels of all habitable rooms are above the defined storm tide event level. **Editor's note—**For Townsville the defined storm tide event level can be taken as RL 4.5m AHD, within 100m of the coastline or RL 3.9m AHD in other areas.
	AO1.2 Underground parking is designed to prevent the intrusion of storm tide waters by the incorporation of a bund above the defined storm tide event level.

	AO1.3 Buildings have open ground floors that allow for the flow through of storm tide water and buildings are not designed as slab on ground.
	AO1.4 Buildings are located outside the erosion prone area or where this would be impractical, do not extend any further seaward than existing immediately adjacent buildings.

Table 8.2.3.3(a) -Accepted development subject to requirements and assessable development (Part)

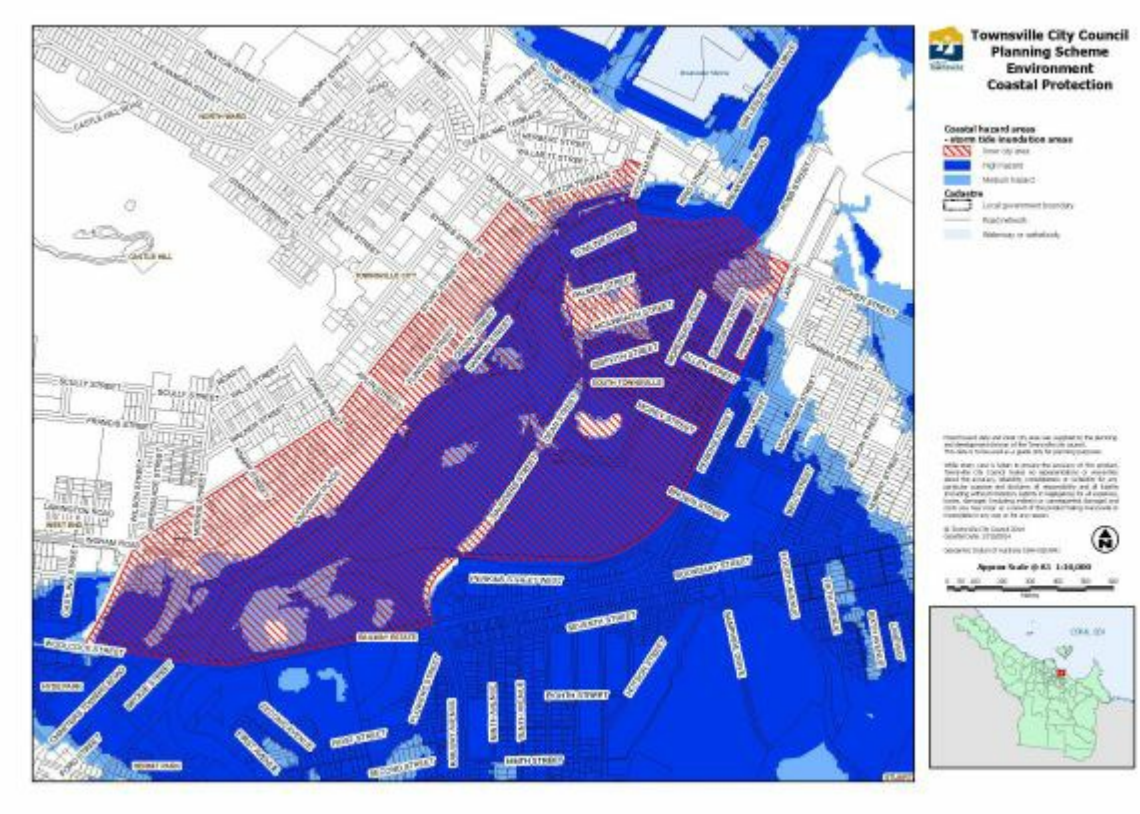
Performance outcomes	Acceptable outcomes
For assessable development	
Development in coastal hazard areas - erosion prone area	
PO2 Development locates outside erosion-prone areas identified on overlay map OM-03.3, apart from: (a) temporary or relocatable structures for safety and recreational purposes; or (b) development that does not intensify the extent of existing development within the erosion prone area; or (c) development that does not extend any further seaward than the existing adjacent buildings.	No acceptable outcome is nominated.
PO3 Development mitigates any increase in risk to people and property from adverse coastal-erosion impacts, avoiding the need for coastal protection works as far as practicable, having regard to: (a) minimising the footprint of the development of the part within the erosion prone area and locating the development as far landward as possible; (b) the practical design life of the development in the context of future erosion threat; (c) the ability for buildings or structures to be decommissioned, dis-assembled or relocated either on the site or to another site; and (d) use of appropriate foundations for the building or structure.	No acceptable outcome is nominated.
PO4 Where used, coastal protection works are: (a) consistent with a shoreline erosion management plan that has been prepared for the area; or (b) in response to a demonstrated need to protect existing permanent structures from an imminent threat of coastal erosion, if abandonment or relocation of the structures is not feasible, and a relevant shoreline erosion management plan has not been prepared.	No acceptable outcome is nominated.

PO5 Coastal erosion is mitigated by: (a) beach nourishment undertaken in accordance with a program of nourishment works; or (b) the construction of an erosion control structure where it is demonstrated that installing an erosion control structure is the only feasible option for protecting existing permanent structures from an imminent threat of coastal erosion at the location. **Editor's note—**Where a shoreline erosion management plan has not been prepared and coastal protection work is required to protect existing structures from coastal erosion threats, beach nourishment is favoured in preference to erosion control structures, such as seawalls and groynes. The location and materials for beach nourishment works are to ensure the natural characteristics and landform of the beach or foreshore is maintained. Applications involving erosion control structures must demonstrate the consideration of beach nourishment techniques and include a statement of why nourishment (in whole or part) has not been adopted as the preferred means of controlling the erosion risk.	No acceptable outcome is nominated.
PO6 Any development using erosion control structures to protect private property from threat of coastal erosion ensures: (a) erosion control structures are located wholly on private land; and (b) physical coastal processes outside the area subject to the coastal protection work are maintained. **Editor's note—**Applications for coastal protection work must be supported by a report certified by a registered professional engineer with coastal engineering experience that demonstrates how the engineering solution sought by the work will be achieved.	No acceptable outcome is nominated.

Table 8.2.3.3(a) - Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Development in coastal hazard areas — storm tide inundation areas	
PO7 Development is located outside high or medium storm tide inundation areas and erosion areas from sea level rise identified on overlay maps OM-03.1 and OM-03.2 unless it: (a) does not result in an increase in the intensity of development on the site; or (b) is located within the inner city area shown on Figure 8.1 — Coastal hazard areas: storm tide inundation areas and provides measures to ensure critical services remain operational up to the defined storm tide event; or (c) avoids any increase in risk to people or property from coastal hazard impacts (including impacts on the development's ongoing operation).	No acceptable outcome is nominated.
PO8 Development in storm tide inundation areas and erosion areas from sea level rise identified on overlay maps OM-03.1-OM-03.2 is located, designed, constructed and operated to: (a) ensure structures can sustain flooding from a defined storm tide event; and (b) maintain the safety of people living and working on the premises from a defined storm tide event.	**AO8.1** Development within a high or medium storm tide inundation area identified on overlay maps OM-03.1-OM-03.2 ensures: (a) habitable rooms of built structures are located above the defined storm tide event level; (b) underground parking is designed to prevent the intrusion of flood waters by the incorporation of a bund above the defined storm tide event level; and (c) where reconfiguring a lot, at least one evacuation route remains passable for emergency evacuations during a defined storm tide event. **Editor's note—**For Townsville the defined storm tide event level can be taken as RL 4.5m AHD, within 100m of the coastline or RL 3.9m AHD in other areas.
	AO8.2 Structures used for the manufacture or storage of hazardous materials in bulk are designed to prevent the intrusion of waters from a defined storm tide event.
PO9 Facilities with a role in emergency management and vulnerable community services are located, designed and constructed to ensure it is able to function during and after a storm tide inundation event.	**AO9.1** Development is either: (a) located in an area that is above the storm tide event level specified for that activity in table 8.2.3.3(b); or (b) designed to ensure any components of the infrastructure that are likely to fail to function or may result in contamination when inundated by storm tide inundation are above the storm tide event level for that activity in table 8.2.3.3(b).

	AO9.2 Emergency services and shelters, police facilities and hospitals, and associated facilities have an emergency rescue area above the storm tide event level specified for that infrastructure in table 8.2.3.3(b).



Click here to view PDF high resolution map.

Figure 8.1 - Coastal hazard areas: storm tide inundation areas

Table 8.2.3.3(a) -Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Public access	
PO10 Development maintains or enhances safe and convenient public access to the foreshore.	No acceptable outcome is nominated.

Table 8.2.3.3(a) -Accepted subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Canals and artificial waterways	
PO11 Development that involves the construction of canals or artificial waterways connected to tidal water (either directly or indirectly) does not adversely affect coastal resources and their values.	No acceptable outcome is nominated.
PO12 The design, location, construction and operation of artificial tidal waterways are to maintain the tidal prism volume of the natural waterway to which it is connected.	No acceptable outcome is nominated.

Table 8.2.3.3(b)-Storm tide event levels for essential community services and facilities

Development	Level of immunity annual exceedance probability (AEP)
Development involving: (a) hospitals and associated facilities; or (b) major electricity infrastructure.	0.2% AEP event
Development involving: • emergency/evacuation shelters; or • fire and police stations; or • the storage of valuable records or items of historic or cultural significance (e.g. libraries, galleries); or • aeronautical facilities; or • telecommunication facilities; or • substations; or • water treatment plants; or • regional fuel storage; or • food storage warehouse; or • retirement facility and residential care facility.	0.5% AEP event
Development involving sewerage treatment plants requiring licensing as an environmentally relevant activity.	1% AEP event

8.2.4 Cultural heritage overlay code

8.2.4.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment for the Cultural heritage overlay. When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

Editor's note—Places of cultural heritage significance are identified in Schedule 7, as well as on overlay maps OM-04.1, OM-04.2. OM-04.3 and OM-04.4.

8.2.4.2 Purpose

(1) The purpose of the Cultural heritage overlay code is to ensure:

- (a) the cultural heritage of Townsville continues to be a major contributor to the identity of the city and local communities;
- (b) the cultural heritage of Townsville is conserved for present and future communities;
- (c) development is consistent with the Burra Charter;
- (d) new development reflects and respects cultural heritage significance; and
- (e) places of cultural heritage significance are appropriately re-used.

(2) The purpose of the code will be achieved through the following overall outcomes:

- (a) places having cultural heritage significance in Townsville are conserved;
- (b) change is managed to ensure significant heritage features and values of a place are retained;
- (c) any demolition, removal or relocation of a heritage place does not have an adverse impact on the heritage significance of that place;
- (d) development on or adjoining a heritage place does not detract from the cultural heritage significance of the heritage place and its cultural heritage values;
- (e) development on or adjoining a heritage place is visually subservient to the heritage place and does not cause adverse impacts on significant views or the visual setting of the heritage place;
- (f) development on or adjoining a place of cultural heritage significance incorporates features which complement rather than replicate the heritage place;
- (g) restoration or reconstruction of known earlier states of heritage places is encouraged where practical; and
- (h) places of Aboriginal and Torres Strait Islander cultural heritage significance are conserved and managed in a culturally appropriate way.

Editor's note—Cultural heritage planning scheme policy no. SC6.3 will provide applicants with guidance in meeting the requirements of this code.

Editor's note—Council's process for adding or removing a place within Schedule 7 Places of cultural heritage value is stated in the Cultural heritage planning scheme policy SC6.3.

8.2.4.3 Assessment benchmarks

Table 8.2.4.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Demolition or removal of, or within, a heritage place	
PO1 The removal or partial or total demolition, or relocation of a building or structure that is a heritage place only occurs if it can be demonstrated that the: (a) loss of the building or structure will not contribute to the loss of cultural heritage values; and (b) building or structure is not capable of structural repair.	No acceptable outcome is nominated. **Editor's note—**A heritage impact statement produced by a suitably qualified professional will be required to demonstrate there is no adverse impact on the cultural heritage significance of the place, and a suitably qualified professional provides a report on the building's condition, demonstrating that the place is not capable of repair. **Editor's note—** Refer to the Cultural heritage planning scheme policy no. SC6.3 for guidance on writing a Heritage Impact Statement.
PO2 When demolition or relocation of a heritage place occurs, appropriate archival recording is undertaken.	No acceptable outcome is nominated. **Editor's note—**Refer to the Cultural heritage planning scheme policy no. SC6.3 for guidance on the archival recording of heritage places, with which the action should be consistent.

Table 8.2.4.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Development within a heritage place	
PO3 Development is sympathetic to, and consistent with the significant features and values of the heritage place, including: (a) maintaining significant views to and from the heritage place; (b) built form and setback; (c) scale; and (d) open space and landscaping features.	No acceptable outcome is nominated. **Editor's note—**A heritage impact statement produced by a suitably qualified professional will be required to demonstrate there is no adverse impact on the cultural heritage significance of the place, and any change will be effectively managed. **Editor's note—**Refer to the Cultural heritage planning scheme policy no. SC6.3 for guidance on writing a Heritage Impact Statement.
PO4 New buildings within a heritage place are visually subservient to the cultural heritage significance of the heritage place.	No acceptable outcome is nominated. **Editor's note—**A heritage impact statement produced by a suitably qualified professional may be required to demonstrate compliance with this performance outcome. Cultural heritage planning scheme policy no. SC6.3 provides guidance on how to write a heritage impact statement. It also sets out relevant parts of the Burra Charter. **Editor's note—**A proposed development should be designed by a suitably qualified architect or a building designer with demonstrated relevant experience.
PO5 Development incorporates compatible elements which complement rather than reproduce traditional building forms and details in terms of: (a) architecture; (b) scale; (c) external materials; and (d) finishes and colours.	No acceptable outcome is nominated. **Editor's note—**Refer to the Cultural heritage planning scheme policy no. SC6.3 for guidance on achieving performance outcomes.

PO6 Development does not alter, remove or conceal the significant features or values of the heritage place.	No acceptable outcome is nominated. **Editor's note—**Refer to the Cultural heritage planning scheme policy no. SC6.3 for guidance on achieving performance outcomes.
PO7 Development being a reconfiguration of a lot reflects the pattern and lot layout of the original subdivision in the locality and does not: (a) reduce public access to the place; or (b) obscure or destroy the historical context, the landscape settings or the scale and consistency of the built environment.	No acceptable outcome is nominated. **Editor's note—**Refer to the Cultural heritage planning scheme policy no. SC6.3 for guidance on writing a Heritage Impact Statement.
PO8 Any new fencing, landscaping, advertising device, access or parking arrangements are designed and sited in a manner that: (a) does not have a detrimental impact on the significant values or view of the place; (b) enhances the overall appearance of the heritage place; and (c) is sensitive to materials, colours, scale, placement and layout of the place.	No acceptable outcome is nominated. **Editor's note—**Refer to the Cultural heritage planning scheme policy no. SC6.3 for guidance on achieving performance outcomes.

Table 8.2.4.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Signage	
PO9 Signage on Flinders Street East does not adversely affect the fabric and setting of the heritage place.	**AO9** For heritage places on Flinders Street East, signage is in accordance with the Cultural heritage planning scheme policy no. SC6.3.
PO10 If the loss of a heritage place occurs, interpretive signage is erected.	No acceptable outcome is nominated. **Editor's note—**Refer to the Cultural heritage planning scheme policy no. SC6.3 for guidance on how such signage should be established.

Table 8.2.4.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Archaeology	
PO11 Development does not adversely impact on known or potential archaeological deposits.	No acceptable outcome is nominated. **Editor's note—**The Cultural heritage planning scheme policy no. SC6.3 provides guidance on how this may be achieved to council's satisfaction. Earthworks, including those associated with demolition, should be monitored by a suitably qualified archaeologist and archaeological deposits should be managed in accordance with the policy.

Table 8.2.4.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Indigenous heritage significance	
PO12 There are no adverse impacts on any place that has cultural heritage significance to Aboriginal or Torres Strait Islander people.	No acceptable outcome is nominated. **Editor's note—**All proposed development on or adjacent to identified sites of indigenous cultural heritage significance is required to be carried out in accordance with the latest version of the *Aboriginal Cultural Heritage Act 2003 - Duty of Care Provisions.*

Table 8.2.4.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Development adjoining a heritage place	
PO13 Development is sympathetic to and consistent with the features and values of the heritage place, including: (a) maintaining views to and from the heritage place where significant; (b) consistency of built form and setback; (c) potential for overshadowing; and (d) consistency with open space and landscaping features.	No acceptable outcome is nominated. **Editor's note—**Refer to the Cultural heritage planning scheme policy no. SC6.3 for guidance on achieving performance outcomes.
PO14 Reconfiguring a lot does not: (a) reduce public access to the heritage place; or (b) create the potential to adversely affect significant views to and from the heritage place; or (c) obscure, destroy or disrupt any pattern of historic subdivision, the historical context, the landscape settings or the scale and consistency of the built environment relevant to the heritage place.	No acceptable outcome is nominated.

Table 8.2.4.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Elements in the road reserve	
PO15 Elements in the road reserve make a positive contribution to cultural heritage values of a place. Introduced features are compatible with significant features of the place.	No acceptable outcome is nominated.

8.2.5 Extractive resources overlay code

8.2.5.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment for the Extractive resources overlay. When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

8.2.5.2 Purpose

(1) The purpose of the Extractive resources overlay code is to ensure:

- (a) extractive resources are protected from development that might prevent or constrain current or future extraction or mining when the need for the resource arises; and
- (b) extractive industry uses are operated in a way that minimises impacts on surrounding land uses and environmental values.

(2) The purpose of the code will be achieved through the following overall outcomes:

- (a) development not associated with extractive industry is not located where likely to have an adverse impact upon existing and future extraction, processing and transportation of extractive resources;
- (b) development is compatible with the existing and future mining within mining tenements granted or renewed under the *Mineral Resources Act 1989*;
- (c) development does not increase the number of people living within a separation area for a resource/processing area or transport route; and
- (d) development for the purpose of extractive industry
  - (i) protects personal health and safety;
  - (ii) minimises impacts to the amenity of surrounding land uses;
  - (iii) avoids impacts to environmental values on external premises; and
  - (iv) minimises impacts to environmental values on the premises.

8.2.5.3 Assessment benchmarks

Table 8.2.5.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Development other than extractive industry	
PO1 Development located within a resource/processing area maintains the long-term availability and efficient winning of the extractive resource for extraction and processing, except where the following can be demonstrated: (a) there is an overriding benefit to the community; and (b) the development cannot reasonably be located elsewhere.	No acceptable outcome is nominated.

PO2 Development located in a separation area for a resource/processing area: (a) does not increase the number of people living in the separation area; and (b) minimises impacts from existing and future extractive industries on people working or congregating in the separation area; and does not compromise the function of the separation area as a buffer from incompatible uses outside the buffer area.	No acceptable outcome is nominated.
PO3 Development in a separation area for a transport route does not increase the number of people living in the separation area and is compatible with the safe and efficient operation of the transport route.	No acceptable outcome is nominated.
PO4 Development in the vicinity of mining-related leases: (a) does not compromise current or future utilisation of mineral resources; and (b) is not located where likely to be adversely impacted upon by existing and future mining activities.	No acceptable outcome is nominated.
PO5 Development with direct vehicle access to a transport route does not adversely impact the safety and efficiency of transport route.	No acceptable outcome is nominated.

Table 8.2.5.3—Assessable development (Part)

Performance outcomes	**Acceptable outcomes**
Extractive industry	
PO6 Extractive industry is operated such that: (a) blasting activities do not create a public safety risk; and (b) on-site workers and the public are adequately warned of the activities and safety hazards.	No acceptable outcome is nominated.
PO7 Measures are taken to avoid or minimise adverse impacts from dust, sand, or soil on nearby properties.	No acceptable outcome is nominated.
PO8 Premises are secured to ensure that a person not involved in the operation is unable to gain entry to the premises.	No acceptable outcome is nominated.
PO9 The development maintains the extractive industry transport route to a standard commensurate with the volume, type, and nature of vehicular traffic utilising the transport route.	No acceptable outcome is nominated.

PO10 Development avoids adverse impacts on land uses, having regard to: (a) noise; (b) vibration; (c) airblast overpressure; (d) dust; (e) flyrock; (f) visual amenity; and (g) safety.	No acceptable outcome is nominated.
PO11 The extractive industry use is screened from any adjoining major road.	No acceptable outcome is nominated.
PO12 Development avoids or minimises impact on areas of ecological significance, ecological processes or biodiversity values external to the site.	No acceptable outcome is nominated.
PO13 Surface and groundwater quality external to the site is protected.	No acceptable outcome is nominated.
PO14 Development provides for the rehabilitation of the premises to restore the nature conservation values of the premises prior to the extractive industry as far as is reasonably practicable. **Editor's note—**A rehabilitation plan and expert ecological advice may be required to demonstrate achievement of this performance outcome.	No acceptable outcome is nominated.

8.2.6 Flood hazard overlay code

8.2.6.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment for the Flood hazard overlay. When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

8.2.6.2 Purpose

(1) The purpose of the Flood hazard overlay code is to manage development outcomes in flood hazard areas so that risk to life, property, community, economic activity and the environment during future flood events is minimised, and to ensure that development does not increase the potential for flood damage on-site or to other property.

(2) The purpose of the code will be achieved through the following overall outcomes:

- (a) development is compatible with the nature of the flood hazard except where there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal;
- (b) where development is not compatible with the nature of the flood hazard and there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal:
  - (i) development minimises as far as practicable the adverse impacts from the hazard; and
  - (ii) does not result in unacceptable risk to people or property;
- (c) wherever practicable, facilities with a role in emergency management and vulnerable community services are located and designed to function effectively during and immediately after flood hazard event;
- (d) development maintains the safety of people and minimises the potential damage to property from flood events on the development site; and
- (e) development does not result in adverse impacts on people's safety, the environment or the capacity to use land within the floodplain.

8.2.6.3 Assessment benchmarks

Note—To avoid any doubt, the term medium hazard area used in this code includes areas shown on the overlay maps as medium hazard – further investigation areas.

Editor's note—Areas shown on the overlay maps as medium hazard — further investigation areas are based on Queensland Reconstruction Authority mapping. Limited information is available on flood characteristics in these areas. Further investigation may be required as a result. Flood hazard planning scheme policy no. SC6.7 will provide applicants with guidance in meeting the requirements of this code in these and other identified hazard areas.

Table 8.2.6.3(a)-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
PO1 Development in medium and high hazard areas is designed and located to minimise susceptibility to and potential impacts of flooding. **Editor's note—**The *Building Regulation 2006* may also establish requirements with which development will need to comply. The defined flood event is identified in this planning scheme as the 1% annual exceedance probability (AEP) flood and is mapped as the combined extent of the high and medium flood hazard areas identified on overlay map OM-06.1 and 06.2. Other than in the medium hazard — further investigation area, council will be able to make available the height of the flood level for any particular location upon request. Applicants must be aware that in some areas storm tide hazard areas will also co-exist with flood hazard areas. In these instances, the floor levels and other design responses will need to be sufficient to comply with this code, the Coastal environment overlay code and the *Building Regulation 2006*.	**AO1.1** Where the development is located within an area shown on overlay map OM-06.1 or 06.2 as medium hazard — further investigation area, new buildings containing habitable rooms: (a) are sited on a part of the site which is outside the medium hazard — further investigation area; or (b) are sited on the highest part of the site. OR **AO1.2** Where development is located within another hazard area shown on overlay map OM-06.1 or 06.2: (a) floor levels of all habitable rooms are a minimum of 300mm above the defined flood level; (b) floor levels of all non-habitable rooms (other than class 10 buildings) are above the defined flood event; (c) parking spaces associated with non-residential development are located outside the high hazard areas identified on overlay map OM-06.1 or 06.2; and **Editor's note—**Class 10 buildings are identified under the Building Code of Australia and includes carports and outbuildings. (d) underground parking is designed to prevent the intrusion of flood waters by the incorporation of a bund or similar barrier with a minimum height of 300mm above the defined flood level.
PO2 Development in high hazard areas does not significantly impede the flow of flood waters through the site or worsen flood flows external to the site.	**AO2.1** Development in high hazard areas do not involve: (a) filling with a height greater than 150mm; or (b) block or solid walls or solid fences; or (c) garden beds or other structures with a height more than 150mm; or (d) the planting of dense shrub hedges.

Table 8.2.6.3(a)-Self-assessable and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
PO3 Development does not intensify use in high hazard areas, in order to avoid risks to people and property. **Editor's note—**High hazard areas are those likely to experience deep and/or fast moving water in a defined flood event.	**AO3.1** New buildings are located outside high hazard areas identified on overlay map OM-06.1 or 06.2.
	AO3.2 New lots or roads are not created within high hazard areas identified on overlay map OM-06.1 or 06.2.
	AO3.3 Sites for non-permanent accommodation such as tents, cabins or caravans (whether intended for short or long-term accommodation) are located outside the high hazard areas identified on overlay map OM-06.1 or 06.2.
PO4 Siting and layout of development maintains the safety of people and property in medium hazard areas. **Editor's note—**The *Building Regulation 2006* establishes requirements with which development will need to comply. The defined flood event is identified in this planning scheme as the 1% annual exceedance probability (AEP) flood and is mapped as the combined extent of the high and medium flood hazard areas identified on overlay map OM-06.1 and 06.2. Other than in the medium hazard — further investigation area, council will be able to make available the height of the flood level for any particular location upon request. Applicants must be aware that in some areas storm tide hazard areas will also co-exist with flood hazard areas. In these instances, the floor levels and other design responses will need to be sufficient to comply with this code, the Coastal environment overlay code and the *Building Regulation 2006*.	**On existing lots** **AO4.1** Floor levels for residential buildings are 300mm above the defined flood level. **Editor's note—**In medium hazard — further investigation area, a flood assessment in accordance with the Flood hazard planning scheme policy no. SC6.7 may be needed to establish the defined flood level.
	AO4.2 Floor levels of non-residential buildings (other than class 10 buildings) are above the defined flood level. **Editor's note—**Class 10 buildings are identified under the *Building Code of Australia* and includes carports and outbuildings.
	AO4.3 Underground parking is designed to prevent the intrusion of flood waters by the incorporation of a bund or similar barrier with a minimum height of 300mm above the defined flood level.
	AO4.4 Development for non-permanent accommodation such as tents, cabins or caravans (whether intended for short or long-term accommodation) are located outside the medium hazard areas identified on overlay map OM-06.1 or 06.2.
	Where reconfiguring a lot **AO4.5** Where reconfiguring a lot, new lots contain designated building envelopes (whether or not for residential purposes) outside the medium hazard areas identified on overlay map OM-06.1 or 06.2 and those building envelopes are of a sufficient size to accommodate buildings associated with the development.
	AO4.6 In new subdivisions, arterial, sub-arterial or major collector roads are located above the 2% AEP flood level.

	AO4.7 Reconfiguration of lots does not involve cul-de-sacs or dead end streets within medium hazard areas identified on overlay map OM-06.1 or 06.2.
PO5 Signage is provided within high and medium hazard areas to alert residents and visitors to the flood hazard.	**AO5** Signage is provided on-site (regardless of whether land will be public or private ownership) to indicate depth at key hazard points, such as at floodway crossings, entrances to low-lying reserves or parking areas.
PO6 Development within high and medium hazard areas ensures any changes to the depth, duration, velocity of flood waters are contained within the site. **Editor's note—**Impacts on a range of floods may need to be assessed and in most instances can be evaluated by analysing the minor drainage system capacity event and the defined flood event for the catchment wide critical duration, unless the site is located in an area noted in the Flood hazard planning scheme policy SC6.7.	No acceptable outcome is nominated.
PO7 Development within high and medium hazard areas does not directly, indirectly or cumulatively worsen flood characteristics outside the development site, having regard to: (a) increased scour and erosion; or (b) loss of flood storage; or (c) loss of or changes to flow paths; or (d) flow acceleration or retardation; or (e) reduction in flood warning times. **Editor's note—**To adequately assess the impacts of development on flooding regimes, applicants may need to have a hydrological and hydraulic assessment carried out by a suitably qualified and experienced hydrologist or engineer.	No acceptable outcome is nominated.
PO8 Facilities with a role in emergency management and vulnerable community services are able to function effectively during and immediately after flood events. **Editor's note—**This provision applies to high, medium and low flood hazard areas.	**AO8** The development is provided with the level of flood immunity set out in Table 8.2.6.3(b).
PO9 Public safety and the environment are not adversely affected by the detrimental impacts of flooding on hazardous materials manufactured or stored in bulk.	**AO9.1** Development does not involve the manufacture or storage of hazardous materials within a high flood hazard area identified on overlay map OM-06.1 or 06.2.
	AO9.2 Within the low or medium flood hazard area identified on overlay map OM-06.1 or 06.2, structures used for the manufacture or storage of hazardous materials in bulk are designed to prevent the intrusion of flood waters up to at least a 0.2% AEP flood event.

Table 8.2.6.3(b)-Flood immunity for community services and facilities

Development	**Level of flood immunity annual exceedance probability (AEP)**
Development involving: (a) emergency services; (b) hospitals and associated facilities; (c) major electricity infrastructure.	0.2% AEP flood event
Development involving: (a) emergency/evacuation shelters; (b) the storage of valuable records or items of historic/cultural significance (e.g. libraries, galleries); (c) aeronautical facilities; (d) telecommunication facilities; (e) substations; (f) water treatment plants; (g) regional fuel storage; (h) food storage warehouse; (i) retirement facility and residential care facility.	0.5% AEP flood event
Sewerage treatment plants (requiring licensing as an environmentally relevant activity).	1% AEP flood event

8.2.7 Landslide hazard overlay code

8.2.7.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment for the Landslide hazard overlay. When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

8.2.7.2 Purpose

(1) The purpose of the Landslide hazard overlay code is to manage development so that there is no increase to the extent or the severity of a landslide hazard and risk to life, property, community and the environment during landslide events is avoided.

(2) The purpose of the code will be achieved through the following overall outcomes:

(a) development is compatible with the nature of the landslide hazard except where there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal;

(b) where development is not compatible with the nature of the landslide hazard and there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal:

(i) development minimises as far as practicable the adverse impacts from landslide hazards; and

(ii) does not result in unacceptable risk to people or property.

(c) wherever practicable, facilities with a role in emergency management and vulnerable community services are located and designed to function effectively during and immediately after landslide hazard events.

8.2.7.3 Assessment benchmarks

Table 8.2.7.3-Assessable development

Editor's note—The Development manual planning scheme policy no. SC6.4 - SC6.4.15 Steep Land Development design guidelines will provide applicants with guidance in meeting requirements of this code.

Performance outcomes	Acceptable outcomes
PO1 Development is not subject to potential debris flow hazard.	**AO1** Development does not occur within the potential debris flow areas identified on OM-07.1.
PO2 People and property within the development site are protected from landslide hazard originating from inside or external to the site.	No acceptable outcome is nominated. **Editor's note—**The Development manual planning scheme policy no. SC6.4 - SC6.4.16 Geotechnical Investigationswill provide applicants with guidance in meeting requirements of this code.
PO3 Development does not increase the risk of landslide to adjoining properties.	No acceptable outcome is nominated. **Editor's note—**The Development manual planning scheme policy no. SC6.4 - SC6.4.16 Geotechnical Investigations will provide applicants with guidance in meeting requirements of this code.
PO4 The development ensures the long-term stability of the development site.	No acceptable outcome is nominated. **Editor's note—**The Development manual planning scheme policy no. SC6.4 - SC6.4.16 Geotechnical Investigations will provide applicants with guidance in meeting requirements of this code.
PO5 Site access is not at risk from being permanently impeded by a landslide event.	No acceptable outcome is nominated. **Editor's note—**The Development manual planning scheme policy no. SC6.4 - SC6.4.16 Geotechnical Investigations will provide applicants with guidance in meeting requirements of this code.

PO6 The siting, design and construction works of development minimises the impacts on the natural landform and do not have a detrimental impact on slope stability or erosion potential.	No acceptable outcome is nominated. **Editor's note—**The Development manual planning scheme policy no. SC6.4 - SC6.4.16 Geotechnical Investigations will provide applicants with guidance in meeting requirements of this code.
PO7 Development maintains the safety of hazardous materials manufactured or stored in bulk. **Editor's note—** The term "hazardous material" is defined in the State Planning Policy.	**AO7** The manufacture or storage of hazardous materials in bulk does not occur: (a) within the medium, high or potential debris flow areas identified on overlay map OM-07.1; or (b) on land with a slope angle >23 degrees identified on overlay map OM-07.2.
PO8 Facilities with a role in emergency management and vulnerable community services are able to function effectively during and immediately after landslide events.	**AO8.1** Facilities with a role in emergency management and vulnerable community services are not located on land: (a) within the medium, high or potential debris flow areas identified on overlay map OM-07.1; or (b) on land with a slope angle >23 degrees identified on overlay map OM-07.2. OR **AO8.2** The development does not: (a) result in any new building work other than an addition to an existing building; (b) involve vegetation clearing; or (c) alter site levels or stormwater conditions.

8.2.8 Natural assets overlay code

8.2.8.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment for the Natural assets overlay. When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

8.2.8.2 Purpose

(1) The purpose of the Natural assets overlay code is to:

- (a) protect areas of environmental significance, and the ecological processes and biodiversity values of terrestrial and aquatic ecosystems;
- (b) maintain ecosystem services and other functions performed by Townsville's natural areas; and
- (c) protect water quality, ecosystem health and the natural hydrological functioning of waterways, wetlands and their riparian areas.

(2) The purpose of the code will be achieved through the following overall outcomes:

- (a) development avoids or minimises direct and indirect impacts on areas of environmental significance and their associated ecological functions and biophysical processes;
- (b) development provides for the protection or enhancement of a linked network of habitat areas, including maximising opportunities for rehabilitation and restoration of degraded ecosystems, ecological communities, remnant vegetation and connecting corridors wherever possible;
- (c) development, including infrastructure, is located and designed to maintain or enhance ecological functions including facilitation of wildlife movement for native terrestrial and aquatic species and native and migratory avian species;
- (d) the water quality values and ecological functions of wetlands, waterways and their riparian areas and buffers are protected or enhanced;
- (e) development maintains, protects or enhances the natural hydrological regime and functioning of waterways and wetlands, including surface and ground waters and their interaction;
- (f) fragmentation of remnant vegetation and habitat areas is avoided to maintain ecological function and biodiversity values, and to maintain or increase the resilience of natural assets to threatening processes, including climate change; and
- (g) development incorporates appropriate buffering and mitigation strategies to avoid or minimise potential damage to natural areas and other environmental assets.

Editor's note—Natural assets planning scheme policy no. SC6.9 will provide applicants with guidance in meeting the requirements of this code.

8.2.8.3 Assessment benchmarks

Table 8.2.8.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Protection of biodiversity values and ecological processes	
PO1 In areas identified as having high or very high environmental importance, significant values are protected and associated ecological functions and biophysical processes are maintained to ensure long term viability. **Editor's note—**Applicants should also refer to other state and federal legislation which may also require applicants to obtain additional approvals.	No acceptable outcome is nominated. **Editor's note**—Natural assets planning scheme policy no. SC6.9 provides information on the primary attributes included in very high, high and medium environmental importance areas. The overlay map has been produced using local government area wide data. Site-specific investigation will be required to confirm the extent and nature of values indicated on the overlay map or otherwise identify site-specific natural assets and ecological functions.
PO2 In areas identified as having medium environmental importance, development is located, designed and operated to: (a) retain and protect significant values; and (b) maintain the underlying ecological functions and biophysical processes. **Editor's note—**Applicants should also refer to other state and federal legislation which may also require applicants to obtain additional approvals.	No acceptable outcome is nominated. **Editor's note—**This category of environmental importance will also require a high level of investigation as part of any development application, to determine on the ground values and priority for protection. A detailed environmental assessment is to be undertaken by applicants in accordance with the guidance provided in the Natural assets planning scheme policy no. SC6.9.
PO3 Degraded areas with significant ecological and environmental values or important to the maintenance of underlying ecological functions and biophysical processes required to maintain biodiversity and ecosystem services are rehabilitated as near as is practical to the naturally occurring suite of native plant species and ecological communities.	No acceptable outcome is nominated. **Editor's note—**A rehabilitation plan supported by expert ecological advice prepared in accordance with Natural assets planning scheme policy no. SC6.9 will assist in demonstrating achievement of this performance outcome.

Table 8.2.8.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Significant species and ecological communities	
PO4 Development avoids direct and indirect impacts on significant ecological communities and significant species and their habitats, including disturbance from the presence of vehicles, pedestrian use, increased exposure to domestic animals and noise and lighting impacts. **Editor's note—**Significant species and ecological communities include those identified in the Natural assets planning scheme policy no. SC6.9.	No acceptable outcome is nominated. **Editor's note—**Applications for development should identify any significant species or communities that may be affected by the proposal. A detailed environmental assessment is to be undertaken by applicants in accordance with the guidance provided in the Natural assets planning scheme policy no. SC6.9.
PO5 Areas of habitat that support a critical life cycle stage such as feeding, breeding or roosting or ecological function for threatened species, ecological communities or migratory species are not impacted by development.	No acceptable outcome is nominated.

Table 8.2.8.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Buffering and edge impacts	
PO6 Development provides a vegetated buffer to an area of significant ecological or environmental value, in order to: (a) protect core habitat areas from threatening processes; (b) maintain connectivity or support linkages; (c) reduce threats to the environmental values from non-native or pest fauna or flora; and (d) avoid undesirable microclimate effects. Any setbacks or other areas required for bushfire management, safety, recreation, maintenance or any other purpose, are provided in addition to a vegetated buffer provided for ecological and environmental protection purposes.	**AO6** A buffer extending from the outside edge of a declared fish habitat area (measured from highest astronomical tide (HAT)) has a minimum width of 100m. For other areas, no acceptable outcome is nominated. **Editor's note—**Areas which are expected to constitute core habitat as well as declared fish habitat areas are identified on maps contained in the Natural assets planning scheme policy no. SC6.9. Declared fish habitat areas may also be obtained from the relevant state agency. Buffers for significant species and ecological communities, including areas of habitat for listed threatened and migratory species, should be based on best practice and current scientific knowledge of individual species requirements and supported by an environmental assessment prepared in accordance with the Natural assets planning scheme policy no. SC6.9. Other legislation, including the *Nature Conservation Act* and *Environment Protection and Biodiversity Conservation Act* may establish other requirements with which applicants must comply.
PO7 Buffering, rehabilitation or restoration: (a) uses site appropriate or endemic native vegetation; (b) replicates as far as practicable, the species composition and structural components of healthy remnant native vegetation and associated habitats, including understorey vegetation; and (c) excludes declared plants, environmental weeds and other non-native plants likely to displace native flora species or degrade habitat.	No acceptable outcome is nominated. **Editor's note—**A site-based management and rehabilitation plan prepared in accordance with the Natural assets planning scheme policy no. SC6.9 will assist in demonstrating achievement of this performance outcome.
PO8 Pest species are prevented from encroaching into ecologically significant areas.	No acceptable outcome is nominated. **Editor's note—**A site-based management and rehabilitation plan prepared in accordance with the Natural assets planning scheme policy no. SC6.9 will assist in demonstrating achievement of this performance outcome.
PO9 During construction and operation of development, measures are implemented to prevent light, noise, visual and other disturbances.	No acceptable outcome is nominated. **Editor's note—**A site-based management and rehabilitation plan prepared in accordance with the Natural assets planning scheme policy no. SC6.9 will assist in demonstrating achievement of this performance outcome.

Table 8.2.8.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Ecological corridors and habitat connectivity	
PO10 Significant ecological corridors and habitat linkages are protected and have dimensions and characteristics to support: (a) ecological processes and functions that enable the natural change in distributions of species and provide connectivity between populations of species over long periods of time; (b) ecological responses to climate change; (c) connectivity between large tracts and patches of remnant vegetation and habitat areas; and (d) effective and unhindered day-to-day and seasonal movement of avian, terrestrial and aquatic fauna.	No acceptable outcome is nominated where in an urban residential zone or centre zone. In all other zones (including the Emerging community zone, Rural residential zone or industry zones): **AO10** Major ecological corridors identified on Figure SC6.9.3 in the Natural assets planning scheme policy no. SC6.9 are maintained and restored to achieve a minimum width of 350m, consisting of: (a) a 250m wide core corridor to support avian species and most arboreal mammals; and (b) a 50m wide vegetated buffer extending from the outside edges on both sides of the core corridor. No acceptable outcome is nominated for the great eastern ranges conservation corridor identified on Figure SC6.9.3 in the Natural assets planning scheme policy no SC6.9.
PO11 Corridors and linkages are provided to supplement and create additional ecological corridors and habitat linkages along waterways, drainage lines, ridgelines, coastlines and other areas where possible.	No acceptable outcome is nominated.
PO12 Development facilitates unimpeded use and movement of terrestrial and aquatic fauna that are associated with or are likely to use an ecological corridor as part of their normal life cycle by: (a) ensuring development, including roads, pedestrian access and in-stream structures, does not create barriers to the movement of fauna along or within ecological corridors; (b) providing effective wildlife management infrastructure to direct fauna to locations where wildlife movement infrastructure has been provided to enable fauna to safely negotiate a development area; and (c) separating fauna from potential hazards through the use of appropriate barriers and buffers.	No acceptable outcome is nominated.

Table 8.2.8.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Riparian and buffer area management for wetlands and waterways	
PO13 Development locates outside of, and does not impact on wetlands, to ensure long-term ecological function.	**AO13** Development, including any associated filling or excavation (other than restorative works) is located outside of any mapped, defined or identified boundary of a wetland and its associated buffer. **Editor's Note—**Natural assets planning scheme policy no. SC6.9 contains Figure SC6.9.2 which identifies wetland areas. This information may also be obtained from the relevant state agency.
PO14 Development provides a buffer to a wetland area to: (a) protect or enhance habitat values, connectivity and other ecological functions and values; (b) protect water quality and aquatic conditions; (c) maintain natural micro-climatic conditions; (d) maintain natural hydrological processes; (e) prevent mass movement, gully erosion, rill erosion, sheet erosion, tunnel erosion, stream bank erosion, wind erosion, or scalding; and (f) avoid loss or modification of chemical, physical or biological properties or functions of soil. Any setbacks or other areas required for bushfire management, safety, recreation, maintenance or any other purpose, are provided in addition to a vegetated buffer provided for ecological purposes.	**AO14** A development-free buffer is provided and maintained with a minimum width of: (a) for wetlands designated as high ecological significance (HES) by the Queensland Government: (i) 50m from the outermost part of the wetland where located in an urban area; or (ii) 200m from the outermost part of the wetland where located in a non-urban area; or (b) for other wetlands: 50m from the outermost part of the wetland in either urban or non-urban areas. **Editor's note—**Natural assets planning scheme policy no. SC6.9 contains Figure SC6.9.2 which identifies wetland areas. This information may also be obtained from the relevant state agency. **Editor's note—**To avoid conflict, where a development requires multiple buffers to be established by this code to protect watercourses, corridors, wetlands or core habitat, the greatest distances required by this code will prevail to the extent of any inconsistency.
PO15 Development (including operation) and construction maintains or enhances the natural hydrological regime of wetlands, including surface and ground waters. **Editor's note—**The hydrological regime of surface waters includes: (i) peak flows; (ii) volume of flows; (iii) duration of flows; (iv) frequency of flows; (v) seasonability of flows; (vi) water depth (seasonal average); and (vii) wetting and drying cycle.	**AO15.1** Development does not change the existing surface hydrological regime of a wetland including through channelisation, redirection or interruption of flows. **AO15.2** There is no change to the reference duration high-flow and low-flow duration frequency curves, low-flow spells frequency curve and mean annual flow to and from the wetland. **AO15.3** Any relevant stream flows into the wetland comply with relevant environmental flow objectives. **AO15.4** The water table and hydrostatic pressure in the wetland is either: (a) returned to its natural state; or (b) not lowered or raised outside the bounds of variability under existing pre-development conditions.

	AO15.5 Development does not result in the ingress of saline water into freshwater aquifers.
PO16 Development provides a buffer to a waterway, in order to: (a) protect or enhance habitat values, connectivity and other ecological processes and values; (b) protect water quality and aquatic conditions; (c) maintain natural micro-climatic conditions; (d) maintain natural hydrological processes; (e) prevent mass movement, gully erosion, rill erosion, sheet erosion, tunnel erosion, stream bank erosion, wind erosion, or scalding; and (f) prevent loss or modification of chemical, physical or biological properties or functions of soil. Any setbacks or other areas required for bushfire management, safety, recreation, maintenance or any other purpose, are provided in addition to a vegetated buffer provided for ecological purposes.	No acceptable outcome is nominated where in an urban residential zone or centre zone. Elsewhere (including the Emerging community zone, Rural residential zone or industry zones): **AO16** Other than where cropping for forestry for wood production, a development-free buffer is provided and maintained, extending from top of the bank of a waterway and with a minimum width of: (a) where in the Wet Tropics bioregion: (i) stream order 1 to 4: 25m; or (ii) stream order 5 and above: 50m; OR (b) in all other regions (Brigalow Belt North Bioregion or the Einasleigh Uplands Bioregion): (i) stream order 1 or 2: 25m; or (ii) stream order 3 or 4: 50m; or (iii) stream order 5 and above: 100m; **Editor's note—**Natural assets planning scheme policy no. SC6.9 contains Figure SC6.9.1 which identifies stream orders and bioregions. This information may also be obtained from the relevant state agency. **Editor's note—** Where a development requires multiple buffers to be established by this code to protect watercourses, corridors, wetlands or core habitat, the greatest distances required by this code will prevail to the extent of any inconsistency.

Table 8.2.8.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Ongoing management, construction and operation	
PO17 During construction and operation of development, ongoing management, monitoring and maintenance is undertaken to ensure impacts on significant ecological areas, underlying ecological functions and biophysical processes and environmental values are avoided or minimised.	No acceptable outcome is nominated. **Editor's note**–Applicants will be asked to prepare an site based management plan to guide construction and operation.
PO18 Management arrangements facilitate the effective conservation and protection of significant ecological areas and underlying ecological functions and biophysical processes.	**AO18** Significant ecological areas are: (a) transferred into public ownership where the land is required for public access or for some other public purpose consistent with its values; or (b) incorporated within private open space and included within a voluntary statutory covenant by registration under the *Land Title Act 1994.*

8.2.9 Water resource catchment overlay code

8.2.9.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment for the Water resource catchment overlay. When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

8.2.9.2 Purpose

(1) The purpose of the Water resource catchment overlay code is to ensure:

(a) the quality of surface and ground waters and the ecological values and hydrological processes of water resource catchments are protected;

(b) natural environment values and the ecological processes of terrestrial and aquatic ecosystems within the catchment area are protected;

(c) the water resource catchment area is maintained predominantly in a natural state and is protected from development and activities that would have unacceptable impacts on water quality, either directly or indirectly.

(2) The purpose of the code will be achieved through the following overall outcomes:

(a) the establishment, expansion or intensification of development is avoided in a water resource catchment area;

(b) rural residential development is contained within the zoned Oak Valley community and development densities minimise the potential for impact on the catchment;

Editor's note—Applicants should refer to the Rural residential zone code.

(c) the ecological values, hydrological processes and water quality values of ground and surface waters in water resource catchment areas are protected from direct and indirect development impacts;

(d) development does not adversely affect the physical integrity of waterways, wetlands, lakes, springs, riparian areas and natural ecosystems that support water quality; and

(e) vegetated buffers to the full supply level of a water storage area are provided and maintained.

8.2.9.3 Assessment benchmarks

For accepted development subject to requirements

Table 8.2.9.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
PO1 Development is set back from features contributing to catchment waters and incorporates a buffer to protect and enhance water quality values of ground and surface waters for ecosystem health and human consumption.	**AO1** Development, including all buildings and supporting infrastructure, is set back from the top of the bank of a waterway as shown on Figure 8.2 – Waterways within the Ross Dam Catchment with a minimum width of: (a) for stream order 3 or 4: 50m; or (b) for stream order 5 and above: 100m.

Table 8.2.9.3-Accepted development subject to requirements and assessable development (Part)

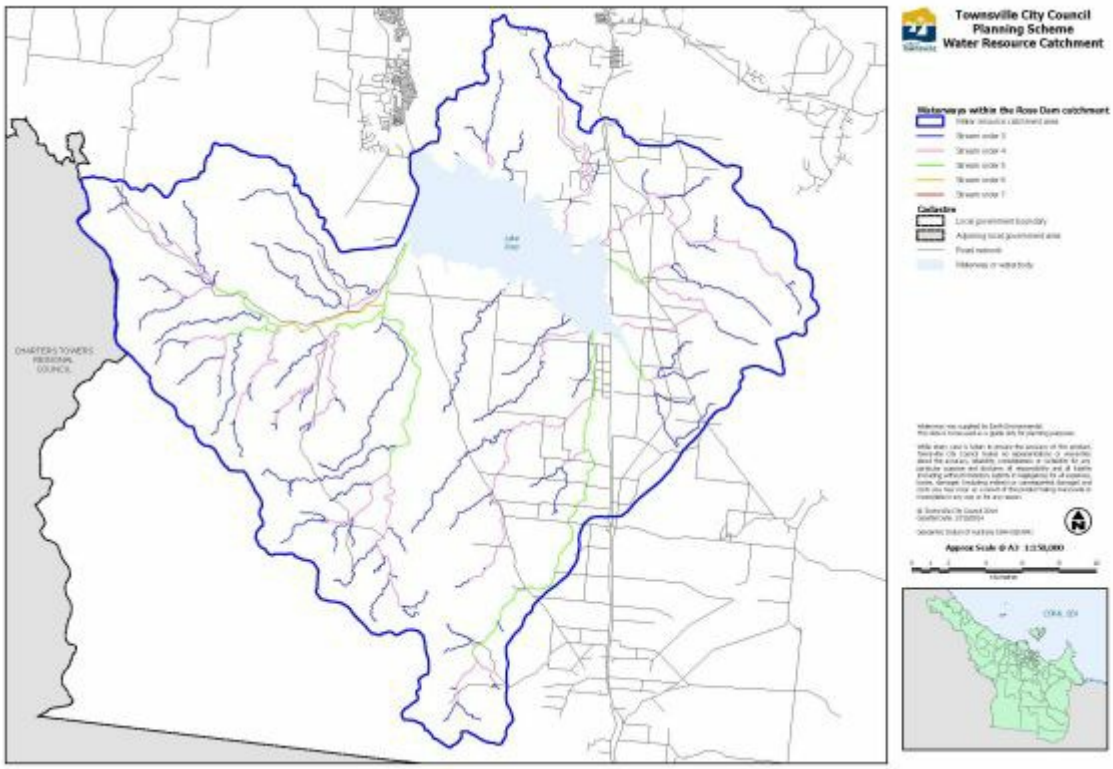
Performance outcomes	Acceptable outcomes
For assessable development	
Nature of development	
PO2 The intensification of activities within catchments is avoided, including any: (a) development, land use and management practices with the potential to degrade or contribute to the degradation of water quality in the water resource catchment area; and (b) development, use or activity that adversely affects the physical integrity of waterways, lakes, springs, riparian areas, wetlands and natural ecosystems.	No acceptable outcome is nominated.
PO3 Reconfiguration of lots does not increase the number of lots within the catchment, other than within the zoned Oak Valley rural residential area.	No acceptable outcome is nominated.
PO4 Within Oak Valley, the creation of additional lots is minimised.	**AO4** The minimum lot size in the rural residential zone within the catchment is 4ha.
PO5 Development in a water resource catchment area minimises land disturbance through appropriate siting, design and construction of buildings, structures, roadways and other work, and does not result in land degradation.	**AO5.1** Development does not involve earthworks.
	AO5.2 Development locates on slopes that do not exceed a 6% gradient.
PO6 Development in a water resource catchment area is managed in a way that maintains the structure and function of remnant vegetation and including erosion and associated loss to the soil fertility.	**AO6** Development does not involve vegetation clearing.
PO7 Development protects the water quality, ecological values, hydrological processes and other environmental values of any surface water or groundwater.	No acceptable outcome is nominated. **Editor's note** – Applicants should also have regard to Part 9.3.2 Healthy waters code for guidance on how to demonstrate compliance with this performance outcome. To demonstrate compliance with this performance outcome, council may request that a ground and surface water resource assessment be undertaken by a qualified person.

3.8.2 PIA Map 001 to PIA Map 020

(1) The PIA, overlaid with land use zonings and cadastral boundaries, is shown in the ensuing maps: PIA Map 001 to PIA Map 020.

Table 8.2.9.3-Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Buffers	
PO8 Development adjoining the water storage area identified on overlay map OM-09 protects and restores a vegetated buffer to avoid sediment, nutrients and pollutants from entering a waterway, wetland, lake, spring, riparian area or water storage area.	**AO8.1** Development including buildings, infrastructure, structures, enclosures and ancillary activities are not carried out within 500m of the water storage area identified on overlay map OM-09 and all existing vegetation is retained within the buffer.
	AO8.2 A vegetated buffer having a minimum width of 100m is established and maintained from the water storage area identified on overlay map OM-09.
PO9 Riparian vegetation within the water resource catchment area is protected.	**AO9** Development does not result in the clearing of any native riparian vegetation.
PO10 Development is set back from features contributing to catchment waters and incorporates a buffer to protect and enhance water quality values of ground and surface waters for ecosystem health and human consumption.	**AO10** Development, including all buildings and supporting infrastructure, is set back from the top of the bank of a waterway as shown on Figure 8.2 – Waterways within the Ross Dam Catchment with a minimum width of: (a) for stream order 3 or 4: 50m; or (b) for stream order 5 and above: 100m.



Click here to view PDF high resolution map.

Figure 8.2 - Waterways within the Ross Dam Catchment

Part 9 Development codes

9.1 Preliminary

(1) Development codes are assessment benchmarks where identified as an applicable code in Part 5.

(2) Use codes and other development codes are specific to each planning scheme area.

Editor's note–the Planning Regulation may establish requirements for development it prescribes to be accepted (for example, community residences and forestry) and assessment benchmarks that it prescribes to be assessable (for example, reconfiguration of 1 lot into 2).

(3) The following are the use codes for the planning scheme:

(a) Telecommunications facilities and utilities code.

(4) The following are the other development codes for the planning scheme:

(a) Advertising devices code;

(b) Healthy waters code;

(c) Landscape code;

(d) Reconfiguring a lot code;

(e) Transport impact, access and parking code;

(f) Works code.

9.2 Use codes

9.2.1 Telecommunications facilities and utilities code

9.2.1.1 Application

This code applies to a material change of use for telecommunications facilities, utilities, substations and major electricity infrastructure where the code is identified as applicable in the categories of development and assessment. When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

Editor's note—Low impact telecommunications facilities and minor electricity infrastructure are not regulated by the planning scheme. The *Telecommunications (Low Impact Facilities) Determination 1997* provides a full list of low impact facilities. Low impact facilities remain the responsibility of the Commonwealth Government.

9.2.1.2 Purpose

(1) The purpose of the Telecommunications facilities and utilities code is to ensure that facilities are located, designed and managed to be compatible with the locality in which they are established.

(2) The purpose of the code will be achieved through the following overall outcomes:

- (a) development avoids or minimises adverse impacts on the natural environment;
- (b) development does not unreasonably impact on the character and amenity of the locality;
- (c) risks to public health and safety are minimised and contained to acceptable levels; and
- (d) development facilitates co-location of infrastructure wherever possible.

9.2.1.3 Assessment benchmarks

Table 9.2.1.3—Accepted development subject to requirements and assessable development (Part)

Editor's note—Applicants must also comply with the relevant zone code and any applicable overlay code or development code.

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements development	
PO1 Aerial cabling and associated works for broadband telecommunications purposes is located and constructed in a manner that minimises visual impacts on the locality.	**AO1.1** The cables are co-located with operating works for a transmission entity or a distribution entity under the *Electricity Act 1994* wherever practicable.
	AO1.2 Any new cable has substantially the same appearance as existing cables.
	AO1.3 The average width of cabling for the facility is 25mm or less (excluding overmoulds).
	AO1.4 Any new cable is located: (a) above any existing street lighting cable; or (b) if there is no existing street cable lighting — no further than 600mm below any existing cable.
	AO1.5 In all other respects, the development complies with ACIF C524:2013 — External telecommunication cable networks.
PO2 Development does not unduly detract from the continued use and enjoyment of land included in a residential zone or of any other existing sensitive land use.	**AO2** The development is separated by a minimum of 50m to any land in a residential zone.

Table 9.2.1.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Visual integration, character and amenity	
PO3 The building height and the height of structures do not significantly detract from the scenic amenity and character of the locality.	No acceptable outcome is nominated.

PO4 Development is: (a) of high quality design and construction; (b) integrated with the surrounding area so as not to be visually dominant or intrusive, having regard to: (i) scale; (ii) height; (iii) bulk; (iv) materials and colour; and (v) aesthetic appearance; and (c) treated to eliminate glare and reflectivity.	No acceptable outcome is nominated.
PO5 Development in the Rural zone is not visually obtrusive when viewed from highways or significant public vantage points.	**AO5** Development in the Rural zone is setback from highway frontages by a minimum of 50m.
PO6 Where development is attached to an existing structure, it does not: (a) increase the visual prominence of the structure; or (b) detract from the design and architectural qualities of the structure.	No acceptable outcome is nominated.
PO7 Development does not unduly detract from the continued use and enjoyment of land included in a residential zone or of any other existing sensitive land use.	No acceptable outcome is nominated.
PO8 Development is setback from the site boundaries, to minimise impacts on adjoining land as a result of noise, glare, overshadowing, loss of privacy or visual obtrusiveness.	**AO8.1** The following minimum setbacks to all site boundaries are achieved: (a) 10m, where the height of the structure is less than 20m; (b) 15m, where the height of the structure is between 20m and 30m; (c) 20m, where the height of the structure is greater than 30m; and (d) 50m where adjoining a residential zone. OR **AO8.2** Where development reuses, extends or is attached to an existing structure, existing setbacks are not reduced.
PO9 Screening is provided to reduce the visual impacts of the facility and to enhance the character of the local area.	**AO9** A minimum 3m deep landscaped strip of dense planting is provided along all site boundaries.

PO10 Development prevents or minimises the generation of any noise such that: (a) nuisance is not caused; and (b) ambient noise levels are maintained.	**AO10** Development provides that: (a) noise levels measured as the adjusted maximum sound pressure level LAmax, adj. T at a noise sensitive place do not exceed: (i) background noise level plus 5dB(A) between the hours of 7am and 10pm; and (ii) background noise level plus 3dB(A) between the hours of 10pm and 7am; and (b) noise levels measured as the adjusted maximum sound pressure level LAmax, adj. T at a business place do not exceed: (i) background noise level plus 10dB(A) between the hours of 7am and 10pm; and (ii) background noise level plus 8dB(A) between the hours of 10pm and 7am.

Table 9.2.1.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Public health and safety	
PO11 Facilities are established, operated and maintained in a way to minimise the risk to public health and safety from electromagnetic emissions.	**AO11** For telecommunications facilities, development is designed and operated to restrict electromagnetic emissions in accordance with: (a) Radiocommunications (Electromagnetic Radiation — Human Exposure) Standard 2014; and (b) Radio Protection Standard for Maximum Exposure Levels to Radiofrequency Fields — 3KHz to 300GHz; or (c) other standards as specified by the Commonwealth Government Minister responsible for communications. For other development, no acceptable outcome is nominated.
PO12 Security fencing encloses the outermost boundaries of the land on which the facility is built in order to: (a) prevent unauthorised access; and (b) protect ease of maintenance access to the property.	**AO12** The site is securely fenced along all boundaries, including areas used for vehicle parking and storage.

PO13 Development incorporating access control arrangements includes: (a) providing warning information signs on all boundaries to prevent unauthorised entry; (b) the minimisation of the number and width of entry points; and (c) safe vehicular access to the site.	No acceptable outcome is nominated.

Table 9.2.1.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
Environmental impact	
PO14 Development does not adversely impact on the natural environment.	**AO14** Development does not involve vegetation clearing or earthworks.

Table 9.2.1.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
For upgrading an existing substation or bulk supply substation only	
PO15 When the proposal involves the upgrade of an existing substation to a bulk supply substation, the existing substation is: (a) in a location where viable corridors are accessible to connect powerline infrastructure to the site; and (b) in proximity to existing powerline infrastructure, to ensure that the need for additional powerline infrastructure is minimised.	No acceptable outcome is nominated.

Table 9.2.1.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
For major electricity infrastructure	
PO16 The proposed major electricity infrastructure: (a) maximise co-location with other existing powerlines and easements; and (b) avoid, where possible, location near residential uses.	No acceptable outcome is nominated.
PO17 The proposed overhead powerline infrastructure is positioned with safe clearances to land uses and vegetation.	**AO17** The proposed powerline infrastructure maintains mandatory clearances from any existing or proposed buildings, structures and operational equipment to existing powerlines in accordance with Schedules 4 and 5 of the *Electrical Safety Regulation 2013.*

Table 9.2.1.3—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For assessable development	
For major electricity infrastructure (underground powerline infrastructure) only	
PO18 Powerline infrastructure minimises any potential impact on transport, access and utilities infrastructure in an area.	No acceptable outcome is nominated.

9.3 Other development codes

9.3.1 Advertising devices code

9.3.1.1 Application

This code applies to assessing operational work for placing an advertising device on premises where the code is identified as applicable in the categories of development and assessment for operational works.
When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

9.3.1.2 Purpose

(1) The purpose of the advertising devices code is to facilitate economic activity through the advertising of business, products and/or services, while ensuring high levels of visual amenity, public safety and maintaining the character of the locality.

(2) The purpose of the code will be achieved through the following overall outcomes:

- (a) advertising devices are compatible with the character of the surrounding local area and do not dominate or diminish visual amenity; and
- (b) advertising devices do not create a hazard to people or property, in particular pedestrians, cyclists and vehicular traffic.

9.3.1.3 Assessment benchmarks

Table 9.3.1.3(a)—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Character and amenity	
PO1 The type, location, size and design of advertising devices do not dominate or diminish the character and visual amenity of the surrounding area in which they are located.	**AO1.1** The following types of advertising device are not located in the Community facilities zone: (a) in any circumstance any advertising device defined in Table 9.3.1.3(b) as a higher impact advertising device, other than: (i) a pole sign not exceeding 1.5m in any dimension; or (ii) a wall sign not exceeding 4m^2; and (b) advertising devices in the Community facilities zone do not involve third party advertising.
	AO1.2 No advertising devices are located within the Environmental management and conservation zone.
	AO1.3 Any advertising device defined in Table 9.3.1.3(b) as either an intermediate impact advertising device or a higher impact advertising device is not located in the Open space zone.

AO1.4
Advertising devices are not located in the residential zones other than where:

(a) in the High density residential zone; or

(b) in the Medium density residential zone (Picnic Bay, Nelly Bay tourist, North Ward villages, Hyde Park medium density, Aitkenvale village or The Strand precincts only); or

(c) comprising of a fence sign or a wall sign for a home based business, and:

  (i) limited to a maximum of one advertising device per premises; and

  (ii) limited to a maximum sign face area of 1m²; or

(d) comprising of an advertising device defined in Table 9.3.1.3(b) as a lower impact or intermediate impact advertising device for short-term accommodation and rooming accommodation.

AO1.5
Advertising devices in the High and Medium density residential zone are associated with the residential use or non-residential use located on the same premises and do not involve third party advertisement.

AO1.6
The following types of advertising devices are not located in the Rural zone:

(a) in any circumstance any advertising device defined in Table 9.3.1.3(b) as a higher impact advertising code other than;

  (i) a billboard; and

(b) only one (1) advertising device is located on each Rural-zoned land parcel.

AO1.7
The following types of advertising devices are not located in the Sport and recreation zone:

(a) in any circumstances any advertising device defined in Table 9.3.1.3(b) as a higher impact advertising device other than:

  (i) a billboard; or

  (ii) a pole sign; or

  (iii) a wall sign less than 4m2. and

(b) only one (1) higher impact advertising device identified above is located on the subject site.

AO1.8
Bunting is only located on premises used for any of the following purposes:

(a) Bulk landscape supplies; or

(b) Garden centre; or

(c) Market; or

(d) Outdoor sales; or

(e) Service station; or

(f) Outdoor sport and recreation; or

(g) Roadside stall.

AO1.9
Advertising devices that are illuminated by an internal or external light source or contain a digital display component are only permitted in the following circumstances:

(a) if located within the;

  (i) District centre zone; or

  (ii) Major centre zone; or

  (iii) Principal centre (CBD) zone; or

  (iv) Specialised centre zone (Domain precinct only); or

  (v) Community facilities zone; or

  (vi) Sport and recreation zone; or

  (vii) an industry zone; or

(b) not in the Flinders Street East precinct;

(c) not located within 100m of a sensitive land use;

(d) if a device containing a digital display, is not located within 500m of an existing digital display device; and

(e) not exceeding the luminance value identified in Table 1 - Maximum average luminance of advertising devices.

AO1.10
Advertising devices comply with the design parameters set out in Table 9.3.1.3(c).

AO1.11
Advertising devices are produced or manufactured and installed by a commercial painting or signwriting business or professional advertising business and are not constructed of cardboard, paper or similar product.

	AO1.12 Higher impact advertising devices, if freestanding, are provided with landscaping to enhance the visual amenity of the area immediately surrounding the device in the following zones: (a) Principal centre (CBD); or (b) Major centre; or (c) District centre; or (d) Specialized centre (Domain precinct only); or (e) Sport and recreation.
	AO1.13 Any structural componentry associated with the advertising device are appropriately incorporated into the device and are screened from public view. **Note**: The use of shipping containers as structural components is not supported.
	AO1.14 Digital advertising devices located on a vehicular trailer are not positioned within the road reserve.
PO2 Development avoids a visually cluttered and confusing proliferation of advertising devices.	**AO2.1** Advertising devices that display third party advertisement are only located in the following zones: (a) Principle centre (CBD); or (b) Major centre; or (c) District centre; or (d) Specialised centre (Domain precinct only); or (e) Low impact industry; or (f) Medium impact industry; or (g) High impact industry; or (h) Sport and recreation; or (i) Rural
	AO2.2 Only one (1) Higher impact advertising device is permitted on each land parcel.
PO3 Advertising devices in the Flinders Street East precinct do not adversely affect the fabric and setting of the heritage place or the general character of the locality.	**AO3.1** Advertising devices for heritage places in the Flinders Street East precinct are in accordance with the Cultural heritage planning scheme policy no. SC6.3.

Table 9.3.1.3(a)—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	Acceptable outcomes
For accepted development subject to requirements and assessable development	
Safety	
PO4 Advertising devices do not obstruct, endanger or pose a safety hazard to both vehicular and pedestrian traffic.	**AO4.1** Advertising devices, other than those listed below, are entirely contained within the lot and do not encroach into a road reserve or other public place: (a) awning sign (above-awning, awning fascia or under-awning sign); (b) blind/canopy sign; (c) footway sign; (d) inflatable sign; (e) projecting sign; (f) hamper sign, stallboard sign, fence sign or wall sign, subject to the provisions of AO4.9; and (g) animated sign of a type mentioned in (a) to (e) above.
	AO4.2 Advertising devices that incorporate a digital display involving changing content are spaced out in accordance with the requirements outlined in the Transport and Main Roads Practitioner Manual Roadside Advertising Manual Edition 3 Technical Volume September 2019 Guideline.
	AO4.3 Advertising devices are not located on or over a public road carriageway.
	AO4.4 Advertising devices do not obscure any road signs, traffic signals, direction signs, information signs, street numbers or street lighting.
	AO4.5 Advertising content does not include or resemble any official road signs.
	AO4.6 Advertising devices, other than a footway sign, are not located on a footpath. A footway sign is not located on a footpath less than 2.5m in width, or within 250mm of a kerb.
	AO4.7 Footway signs are only displayed during the business hours of the advertised business.

	AO4.8 Advertising devices do not project into or over a driveway, vehicle access, parking area, cycleway or pedestrian footpath unless maintaining a minimum vertical clearance of: (a) 4.5m where intended for use by buses or commercial vehicles comprising small rigid vehicles and above; or (b) 2.5m for any other driveway, vehicle access, parking area, cycleway or pedestrian footpath. **Editor's note—**As defined in AS/NZS 2890.2 – 2002.
	AO4.9 Advertising devices attached flat to a wall, fence or other structure adjacent to a road, driveway, vehicle access, parking area, cycleway or pedestrian footpath have a maximum thickness of 30mm, unless maintaining a minimum vertical clearance of: (a) 4.5m where intended for use by buses or commercial vehicles comprising small rigid vehicles and above; or (b) 2.5m for any other driveway, vehicle access, parking area, cycleway or pedestrian footpath. **Editor's note—**As defined in AS/NZS 2890.2 – 2002.
	AO4.10 An inflatable sign is: (a) securely tethered to purpose-made anchor points on a building or permanent structure, and by means of a minimum of two safety-tested tether lines; (b) located and tethered so as to remain contained at all times within an envelope formed by the vertical projection of the lot boundaries; and (c) inflated only by cold air or helium.

PO5 An advertising device only incorporates a digital display where it:- (a) is appropriate to the setting and is compatible with and will not detract from the amenity of the local area; (b) does not cause nuisance or distraction to pedestrians, vehicle traffic or adjoining, land-uses (c) does not create glare, reflecting or flaring of colours; and (d) will not cause distraction or create a potential safety hazard, including a traffic safety hazard	**AO5.1** An advertising device only incorporates a digital display that is designed to ensure that: (a) screen displays change instantaneously with no changeover animation effects or blank, black, white, or coloured screen displayed between advertisements; (b) advertisements remain static for a minimum dwell time, are in accordance with the Transport and main Roads Practitioner Manual Roadside Advertising Manual Edition 3 Technical Volume September 2019 Guideline; (c) advertisements do not incorporate moving visual images such as videos or animations; (d) advertisements only promote a single, self-contained advertising messages; (e) the device is not capable of playing audio or synchronized with any outdoor sound system utilised for advertising purposes (f) the advertising devices only contains one display screen and does not rotate or move; and (g) the advertising device includes an automatic error detection system, which turns off the screen display or displays a blank, black screen should the device malfunction.
PO6 Advertising devices are structurally sound and durable.	**AO6.1** Advertising devices, other than a commercial flag, banner sign, bunting or footway sign are permanently attached to a building, structure or the ground
	AO6.2 Advertising devices being a commercial flag, banner sign or bunting are securely attached to a pole or structure that is permanently attached to a building, structure or the ground.
PO7 Advertising devices do not impact on the safe and efficient operation of infrastructure	**AO7.1** Advertising devices maintain a minimum clearance of 1.5m to any installation or object relating to telecommunications (excluding a public telephone booth or kiosk), water supply, sewerage or stormwater drainage infrastructure.
	AO7.2 Advertising devices maintain a separation distance from power supply and electrical infrastructure in accordance with the distances prescribed by the Electrical Safety Regulation 2013.

Table 9.3.1.3(a)—Accepted development subject to requirements and assessable development (Part)

Performance outcomes	**Acceptable outcomes**
For assessable development	
Character and amenity	

PO8 Advertising devices do not adversely impact on the visual amenity of the locality or the character of the zone, having regard to the following: (a) significant and unreasonable loss of views; (b) overshadowing; (c) loss of access to breezes; (d) illumination effects; (e) impact on sight lines for vehicular access and egress; (f) significant and unreasonable loss of landscaping; and (g) the creation of visual clutter or proliferation of advertising devices; and (h) impact or obstruct existing signage on adjoining properties	No acceptable outcome is nominated.
PO9 Advertising devices are subservient to, and not dominant over, a building's appearance and are reasonably integrated with architectural features.	No acceptable outcome is nominated.

Table 1 Maximum average luminance of advertising devices

Advertising device Size (m²)	Maximum Average Luminance		
	Lighting Environment Zone 1 (cd/m²) (Land contained within the Principal centre (CBD) zone)	Lighting Environment Zone 2 (cd/m²) (Land contained within the following zones: • Major centre zone • District centre zone • Major centre zone • Specialised centre zone • Mixed use zone • Low impact industry • Medium impact industry • High impact industry)	Lighting Environment Zone 3 (cd/m²) (Land contained in all other zones)
All	500	350	300

Table 9.3.1.3(b)—Types of advertising devices (Part)

Device name and definition	Example of device
Lower impact advertising devices	
Blind/canopy sign A sign that is printed, painted or otherwise affixed to a solid or flexible material suspended from an awning, veranda or wall.	

Commercial flag A cloth or similar non-rigid fabric hung from, or attached to, a pole for the purpose of advertising a business, product or service.	
Footway sign A portable, free-standing sign normally supported by an 'A-frame' or inverted 'T-frame' and typically displayed on a footway.	
Hamper sign A sign painted or otherwise affixed in the area between a door head and the underside of an awning, or at equivalent level.	
Stallboard sign A sign painted or otherwise affixed to the base of a shopfront, normally below a shop window.	

Street furniture sign A sign attached to an item of street furniture, such as alfresco dining demarcation, telephone booths/kiosks, bus shelters, garbage bins, public seating and the like.	
Under-awning sign A sign affixed underneath, or suspended from, an awning or veranda.	
Window sign A sign affixed to or printed on the glass of a display window, or displayed behind the glass of the display window and facing outside. The term does not include products displayed in a window.	

Table 9.3.1.3(b)—Types of advertising devices (Part)

Device name and definition	Example of device
Lower impact advertising devices	
Blind/canopy sign A sign that is printed, painted or otherwise affixed to a solid or flexible material suspended from an awning, veranda or wall.	

Commercial flag A cloth or similar non-rigid fabric hung from, or attached to, a pole for the purpose of advertising a business, product or service.	
Footway sign A portable, free-standing sign normally supported by an 'A-frame' or inverted 'T-frame' and typically displayed on a footway.	
Hamper sign A sign painted or otherwise affixed in the area between a door head and the underside of an awning, or at equivalent level.	
Stallboard sign A sign painted or otherwise affixed to the base of a shopfront, normally below a shop window.	

Street furniture sign A sign attached to an item of street furniture, such as alfresco dining demarcation, telephone booths/kiosks, bus shelters, garbage bins, public seating and the like.	
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Window sign A sign affixed to or printed on the glass of a display window, or displayed behind the glass of the display window and facing outside. The term does not include products displayed in a window.	

Table 9.3.1.3(b)—Types of advertising devices (Part)

Device name and definition	Example of device
Lower impact advertising devices	
Blind/canopy sign A sign that is printed, painted or otherwise affixed to a solid or flexible material suspended from an awning, veranda or wall.	

Commercial flag A cloth or similar non-rigid fabric hung from, or attached to, a pole for the purpose of advertising a business, product or service.	
Footway sign A portable, free-standing sign normally supported by an 'A-frame' or inverted 'T-frame' and typically displayed on a footway.	
Hamper sign A sign painted or otherwise affixed in the area between a door head and the underside of an awning, or at equivalent level.	
Stallboard sign A sign painted or otherwise affixed to the base of a shopfront, normally below a shop window.	

Street furniture sign A sign attached to an item of street furniture, such as alfresco dining demarcation, telephone booths/kiosks, bus shelters, garbage bins, public seating and the like.	
Under-awning sign A sign affixed underneath, or suspended from, an awning or veranda.	
Window sign A sign affixed to or printed on the glass of a display window, or displayed behind the glass of the display window and facing outside. The term does not include products displayed in a window.	

Table 9.3.1.3(b)—Types of advertising devices (Part)

Device name and definition	Example of device
Lower impact advertising devices	
Blind/canopy sign A sign that is printed, painted or otherwise affixed to a solid or flexible material suspended from an awning, veranda or wall.	

Commercial flag A cloth or similar non-rigid fabric hung from, or attached to, a pole for the purpose of advertising a business, product or service.	
Footway sign A portable, free-standing sign normally supported by an 'A-frame' or inverted 'T-frame' and typically displayed on a footway.	
Hamper sign A sign painted or otherwise affixed in the area between a door head and the underside of an awning, or at equivalent level.	
Stallboard sign A sign painted or otherwise affixed to the base of a shopfront, normally below a shop window.	

Street furniture sign A sign attached to an item of street furniture, such as alfresco dining demarcation, telephone booths/kiosks, bus shelters, garbage bins, public seating and the like.	
Under-awning sign A sign affixed underneath, or suspended from, an awning or veranda.	
Window sign A sign affixed to or printed on the glass of a display window, or displayed behind the glass of the display window and facing outside. The term does not include products displayed in a window.	

Table 9.3.1.3(b)—Types of advertising devices (Part)

Device name and definition	Example of device
Intermediate impact advertising devices	
Above-awning sign A sign located on top of an awning or veranda of a building.	
Awning Fascia sign A sign painted or otherwise affixed flat to the fascia of an awning, or the balustrade of a veranda.	
Banner sign A removable advertising device attached or tethered to, or suspended from, a fixed object and displaying signage applied to, or printed or painted on, fabric or similar material.	
Bunting Decorative flags, pennants or streamers displayed for the purposes of advertising a business.	
Fence sign A sign that is painted or otherwise affixed to a fence or wall, usually located on a boundary of a site.	

Ground sign A sign that is painted on, or affixed to, a free-standing, low-level wall or similar freestanding structure located on the ground.	
Panel sign A free-standing sign that is typically similar in proportions to, but significantly smaller than, a billboard. The term does not include any sign otherwise defined herein.	
Projecting sign A sign: (a) directly attached to, and projecting horizontally from, and perpendicular to, a wall or building façade; or (b) suspended from a pole or similar device projecting horizontally from, and perpendicular to, a wall or building facade.	

Table 9.3.1.3(b)—Types of advertising devices (Part)

Device name and definition	Example of device
Intermediate impact advertising devices	
Above-awning sign A sign located on top of an awning or veranda of a building.	

Awning Fascia sign A sign painted or otherwise affixed flat to the fascia of an awning, or the balustrade of a veranda.	
Banner sign A removable advertising device attached or tethered to, or suspended from, a fixed object and displaying signage applied to, or printed or painted on, fabric or similar material.	
Bunting Decorative flags, pennants or streamers displayed for the purposes of advertising a business.	
Fence sign A sign that is painted or otherwise affixed to a fence or wall, usually located on a boundary of a site.	
Ground sign A sign that is painted on, or affixed to, a free-standing, low-level wall or similar freestanding structure located on the ground.	

Panel sign A free-standing sign that is typically similar in proportions to, but significantly smaller than, a billboard. The term does not include any sign otherwise defined herein.	
Projecting sign A sign: (a) directly attached to, and projecting horizontally from, and perpendicular to, a wall or building façade; or (b) suspended from a pole or similar device projecting horizontally from, and perpendicular to, a wall or building facade.	

Table 9.3.1.3(b)—Types of advertising devices (Part)

Device name and definition	Example of device
Intermediate impact advertising devices	
Above-awning sign A sign located on top of an awning or veranda of a building.	
Awning Fascia sign A sign painted or otherwise affixed flat to the fascia of an awning, or the balustrade of a veranda.	

Banner sign A removable advertising device attached or tethered to, or suspended from, a fixed object and displaying signage applied to, or printed or painted on, fabric or similar material.	
Bunting Decorative flags, pennants or streamers displayed for the purposes of advertising a business.	
Fence sign A sign that is painted or otherwise affixed to a fence or wall, usually located on a boundary of a site.	
Ground sign A sign that is painted on, or affixed to, a free-standing, low-level wall or similar freestanding structure located on the ground.	
Panel sign A free-standing sign that is typically similar in proportions to, but significantly smaller than, a billboard. The term does not include any sign otherwise defined herein.	

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Table 9.3.1.3(b)—Types of advertising devices (Part)

Device name and definition	Example of device
Intermediate impact advertising devices	
Above-awning sign A sign located on top of an awning or veranda of a building.	
Awning Fascia sign A sign painted or otherwise affixed flat to the fascia of an awning, or the balustrade of a veranda.	
Banner sign A removable advertising device attached or tethered to, or suspended from, a fixed object and displaying signage applied to, or printed or painted on, fabric or similar material.	

Bunting Decorative flags, pennants or streamers displayed for the purposes of advertising a business.	
Fence sign A sign that is painted or otherwise affixed to a fence or wall, usually located on a boundary of a site.	
Ground sign A sign that is painted on, or affixed to, a free-standing, low-level wall or similar freestanding structure located on the ground.	
Panel sign A free-standing sign that is typically similar in proportions to, but significantly smaller than, a billboard. The term does not include any sign otherwise defined herein.	

Projecting sign A sign: (a) directly attached to, and projecting horizontally from, and perpendicular to, a wall or building façade; or (b) suspended from a pole or similar device projecting horizontally from, and perpendicular to, a wall or building facade.	

Table 9.3.1.3(b)—Types of advertising devices (Part)

Device name and definition	Example of device
Higher impact advertising devices	
Animated sign A sign with a moving or changing display, such as moving, flashing, changing or chasing lights or scrolling, changing or projected images.	
Billboard A free-standing display surface which may be positioned on the ground or a building or structure, or mounted on one or multiple vertical supports.	
Inflatable sign An advertising device in the form of a fixed or tethered balloon, or similar lighter than air device.	
Pole sign A free-standing sign on one vertical support.	

Pylon sign A free-standing advertising device, the height of which is greater than the width, that is attached to the ground and either self-supporting or attached to one or more vertical supports.	
Roof sign A sign painted onto or otherwise affixed to the roof of a building. The term does not include an above-awning sign.	
Three-dimensional object sign A sign in the form of a three-dimensional object attached to a building, structure or the ground. The term does not include an inflatable sign.	

Wall sign A sign painted or otherwise affixed flat to the wall or façade of a building or structure. The term includes a parapet sign and a building name sign where advertising the name and/or logo of a business.	

Table 9.3.1.3(b)—Types of advertising devices (Part)

Device name and definition	Example of device
Higher impact advertising devices	
Animated sign A sign with a moving or changing display, such as moving, flashing, changing or chasing lights or scrolling, changing or projected images.	
Billboard A free-standing display surface which may be positioned on the ground or a building or structure, or mounted on one or multiple vertical supports.	

Inflatable sign An advertising device in the form of a fixed or tethered balloon, or similar lighter than air device.	
Pole sign A free-standing sign on one vertical support.	
Pylon sign A free-standing advertising device, the height of which is greater than the width, that is attached to the ground and either self-supporting or attached to one or more vertical supports.	
Roof sign A sign painted onto or otherwise affixed to the roof of a building. The term does not include an above-awning sign.	

Three-dimensional object sign A sign in the form of a three-dimensional object attached to a building, structure or the ground. The term does not include an inflatable sign.	
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Device name and definition	Example of device
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Pole sign A free-standing sign on one vertical support.	
Pylon sign A free-standing advertising device, the height of which is greater than the width, that is attached to the ground and either self-supporting or attached to one or more vertical supports.	

Roof sign A sign painted onto or otherwise affixed to the roof of a building. The term does not include an above-awning sign.	
Three-dimensional object sign A sign in the form of a three-dimensional object attached to a building, structure or the ground. The term does not include an inflatable sign.	
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Device name and definition	Example of device
Higher impact advertising devices	

Animated sign A sign with a moving or changing display, such as moving, flashing, changing or chasing lights or scrolling, changing or projected images.	
Billboard A free-standing display surface which may be positioned on the ground or a building or structure, or mounted on one or multiple vertical supports.	
Inflatable sign An advertising device in the form of a fixed or tethered balloon, or similar lighter than air device.	
Pole sign A free-standing sign on one vertical support.	
Pylon sign A free-standing advertising device, the height of which is greater than the width, that is attached to the ground and either self-supporting or attached to one or more vertical supports.	

Roof sign A sign painted onto or otherwise affixed to the roof of a building. The term does not include an above-awning sign.	
Three-dimensional object sign A sign in the form of a three-dimensional object attached to a building, structure or the ground. The term does not include an inflatable sign.	
Wall sign A sign painted or otherwise affixed flat to the wall or façade of a building or structure. The term includes a parapet sign and a building name sign where advertising the name and/or logo of a business.	

Table 9.3.1.3(c)—Design parameters for advertising devices (Part)

Notes—

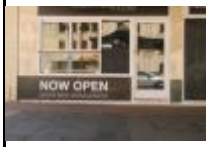
* Sign face area is measured as the total surface area of any face of an advertising device, excluding any supporting structure or, where applicable, as the surface area encompassing the outer extent of the advertising material contained on that face and does not include the frame, associated skirting or tagging components of the advertising device.

** Unless otherwise specified, height is measured from the highest point on any part of the sign structure to ground level below.

*** The minimum separation distance between two advertising devices is calculated as being a direct line between both advertising devices

**** Operational Works applications associated with an Advertising device must identify both the type of advertising device proposed (Billboard, Pylon, Awning sign) as well as the display type of sign face (i.e. static or digital).
Static sign face - is a sign face that comprises of a product such as paint, paper, vinyl or the like.
Digital sign face - is a sign face that comprises of liquid crystal display (LCD) or light emitting diode (LED).

***** Any skirting or tagging components (excluding architectural features) associated with an Advertising device has a maximum area of 10% of the associated attached sign face area.

Device type****	Example of device	Maximum number of devices	Maximum dimensions (m) or sign face area (m^2)*	Maximum number of sign face per advertising device	Maximum height**	Minimum separation distance to another device of the same type***	Other
Lower impact advertising devices							
Blind/canopy sign A sign that is printed, painted or otherwise affixed to a solid or flexible material suspended from an awning, veranda or wall.			A maximum of 50% of the external surface area of the blind or canopy.			500m if the sign face consists of a digital display.	
Commercial flag A cloth or similar nonrigid fabric hung from, or attached to, a pole for the purpose of advertising a business, product or service.			5m²		6.5m		
Footway sign A portable, freestanding sign normally supported by an 'Aframe' or inverted 'Tframe' and typically displayed on a footway.		One per business, tenant or occupant.	1m²	2	1m		
Hamper sign A sign painted or otherwise affixed in the area between a door head and the underside of an awning, or at equivalent level.						500m if the sign face consists of a digital display.	Contained within the limits of the hamper to which it is attached.
Stallboard sign A sign painted or otherwise affixed to the base of a shopfront, normally below a shop window.						500m if the sign face consists of a digital display.	Contained within the limits of the stallboard to which it is attached.

Street furniture sign A sign attached to an item of street furniture, such as alfresco dining demarcation, telephone booths/kiosks, bus shelters, garbage bins, public seating and the like.	 					500m if the sign face consists of a digital display.	
Under-awning sign A sign affixed underneath, or suspended from, an awning or veranda.		One per business, tenant or occupant.	Length: • the lesser of 2m or 75% of awning/veranda width; • height - 0.5m; • thickness - 60mm.	2		3m 500m if the sign face consists of a digital display.	• Contains advertising material on both sign faces. • Sign faces are oriented either perpendcular or parallel to the building facade.
Window sign A sign affixed to or printed on the glass of a display window, or displayed behind the glass of the display window and facing outside. The term does not include products displayed in a window.			A maximum of 25% of the window surface area.			500m if the sign face consists of a digital display.	
Inflatable sign An advertising device in the form of a fixed or tethered balloon, or similar lighter than air device.		One per lot.				500m	• is not located on a lot less than 1,000m^2 in extent. • is not able to rise to a height of more than 25m above ground level below.

Table 9.3.1.3(c)—Design parameters for advertising devices (Part)

Notes—

* Sign face area is measured as the total surface area of any face of an advertising device, excluding any supporting structure or, where applicable, as the surface area encompassing the outer extent of the advertising material contained on that face and does not include the frame, associated skirting or tagging components of the advertising device.

** Unless otherwise specified, height is measured from the highest point on any sign face to ground level below.

*** The minimum separation distance between two advertising devices is calculated as being a direct line between both advertising devices.

**** Operational Works applications associated with an Advertising device should identify both the type of advertising device proposed (Billboard, Pylon, Awning sign) as well as the type of sign face (i.e. static or digital).
Static sign face - is a sign face that comprises of a product such as paint, paper, vinyl or the like.
Digital sign face - is a sign face that comprises of liquid crystal display (LCD) or light emitting diode (LED).

***** Any skirting or tagging components (excluding architectural features) associated with an Advertising device has a maximum area of 10% of the associated attached sign face area.

Device type	Example of device	Maximum number of devices	Maximum dimensions (m) or sign face area (m2)*	Maximum number of sign face per advertising device	Maximum height**	Minimum separation distance to another device of the same type	Other
Intermediate impact advertising device							
Above-awning sign A sign located on top of an awning or veranda of a building.		One per business, tenant or occupant.	2.5m2.	2	1.5m measured to the awning surface below.	3m 500m if the sign face consists of a digital display.	• The horizontal dimension exceeds the vertical dimension. • Sign faces are back-to-back and perpendicular to the building façade.
Awning fascia sign A sign painted or otherwise affixed flat to the fascia of an awning, or the balustrade of a veranda.		One per business, tenant or occupant.				500m if the sign face consists of a digital display.	• Contained within the limits of the fascia to which it is attached; or • Exceeds only the upper and/or lower limits of the fascia by a maximum of 500mm in each case.
Banner sign A removable advertising device attached or tethered to, or suspended from, a fixed object and displaying signage applied to, or printed or painted on, fabric or similar material.		One per business, tenant or occupant.	5m² if in a Centre zone or an Industry zone. Otherwise 2.5m² .		5m		• Contains advertising material on all visible sign faces. • Not attached at both ends to the same building. • Not erected above the eave or parapet line of a building.
Bunting Decorative flags, pennants or streamers displayed for the purposes of advertising a business.					6m		Does not extend beyond the boundaries of the subject premises.
Fence sign A sign that is painted or otherwise affixed to a fence or wall, usually located on a boundary of a site.		One per lot.	Maximum thickness of 30mm.			500m if the sign face consists of a digital display.	Is contained within the outer limits of the fence on which it is located.

Ground sign A sign that is painted on, or affixed to, a freestanding, low-level wall or similar freestanding structure located on the ground.		One per lot.	10m2.		2m	500m if the sign face consists of a digital display.	Advertising material covers a maximum of 75% of each side of the advertising device.
Panel sign A freestanding sign that is typically similar in proportions to, but significantly smaller than, a billboard. The term does not include any sign otherwise defined herein.		One per business, tenant or occupant.	Horizontal – 2.5m; Vertical – 1.5m; Thickness – 60mm.	2	2.5m	3m 500m if the sign face consists of a digital display	• Sign faces are back-to-back. • Contains advertising material on any sign face visible from a road or public place.
Projecting sign A sign: (a) directly attached to, and projecting horizontally from and perpendicular to, a wall or building facade; or (b) suspended from a pole or similar device projecting horizontally from, and perpendicular to, a wall or building facade.		One per business, tenant or occupant.	2m², with a maximum projection from the façade of 2m.	2	4.5m	3m 500m if the sign face consists of a digital display	• Sign faces are back-to-back and perpendicular to the building façade. • Not erected above the eave or parapet line of a building.

Table 9.3.1.3(c)—Design parameters for advertising devices (Part)

Notes—

* Sign face area is measured as the total surface area of any face of an advertising device, excluding any supporting structure or, where applicable, as the surface area encompassing the outer extent of the advertising material contained on that face and does not include the frame, associated skirting or tagging components of the advertising device.

** Unless otherwise specified, height is measured from the highest point on any sign face to ground level below.

*** Operational Works applications associated with an Advertising device should identify both the type of advertising device proposed (Billboard, Pylon, Awning sign) as well as the type of sign face (i.e. static or digital).
Static sign face - is a sign face that comprises of a product such as paint, paper, vinyl or the like.
Digital sign face - is a sign face that comprises of liquid crystal display (LCD) or light emitting diode (LED).

**** The minimum separation distance between two advertising devices is calculated as being a direct line between both advertising devices.

***** Any skirting or tagging components (excluding architectural features) associated with an Advertising device has a maximum area of 10% of the associated attached sign face area.

Device type	Examples of device	Maximum number of devices	Maximum dimensions (m) or sign face area (m2)*	Maximum number of sign face per advertising device	Maximum height**	Minimum separation distance to another device of the same type	Other
Higher impact advertising devices							

Internally illuminated sign A sign that is internally illuminated by a lamp or other device that may contain moving, flashing, changing or chasing lights.		One per lot, if the lot area is less than 1,000m². Otherwise, one per 1,000m² of lot area, or part thereof exceeding 500m².	10m2		12m	50m if not in a Centre zone or an Industry zone.	
Billboard A billboard sign is any advertising device generally characterised as having a width greater than its height and is normally positioned in one or more vertical supports. These advertising devices are generally freestanding signs however in exceptional circumstances they may be mounted on the side of a building.			48m², if located in the Rural zone, a Centre zone or an Industry zone. Otherwise, 18m².	2		500m if located in the Rural zone. 500m if the sign face consists of a digital display. Otherwise, 200m.	• Sign faces are back-to-back or may be oriented at an angle to each other for best viewing. • Contains advertising material on all sign faces visible from a road or public place. • Where a single-sided sign or the back of a sign structure is visible from a road or public space, the back of the sign structure must be attractively treated or screened with vegetation to minimise visual impact.
Pole sign A freestanding sign on one vertical support.		One per lot.	2.5m2.	2	5m	50m 500m if the sign face consists of a digital display.	• Sign faces are back-to-back. • Contains advertising material on all sign faces visible from a road or public place. • Is located only on a lot frontage.

Pylon sign A freestanding advertising device, the height of which is greater than the width, that is attached to the ground and either self-supporting or attached to one or more vertical supports.		One per lot.	36m2 if located in the following zones: (a) Principle centre (CBD); or (b) Major centre; or (c) District centre; or (d) Specialized centre (Domain precinct only); (e) Sport and recreation; or (f) Rural Or 24m2 if located in the Mixed use zone.		12m	60m 500m if the sign face consists of a digital display.	• Is not located on a lot less than 1,000m² in extent. • Contains advertising material on all sign faces visible from a road or public place. • Is located only on a lot frontage.
Roof sign A sign painted onto or otherwise affixed to the roof of a building. The term does not include an above awning sign.		One per roof surface.	10m2		2.5m above roof level below the advertising device.	3m 500m if the sign face consists of a digital display.	• Is contained entirely within the roof line/profile whether seen in plan view or elevation. • Contains advertising material on all sign faces visible from a road or public place.
Shipping container sign A sign in the form of display or advertising material on one or more faces of one or more shipping container units.		One sign per lot	30m2 **Editor's note—**2 shipping containers placed on top of each container having a maximum dimension of: • Height - 2.4m • Width - 2.4m • Length - 6m		5m	500m	The shipping container structure must be covered from view.
Three-dimensional object sign A sign in the form of a three-dimensional object attached to a building, structure or the ground. The term does not include an inflatable sign.		One per lot.	3m in any dimension.		6m	500m if the sign face consists of a digital display.	

Wall sign A sign painted or otherwise affixed flat to the wall or façade of a building or structure. The term includes a parapet sign and a building name sign where advertising the name and/or logo of a business.	 		• A maximum of 20% of the area of the applicable building elevation; and • If a parapet sign, a maximum of 50% of the parapet area.		9m	500m if the sign face consists of a digital display.	Does not project beyond the outer extremities of the wall to which it is affixed or on which it is painted.

9.3.2 Healthy waters code

9.3.2.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

9.3.2.2 Purpose

(1) The purpose of the code is to ensure development manages stormwater and wastewater as part of the integrated total water cycle and in ways that help protect the environmental values specified in the *Environmental Protection (Water) Policy 2009*.

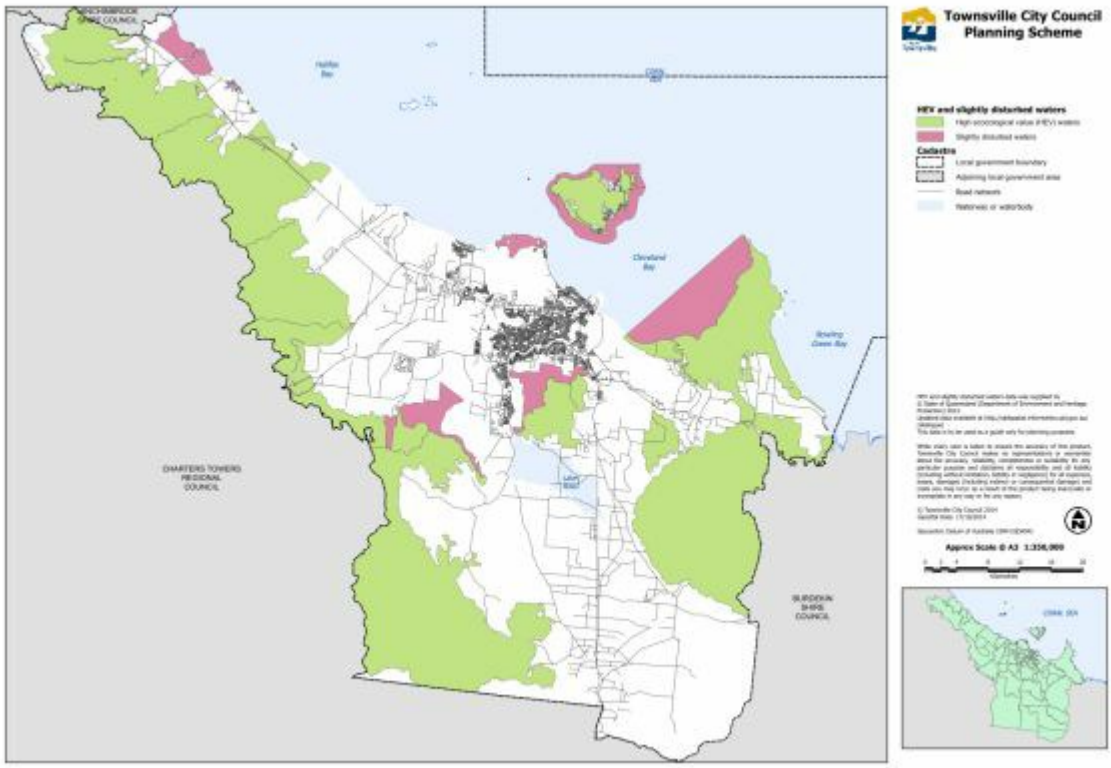
(2) The purpose of the code will be achieved through the following overall outcomes:

- (a) environmental values of receiving water are protected from adverse development impacts arising from altered stormwater quality and altered stormwater flow;
- (b) environmental values of receiving water are protected from waste water impacts;
- (c) environmental values of receiving water are protected from development impacts arising from the creation or expansion of non-tidal artificial waterways such as urban lakes;
- (d) potential adverse impacts on the natural and built environment, including infrastructure and human health as a result of acid sulfate soils are avoided;
- (e) public health and safety are protected and damage or nuisance caused by stormwater is avoided;
- (f) stormwater is designed to maintain or recreate natural hydrological processes and minimise run-off;
- (g) whole of lifecycle costs of infrastructure are minimised; and
- (h) well-designed developments are responsive to receiving water quality.

9.3.2.3 Assessment benchmarks

Table 9.3.2.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Stormwater management - protecting water quality	
PO1 Development contributes to the protection of environmental values and water quality objectives of receiving waters to the extent practicable. **Editor's note -** The environmental values and water quality objectives are established under the Environmental Protection (Water and Wetland Biodiversity) Policy (2019). Catchment-specific Environmental Values (EVs) and Water Quality Objectives (WQOs) have been prepared for some catchments (including the Ross River and Black River catchments). The Queensland Water Quality Guidelines 2009 provides EVs and WQOs for waters where no catchment-specific values have been established.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy SC6.4 - SC6.4.8.10 Stormwater Management Plans; and SC6.4.10.2 Water Sensitive Urban Design.
PO2 High environmental value waters and slightly disturbed waters (shown on Figure 9.1 — High environmental value waters and slightly disturbed waters) are protected from the impacts of development within their catchments. Existing water quality, habitat and biota values, flow regimes and riparian areas are maintained or enhanced.	No acceptable outcome is nominated. **Editor's note—**Refer to the *Queensland Water Quality Guidelines (QWQG)* for details on how to establish a minimum water quality data set for these areas.



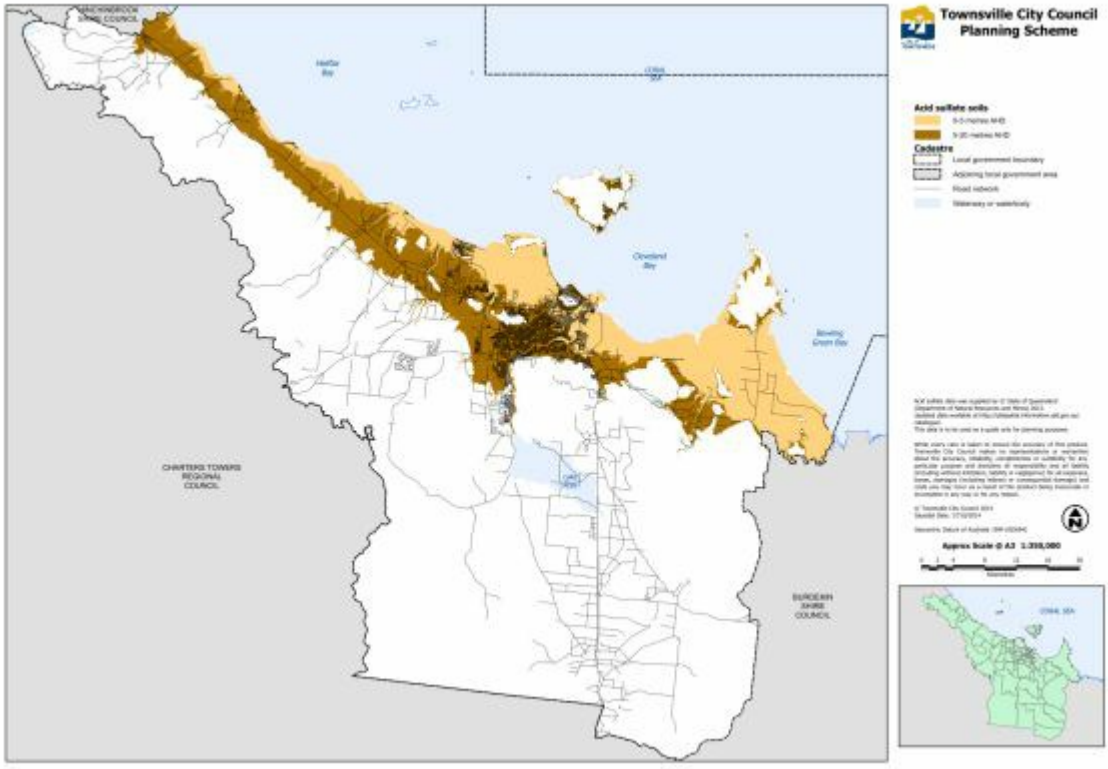
Click here to view PDF high resolution map.

Figure 9.1 - High environmental value waters and slightly disturbed waters

Table 9.3.2.3—Assessable development (Part)

PO3 The entry of contaminants into, and transport of contaminants in, stormwater is avoided or minimised.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy SC6.4 - SC6.4.8.10 Stormwater Management Plans; and SC6.4.10.2 Water Sensitive Urban Design.

PO4 Within the areas identified as potential acid sulfate soils on Figure 9.2 — Acid sulfate soils, the generation or release of acid and metal contaminants into the environment from acid sulfate soils is avoided by: (a) not disturbing acid sulfate soils when excavating or otherwise removing soil or sediment, draining or extracting groundwater, excluding tidal water or filling land; or (b) where disturbance of acid sulfate soils cannot be avoided, development: (i) neutralises existing acidity and prevents the generation of acid and metal contaminants; and (ii) prevents the release of surface or groundwater flows containing acid and metal contaminants into the environment.	**AO4.1** Development does not: (a) involve excavating or removing 100m^3 or more of soil and sediment at or below 5m AHD; or (b) permanently or temporarily drain or extract groundwater or exclude tidal water resulting in the aeration of previously saturated acid sulfate soils; or (c) involve filling with 500m^3 or more with an average depth of 0.5m or greater that results in: (i) actual acid sulfate soils being moved below the water table; or (ii) previously saturated acid sulfate soils being aerated. OR **AO4.2** Development manages waters so that: (a) all disturbed acid sulfate soils are adequately treated and/or managed so that they can no longer release acid or heavy metals; (b) the pH of all site any water including discharges and seepage to groundwater, is maintained between 6.5 and 8.5 (or an agreed pH in line with natural background); (c) waters on the site, including discharges and seepage to groundwater, do not contain elevated levels of soluble metals; (d) there are no visible iron stains, flocs or sums in discharge water; (e) all reasonable preparations and actions are undertaken to ensure that aquatic health is safeguarded; and (f) infrastructure such as buried services, pipes, culverts and bridges are protected from acid attack. **Editor's note—**Where works are proposed within the areas identified as potential acid sulfate soils on Figure 9.2 - Acid sulfate soils, the applicant is required to undertake an on-site acid sulfate investigation. The reason for undertaking an acid sulfate soils investigation is to determine the presence of acid sulfate soil in order to avoid disturbance. Where acid sulfate soils cannot reasonably be avoided, investigation results assist in the planning of treatment and remedial activities and must be undertaken in accordance with the *Queensland Acid Sulfate Soil Technical Manual* and relevant State Planning Policy. Applicants should also refer to the *Guidelines for Sampling Analysis of Lowland Acid Sulfate Soils in Queensland*, Acid Sulfate Soils Laboratory Methods Guidelines or Australian Standard 4969. It is highly recommended that the applicant develop a practical Acid Sulfate Soil Management Plan for use in monitoring and treating acid sulfate soils.



Click here to view PDF high resolution map.

Figure 9.2 - Acid sulfate soils

Table 9.3.2.3—Assessable development (Part)

PO5 Construction activities for the development avoid or minimise adverse impacts on stormwater quality or hydrological processes.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy SC6.4 - SC6.4.8.10 Stormwater Management Plans, SC6.4.23.1 Construction Management; and SC6.4.6.1 - Water Sensitive Urban Design.

Table 9.3.2.3—Assessable development (Part)

Performance outcomes	**Acceptable outcomes**
Hydrological processes	
PO6 The stormwater management system: (a) retains natural waterway corridors and drainage paths; and (b) maximises the use of natural channel design in constructed components.	**AO6.1** All existing waterways and overland flow paths are retained.
	AO6.2 The stormwater management system is designed in accordance with the Development manual planning scheme policy no. SC6.4 — SC6.4.10.2 Water Sensitive Urban Design.
PO7 The development is designed to minimise run-off and peak flows by: (a) minimising large areas of impervious material; and (b) maximising opportunities for capture and reuse.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy SC6.4 - SC6.4.8.10 Stormwater Management Plans; and SC6.4.10.2 Water Sensitive Urban Design.

PO8 Stormwater management is designed to: (a) protect in-stream ecosystems from the significant effects of increased run-off frequency by capturing the initial portion of run-off from impervious areas; and (b) create conditions such that the frequency of hydraulic disturbance to in-stream ecosystems in developed catchments is similar to pre-development conditions. **Editor's note—**Frequent flow management is distinct from flood management purposes, which is concerned with the management of less frequent, more extreme stormwater flows. The latter is an important part of integrated stormwater management and should in no way be compromised in pursuit of the management of more frequent flows for waterway health enhancement.	**AO8** The stormwater management system is designed in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity and SC6.4.10 Stormwater Quality.
PO9 Stormwater management is designed to prevent exacerbated in-stream erosion downstream of a development site by controlling the magnitude and duration of sediment-transporting, erosion-causing flows.	**AO9** The stormwater management system is designed in accordance with the Development manual planning scheme policy no. SC6.4 — SC6.4.10.2 Water Sensitive Urban Design and SC6.4.8.10 Stormwater Management Plans.

Table 9.3.2.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Stormwater drainage generally	
PO10 The proposed stormwater management system or site works does not adversely affect flooding or drainage characteristics of properties that are upstream, downstream or adjacent to the development site.	**AO10.1** The development does not result in an increase in flood level or flood duration on upstream, downstream or adjacent properties.
	AO10.2 The stormwater management system is designed and constructed in accordance with the Development manual planning scheme policy SC6.4 –SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity; and SC6.4.10 Stormwater Quality.
PO11 Development does not cause ponding, or changes in flows and velocities such that the safety, use and enjoyment of nearby properties are adversely affected.	**AO11** The stormwater management system is designed and constructed in accordance with the Development manual planning scheme policy SC6.4 – SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity; and SC6.4.10 Stormwater Quality.
PO12 The drainage network has sufficient capacity to safely convey stormwater run-off from the site.	**AO12** Development is undertaken in accordance with the Development manual planning scheme policy SC6.4 – SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity; and SC6.4.10 Stormwater Quality.
PO13 The stormwater management system: (a) provides for safe access and maintenance; and (b) where relevant, provides for safe recreational use of stormwater management features.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy SC6.4 - SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity; and SC6.4.10 Stormwater Quality.

Table 9.3.2.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Point source waste water management (other than contaminated stormwater and sewage)	
PO14 Waste water is managed in accordance with a waste management hierarchy that: (a) avoids waste water discharge to waterways; or (b) if waste water discharge to waterways cannot practicably be avoided, minimises waste water discharge to waterways by re-use, recycling, recovery and treatment for disposal to sewer, surface water and groundwater. **Editor's note—**To meet this outcome, a waste water management plan (WWMP) should be prepared by a suitably qualified person. The WWMP is to account for the waste water type, climatic conditions, Water Quality Objective (WQOs) and best practice environmental management.	No acceptable outcome is nominated.
PO15 Any treatment and disposal of waste water to a waterway: (a) protects the applicable water quality objectives for the receiving waters; and (b) avoids adverse impact on ecosystem health of receiving waters.	No acceptable outcome is nominated.
PO16 Development avoids or minimises and appropriately manages soil disturbance or altering natural hydrology in nutrient hazardous areas.	No acceptable outcome is nominated.
PO17 Waste water discharge to waterways is managed to avoid or minimise the release of nutrients of concern so as to minimise the occurrence, frequency and intensity of coastal algal blooms. **Editor's note—**Compliance with this outcome can be demonstrated by following the management advice in the Implementing Policies and Plans for Managing Nutrients of Concern for Coastal Algal Blooms in Queensland and associated technical guideline.	No acceptable outcome is nominated.

Table 9.3.2.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Constructed lakes and artificial waterways	
PO18 Where established, a constructed lake or artificial waterway is designed to maintain a reasonable standard of water quality, having regard to factors affecting lake health, including: (a) nutrients and eutrophication; (b) gross pollutants, including organic material; (c) light and turbidity; (d) organic carbon loads; (e) lake stormwater detention time; (f) salinity; (g) temperature; (h) water depth and seasonal variations; (i) water column mixing temperature; and (j) pesticides and other chemicals.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity; and SC6.4.10 Stormwater Quality.
PO19 Stormwater run-off entering and leaving a constructed lake or artificial waterway maintains receiving water quality.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC 6.4 - SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity; and SC6.4.10 Stormwater Quality.
PO20 The location, design and operation of a constructed lake or artificial waterway: (a) protects environmental values in downstream and upstream waterways; (b) protects any groundwater recharge areas; (c) incorporates low lying areas of a catchment connected to an existing waterway; (d) does not disrupt natural wetlands and any associated buffer areas; (e) avoids disturbing soils or sediments; and (f) avoids altering the natural hydrologic regime in acid sulfate soil and nutrient hazardous areas. **Editor's Note—**Monitoring and maintenance programs will be required to adaptively manage water quality and to achieve relevant water quality objectives.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity; and SC6.4.10 Stormwater Quality..

PO21 The constructed lake or artificial waterway is located in a way that is compatible with existing tidal waterways.	For constructed lakes — No acceptable solution is nominated. **AO21** For an artificial waterway: Where an artificial waterway is located adjacent to, or connected to, a tidal waterway by means of a weir, lock, pumping system or similar: (a) there is sufficent flushing or tidal flushing with water level variation >0.3m; (b) any tidal flow alteration does not adversely impact on the tidal waterway; and (c) there is no introduction of salt water into freshwater environments. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity; and SC6.4.10 Stormwater Quality.
PO22 The construction phase for the constructed lake or artificial waterway is compatible with protecting aquatic environmental values in existing natural waterways and wetlands.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity; and SC6.4.10 Stormwater Quality.
PO23 A constructed lake or artificial waterway is designed to avoid terrestrial and aquatic weeds, vectors and concentrations of populations.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity; and SC6.4.10 Stormwater Quality.
PO24 The lake design provides for suitable machinery access to enable maintenance of the lake, including the removal of terrestrial and aquatic weeds.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity; and SC6.4.10 Stormwater Quality.
PO25 A constructed lake or artificial waterway has no adverse impact on flood capacity, including the capacity of upstream catchments and floodplain areas.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity; and SC6.4.10 Stormwater Quality.
PO26 A constructed lake or artificial waterway is designed to minimise hazards to ensure public safety is maintained.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity; and SC6.4.10 Stormwater Quality.
PO27 A constructed lake or artificial waterway is designed to provide a high level of amenity for surrounding residents.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity; and SC6.4.10 Stormwater Quality.
PO28 Opportunities for incorporation of accessible passive and active recreation facilities into the design of the constructed lake or artificial waterway are facilitated.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity; and SC6.4.10 Stormwater Quality.

Table 9.3.2.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Efficiency and whole of life cycle cost	
PO29 Life cycle costs are minimised, taking into account acquisition, construction, establishment, operation, monitoring, maintenance, replacement and disposal costs.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy SC6.4 for assistance in demonstrating this outcome.
PO30 The design of the development allows for sufficient site area to accommodate an effective stormwater management system.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy SC6.4 for assistance in demonstrating this outcome.
PO31 The proposal provides for the orderly development of stormwater infrastructure within a catchment, having regard to: (a) existing capacity of stormwater infrastructure and ultimate catchment conditions; (b) discharge for existing and future upstream development; and (c) protecting the integrity of adjacent and downstream development.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy SC6.4 for assistance in demonstrating this outcome.
PO32 Proposed stormwater infrastructure remains fit for purpose for the life of the development.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy SC6.4 for assistance in demonstrating this outcome.
PO33 Proposed stormwater infrastructure can be easily accessed and can be maintained in a safe and cost effective way.	**AO33** The stormwater management system is designed in accordance with the Development manual planning SC6.4.8 Stormwater Management, SC6.4.9 Stormwater Quantity; and SC6.4.10 Stormwater Quality.

Table 9.3.2.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Water management in reconfiguring a lot	
PO34 Reconfiguration of lots includes water management measures in the design of any road reserve, streetscape or drainage networks to: (a) minimise impacts on the water cycle; (b) protect waterway health by improving stormwater quality and reducing site run-off; and (c) avoid large areas of impervious surfaces.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy SC6.4 for assistance in demonstrating this outcome.

Table 9.3.2.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Ship-sourced pollutants	
PO35 Common user facilities for the handling and disposal of ship-sourced pollutants including oil, garbage and sewage are provided at a suitable location in any development involving a marina or berthing facilities. **Editor's note—**Refer to: *Australian and New Zealand Environment and Conservation Council (ANZECC)*, 1997, *Best Practice Guidelines for Waste Reception Facilities at Ports*, *Marinas and Boat Harbours in Australia and New Zealand.*	No acceptable outcome is nominated.
PO36 Marinas or berthing facilities are designed and operated to ensure the risk of spillage from operations is minimised.	No acceptable outcome is nominated.
PO37 Equipment to contain and remove spillages is stored in a convenient position near marina or berthing facilities and is available for immediate use.	No acceptable outcome is nominated.
PO38 Where practical, the marina pollutant reception facility is connected to a sewerage or other waste reception infrastructure. **Editor's note—**Reception facilities require compliance assessment under the *Plumbing and Drainage Act 2002*. The plumbing compliance assessment process will ensure that the proposed facilities address 'peak load'.	No acceptable outcome is nominated.

9.3.3 Landscape code

9.3.3.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

9.3.3.2 Purpose

(1) The purpose of the Landscape code is to ensure landscaping in both the private and public domains is designed and constructed to a high standard, provides a strong contribution to the city image, is responsive to the local character, site and climatic conditions and remains fit for purpose over the long-term.

(2) The purpose of the code will be achieved by the following overall outcomes:

- (a) a high quality streetscape and on-site landscape enhances the character of the city;
- (b) landscape design is used to integrate the natural and built form elements of the site and the locality;
- (c) landscape elements create a legible and attractive street frontage, and enhance the continuity of the streetscape;
- (d) screening is used to soften built form, mitigate adverse aesthetic impacts and provide privacy and character;
- (e) plant species and landscaping materials are suited to the Dry Tropics' cyclone prone climate;
- (f) plant species, landscape materials and surface treatments are suited to their intended function and user requirements;
- (g) plant species, landscaping materials and surface treatments are designed to remain attractive, fit for purpose and be cost effective to maintain over the long-term;
- (h) landscape design facilitates an accessible, safe and comfortable environment for all users; and
- (i) significant on-site vegetation is retained, protected and integrated into the site design wherever practicable.

9.3.3.3 Assessment benchmarks

Table 9.3.3.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Landscape design and character	
PO1 The overall landscape design of both public and private spaces: (a) creates a sense of place that is consistent with the intended character of the streetscape, city or locality; and (b) is functional and designed to be visually appealing in the long-term as well as when first constructed.	**AO1** When the development is in an identified locality in the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space, landscape design is in accordance with the requirements for that area. Otherwise, no acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space.

PO2 Tree and plant selection ensures: (a) climatically appropriate landscaping; (b) creation of a diverse palette: in form, texture and seasonal colour; (c) longevity of plants and the form and function of landscaped areas; and (d) cost effective and convenient maintenance over the long-term.	**AO2.1** Species are selected from those listed in the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space.
	AO2.2 Plant species do not include undesirable species as listed in the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space.
PO3 Where appropriate, provision is made for on-street planting that: (a) complements the local streetscape; (b) ensures visibility is maintained from entrances and exits to properties and at intersections; (c) establishes healthy vegetation of suitable species; (d) minimises the potential for vegetation to cause damage to persons, property or infrastructure; and (e) does not limit or hinder pedestrian or vehicular flow and movement.	**AO3** Street planting is provided that is consistent with the standards set out in the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space. **Editor's note—**Applicants may also have reference to the Development manual planning scheme policy no. SC6.4 - SC6.4.6.1 Geometric Road Design.
PO4 Streetscape treatments and paving form a functional and attractive component of the overall landscape scheme.	**AO4.1** All general streetscape elements are provided in accordance with the standards set out in the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space.
	AO4.2 Streetscape pavements are provided in accordance with the standards set out in the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space.
	AO4.3 Streetscape furniture is provided in accordance with the standards set out in the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space.
PO5 Landscaping within on-site open space areas is well-designed, having regard to its purpose and the provision of shading, climatic response, and the proportion of soft and hard elements.	**AO5.1** Selected tree species within communal recreation areas are to provide at least 30% shade coverage within 5 — 10 years of planting.
	AO5.2 A minimum of 50% of landscaped areas are to be covered in soft landscaping (turf areas and planting beds), with at least 25% of that area being planting.
PO6 Landscaping and embellishments in local recreational parks is fit for purpose and well-designed, having regard to shading, climatic response, and the proportion of soft and hard elements. Landscaping softens edges and creates an attractive interface with adjoining land.	**AO6** Landscaping and embellishments are provided that are consistent with the standards set out in the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space. **Editor's note—**Applicants should also have regard to requirements for local recreational parks in the Reconfiguring of a lot code.

PO7 The use of hard surface treatments within private and public spaces do not detract from a high standard of amenity, and large unbroken areas of hardstand material is avoided.	**AO7** Surface treatments are provided that are consistent with the standards set out in the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space.

Table 9.3.3.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Edge treatments	
PO8 Where provided, landscape design along site frontages is used to mitigate adverse aesthetic elements, provide privacy and reduce illumination impacts, while maintaining a safe environment for users.	**AO8** Landscaped areas along the frontage of a site consists of: (a) shade or rounded canopy trees that will provide a minimum of 50% shade to the frontage of the site within 5 years of planting; (b) shrubs that provide screening to blank walls and privacy as required; and (c) low shrubs and ground covers that reach a maximum height of 750mm at maturity.
PO9 Where appropriate, acoustic barriers and long fences along road frontages and within the development are screened or softened by landscaping or architectural embellishment to improve visual amenity of the development.	No acceptable outcome is nominated. **Editor's note—**Guidance on desirable treatments in particular circumstances is provided in the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space.
PO10 Where provided, landscaping along a side or rear boundary assists in maintaining privacy, screening unsightly or service elements and enhancing the appearance of the development from nearby premises.	**AO10.1** Screen planting is provided along the side or rear boundary of a site, which consists of: (a) either trees with a maximum spacing of 3m (measured from centres) and capable of providing a dense screen within 3 years of planting or screening shrubs capable of growing to a height of 3m within 2 years of planting; and (b) low shrubs and ground covers, where appropriate, to allow for complete covering of planting area.
	AO10.2 A minimum of 25% of all trees are to grow above the height of the eaves of the equivalent second storey of the building.
PO11 Landscaped areas along or near retaining walls, long unbroken walls, service areas and parking areas consist of an appropriate combination and species of trees, shrubs and groundcovers to minimise the visual impact of these elements.	No acceptable outcome is nominated. **Editor's note—**Guidance on desirable treatments in particular circumstances is provided in the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space.
PO12 Screening trees, shrubs, low shrubs, ground covers and vertical accent plants are appropriate for the space available, orientation and functional requirements of the area.	No acceptable outcome is nominated. **Editor's note—**Guidance on desirable treatments in particular circumstances is provided in the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space.

Table 9.3.3.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Maintenance, drainage, utilities, services and construction	
PO13 Plant selection and location protects the integrity and function of overhead and underground services.	**AO13** Plant selection and location complies with the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space.
PO14 Landscape elements do not adversely affect stormwater quantity or quality by ensuring: (a) the flow of water along overland flow paths is not restricted; (b) opportunities for water infiltration are maximised; and (c) areas of pavement, turf and mulched garden beds are appropriately located and adequately drained.	No acceptable outcome is nominated. **Editor's note—**Applicants should also refer to Section 9.3.6 Works code and Section 9.3.2 Healthy waters code and the Development manual planning scheme policy no. SC6.4 to assist in demonstrating the outcome.
PO15 Landscaping works, design and materials used minimise maintenance costs and whole of life cycle costs. **Editor's note—**Council may request a lifecycle cost analysis and maintenance cost plan for developments that create new public landscape embellishment to determine the appropriateness of landscaping treatment lifecycle costs to the community.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4 to assist in demonstrating the outcome, including SC6.4.12 Landscaping and Open Space. and SC6.4.12.6 Landscaping Construction Standards.
PO16 All turf areas on-site are accessible externally by standard lawn maintenance equipment and receive adequate sunlight for the turf species used.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4 including SC6.4.12 Landscaping and Open Space. to assist in demonstrating the outcome.
PO17 Drainage of podium planters allows for flush out in future and are adequately drained.	No acceptable outcome is nominated.
PO18 Irrigation is installed within private and public spaces to ensure the long-term viability and integrity of landscaped areas. Where provided, irrigation is designed to facilitate the efficient supply of water in accordance with micro-climatic conditions.	**AO18** Irrigation is provided accordance with the Development manual planning scheme policy no. SC6.4 including - SC6.4.12 Landscaping and Open Space. **Editor's note—**Irrigation systems should be minimized where practical, such as in natural areas or areas where landscaping is likely to endure due to landform and microclimate, for example.
PO19 Limited on-site maintenance is achieved for private and public landscaping, by selecting plant species having regard to long life expectancy and minimal leaf litter drop, pruning, watering and fertilising requirements.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy SC6.4.12 Landscaping and Open Space to assist in demonstrating the outcome.
PO20 Container sizes and planting stock maturity is consistent with the intended role of the landscaping.	**AO20** Landscaping is undertaken in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space.
PO21 Planting stocks are of a quality to ensure vigorous growth.	**AO21** Landscaping is undertaken in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space and SC6.4.12.6 Landscaping Construction Standards.

PO22 Plants are protected and maintained to facilitate in-situ growth, vigour and quality form.	**AO22** Landscaping is undertaken in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space and SC6.4.12.6 Landscaping Construction Standards.
PO23 Site preparation works ensure a stable and enhanced landscape form.	**AO23** Landscaping is undertaken in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space and SC6.4.12.6 Landscaping Construction Standards.

Table 9.3.3.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Sustainability	
PO24 Wherever possible, landscape design facilitates the retention of significant existing vegetation, both within and external to the site.	**AO24.1** Site design integrates and incorporates retained and significant trees and vegetation within and external to the site.
	AO24.2 Removed or damaged significant vegetation is replaced with mature vegetation of a comparable quantity and species.
PO25 Appropriate site planning and construction management is undertaken to ensure the longevity and health of retained and significant trees and vegetation.	**AO25.1** Retained trees are protected by a tree protection zone (TPZ) and fenced along the canopy/drip line to comply with AS4970- 2009 Protection of Trees on Development Sites.
	AO25.2 Any required pruning or trimming work is undertaken in accordance with AS4373 — Pruning of Amenity Trees and is carried out by a qualified aborist.
	AO25.3 Retained and significant vegetation damaged during development or construction is treated to repair any damage to the extent practicable by a qualified aborist.
	AO25.4 Protective measures and practices are employed for work adjacent to trees in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.23.1 Construction management.

PO26 Landscape design optimises water and energy efficiency and responds appropriately to local conditions, by: (a) maximising the exposure to the prevailing summer breezes and the north-east winter morning sun; (b) minimising exposure to the prevailing winter winds and western summer sun; and (c) optimising shade to create useable and comfortable areas; (d) hydro-zoning planting.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space.
PO27 Planting bed profiles and edging encourage plant viability, reduce erosion, control weed invasion, provide adequate water infiltration and ease of maintenance to support long-term plant viability and vigorous growth.	**AO27** Planting beds are designed in accordance with the Development manual planning scheme policy no. 6.4 - SC6.4.12 Landscaping and Open Space.
PO28 Landscape buffering and species selection is consistent and compatible with any ecological values on or adjoining the site.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space.
PO29 Landscaping elements are provided within parking areas, along driveways and internal roadways to provide adequate shading, and safe and legible parking areas.	**AO29** Landscaping is provided in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space.

Table 9.3.3.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Safety	
PO30 Landscape design enhances community safety and reduces the potential for crime and antisocial behaviour. **Editor's note—**Applicants may find useful guidance in the Queensland Government's Crime Prevention through Environmental Design Guidelines for Queensland.	**AO30.1** Access to a site, parking area, buildings or public open space is well lit, free from obstructions and clearly defined by landscape treatments.
	AO30.2 Trees with a minimum 1.8m of clear trunk (at maturity) are located along pathways, at building entries, within parking areas, on street corners, adjacent to street lighting and along driveways. Garden beds within the aforementioned areas consist of low shrubs and groundcovers that do not exceed 750mm in height.
	AO30.3 Any solid wall or semi permeable fence is protected from graffiti through means of vertical landscaping or vandal resistant paint or artwork.
PO31 Where appropriate and practicable, all elements of the landscape design are safe and provide accessibility for all abilities.	**AO31.1** Paving material, tactile indicators and construction complies with AS1428 - Design for Access and Mobility.
	AO31.2 Pavement material or treatment clearly delineates between pedestrian and vehicular movement systems through contrasting materials, colours or level changes.

	AO31.3 Hard landscaping materials are not highly reflective, or likely to create glare, slipperiness or other hazardous conditions.

9.3.4 Reconfiguring a lot code

9.3.4.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment for reconfiguring a lot.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

9.3.4.2 Purpose

(1) The purpose of the reconfiguring a lot code is to:

(a) facilitate the creation of attractive, accessible and functional neighbourhoods and districts, and a well-integrated, compact and sustainable city form; and

(b) protect the productive capacity, landscape character and ecological and physical functions of Townsville's diverse natural resources.

(2) The purpose of the code will be achieved through the following overall outcomes:

(a) lot reconfiguration creates safe, convenient, functionally efficient and attractive neighbourhoods and districts that are consistent with the intended character of the area;

(b) lot reconfiguration creates walkable residential neighbourhoods and centres, and accessible community facilities and employment opportunities;

(c) lot reconfiguration is responsive to the local environment, including topography, natural drainage systems, vegetation and habitat, cultural heritage features, streetscape character, landmarks, views and vistas;

(d) lot reconfiguration near infrastructure corridors and other major facilities ensures that sensitive land uses are protected from activities generating amenity impacts;

Editor's note—Applicants will also need to have regard to the relevant overlays dealing with natural hazards, including bushfire, landslide, storm surge, coastal erosion and flooding.

(e) lot reconfiguration assists in protecting areas containing important ecological values or providing important environmental services;

(f) lot reconfiguration does not facilitate fragmentation or alienation of land that would prejudice the productive use of rural land resources;

(g) lot reconfiguration facilitates compatible relationships between different land uses and with the natural environment;

(h) lot design and lot sizes are suited to the intended use of the land having regard to the ability to accommodate buildings, vehicle access, parking, on-site services and open space;

(i) lot orientation facilitates the conservation of non-renewable energy sources and the siting of buildings that is appropriate for the local climatic conditions;

(j) infrastructure is supplied to all lots in a safe, efficient, coordinated and sequenced manner, which minimises whole of life cycle costs and is sensitive to the environment in which they are provided;

(k) the street system provides for high levels of permeability and safety for all users and in particular, facilitates high levels of accessibility by public transport, walking and cycling; and

(l) public open space is attractive and accessible and equitably meets user requirements for recreational, social and cultural activities.

9.3.4.3 Assessment benchmarks

Table 9.3.4.3(a)-Assessable development (Part)

Editor's note—In order to demonstrate compliance with this code, council may request the preparation of a structure plan for the locality, which may include land external to the site. This is likely where the proposed development involves more than 5 lots or the construction of a new road. The structure plan should be prepared in accordance with the guidance provided in the Emerging community planning scheme policy no. SC6.6. Such a plan may form the basis of a preliminary approval for development in an area.

Editor's note—Applicants should also have regard to Crime Prevention through Environmental Design Guidelines for Queensland when addressing relevant sections of the code.

Performance outcomes	Acceptable outcomes
General design elements	
PO1 The layout of roads, streets, lots and infrastructure avoids or minimises impacts on environmental features of the locality by: (a) following the natural topography and minimising earthworks; (b) avoiding crossing or otherwise fragmenting waterways, wetlands, habitat areas or ecological corridors; (c) maintaining natural drainage features and hydrological regimes; and (d) maintaining important ecological corridors and habitat areas.	No acceptable outcome is nominated.
PO2 The development is well integrated with the surrounding locality, having regard to: (a) the layout of, and connections to, surrounding roads, streets, pedestrian and cycle networks and other infrastructure networks; (b) open space networks, habitat areas or corridors; (c) connections to centres and employment areas; (d) opportunities for shared use of public facilities; (e) surrounding landscaping and streetscape treatments; and (f) the interface between incompatible land uses.	No acceptable outcome is nominated. **Editor's note—**The Development manual planning scheme policy no. SC6.4 provides applicants with guidance and additional information.
PO3 The design of urban street blocks encourages walking.	No acceptable outcome is nominated. **Editor's note—**Applicants may refer to Figure 16-3 in Complete Streets: Guidelines for urban street design to assist in compliance with this performance outcome. **Editor's note—**The Development manual planning scheme policy no. SC6.4 provides applicants with guidance and additional information.
PO4 Street blocks and lot types are generally in a grid pattern and arranged to provide: (a) an efficient development pattern that supports walking, cycling and public transport use; (b) regular shaped lots; and (c) development that is consistent with the intent of the zone.	No acceptable outcome is nominated. **Editor's note—**The Development manual planning scheme policy no. SC6.4 provides applicants with guidance and additional information.
PO5 New development optimises views and physical connections to important landscape features to enhance legibility and sense of place.	No acceptable outcome is nominated.

PO6 Reconfiguring a lot does not facilitate development that would be visually obtrusive on ridgelines and prominent landscape features, or does not intensify development where already occurring on such features.	No acceptable outcome is nominated. **Editor's note—**The Development manual planning scheme policy no. SC6.4 - SC6.4.15 Steep Land Developmentprovides applicants with guidance and additional information.
PO7 Development maintains or rehabilitates vegetated buffers to coastal waters where practicable.	No acceptable outcome is nominated.
PO8 Where a reconfiguration involves the creation of a new road or street (other than in the Rural zone), streetscape and landscape treatments are provided that: (a) create an attractive and legible environment which establishes character and identity; (b) enhance safety and comfort, and meet user needs; (c) complement the function of the street in which they are located by reinforcing desired traffic speed and behaviour; (d) support safe pedestrian and cycling movement; (e) maximise infiltration of stormwater runoff wherever practicable; and (f) minimise maintenance and whole of lifecycle costs.	No acceptable outcome is nominated. **Editor's note—**The Development manual planning scheme policy no. SC6.4 provides applicants with guidance and additional information.

Table 9.3.4.3(a)-Assessable development (Part)

Performance outcomes	Acceptable outcomes
Parks and open space **Editor's note—**Where acceptable outcomes are set out in this section, it is acknowledged that they may primarily be practicable in greenfield developments. Alternative outcomes are likely to be appropriate in existing developed areas. This may include works and embellishment to existing parks or recreational corridors to meet the development's demand, or as part of an infrastructure partnership agreement. **Editor's note—**The Development manual planning scheme policy SC6.4 - SC6.4.12 Landscaping and Open Space provides applicants with guidance and additional information regarding parks and open space.	
PO9 Reconfiguration facilitates the provision of a hierarchy of open space at local, district and regional levels that: (a) contributes to the legibility and character of the neighbourhood; (b) is linked to existing parkland or open space networks wherever possible; (c) meets the community's needs and is designed to maximise use by the community it serves; and (d) offer a broad range of informal and formal experiences to the community.	No acceptable outcome is nominated. **Editor's note—**The Local government infrastructure plan identifies desired standards of service for trunk open space infrastructure. Trunk infrastructure does not include local recreational parks.

PO10 Within residential areas, local recreation parks are created which provide informal recreational opportunities to supplement private open space of the neighbourhood.	**AO10.1** Local recreational parks are provided at a rate of 1ha per 1,000 people.
	AO10.2 Local recreational parks are provided at a maximum distance of 400m from the residents they serve.
PO11 Local recreational parks are of a sufficient size, shape and topography to accommodate a usable activity area, accommodating recreational facilities that meet local needs for a range of age cohorts, such as play equipment, kick-about areas, picnic areas, seating and the like. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space to assist in complying with this outcome.	**AO11.1** Local recreational parks have a minimum usable activity area of 0.5ha.
	AO11.2 Parks are square to rectangular with the ratio of dimensions no greater than 2:1.
	AO11.3 At least 80% of the park has a grade of no more than 1:10.
PO12 Local recreational parks are located and designed to maximise accessibility and to ensure a majority of the park has good casual surveillance established through overlooking from adjacent land uses.	**AO12** At least 50% of the perimeter of the park has a direct road frontage.
PO13 Local recreational parks are provided with a reasonable level of flood immunity such that community space remains available during most flood events.	**AO13** At least 10% of the park area is above the 2% AEP and embellishments, including play equipment, shelters and shared pathways are constructed above the 2% AEP flood level.
PO14 Parkland is safe and secure, with a clear relationship between the public realm and adjoining land uses through treatment including alignment, fencing, public lighting and landscaping.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space to assist in complying with this outcome.
PO15 Design and embellishments of local recreational parks: (a) reflect the likely demographic needs of the local community which the park services; (b) complement those in nearby parks, increasing the range of facilities available to the community; and (c) are fit for purpose.	**AO15** The design and embellishments of local recreational parks is undertaken in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space.
PO16 Local recreational parks are to provide pathway connections to the on-street verge pathway network and pathways are provided to connect to activity areas within the park.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy SC6.4 - SC6.4.12 Landscaping and Open Space to assist in complying with this outcome.

Table 9.3.4.3(a)-Assessable development (Part)

Performance outcomes	Acceptable outcomes
Climatic response	
PO17 Road, street and lot orientation and lot size facilitate development that conserves non-renewable energy sources and enhances climate responsiveness by: (a) optimising a generally north-south orientation for the long axis of street blocks, or where east-west orientation is unavoidable, proportioning lots to allow for appropriate building orientation; and (b) creating lots that are generally rectangular in shape.	No acceptable outcome is nominated.
PO18 Road, street and lot orientation and lot size are responsive to north east prevailing winds and facilitates air permeability.	**AO18.1** Where practicable, parallel side boundaries are staggered. Figure 9.3 — Staggered parallel boundaries illustrates.
	AO18.2 The layout does not create more than three small lots, solid fencing or other barriers perpendicular to the target winds. OR **AO18.3** Where barriers exist perpendicular to target winds, the distance between a down-wind barrier or receptor and the up-wind barrier is not less than 7 times the height of the upwind barrier. Figure 9.4 — Airflow and barriers illustrates. **Editor's note—**Research has shown that long horizontal barriers perpendicular to airflow, such as solid fencing or continuous building lines, attenuates airflow for a horizontal distance of seven times the height of the barrier. Where a second barrier occurs airflow continues to 'skim' and does not return to the unimpeded pattern for the same seven-times height distance.
	AO18.4 Where they are proposed, built to boundary walls are located on the west-southwest boundary of lots, except where these boundaries are on the higher side of a sloping lot.

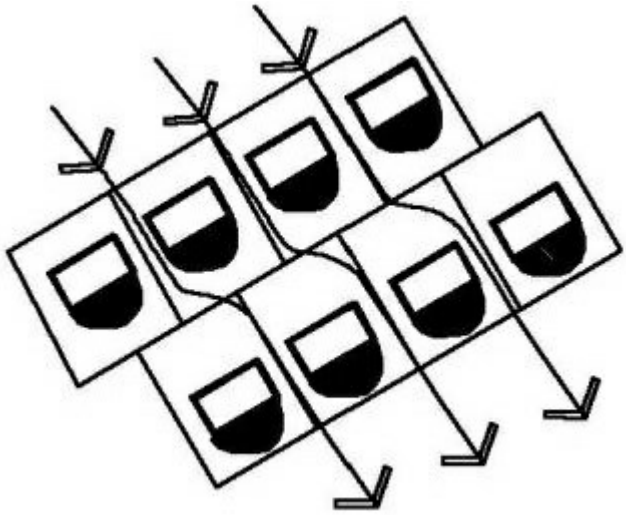


Figure 9.3 - Staggered parallel boundaries

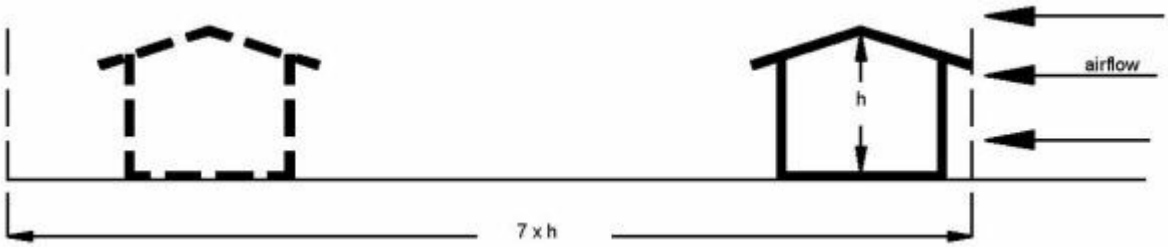


Figure 9.4 - Airflow and barriers

Table 9.3.4.3(a)-Assessable development (Part)

Performance outcomes	Acceptable outcomes
Development near infrastructure corridors and other major facilities	
PO19 Reconfiguration within 100m of any high pressure gas pipeline does not: (a) increase the number of lots; (b) affect the long-term operation of the pipeline; and (c) put at risk the safety and lives of people or the safety of property.	No acceptable outcome is nominated.
PO20 Lots are designed and oriented to: (a) minimise the visual exposure of electricity transmission lines; (b) facilitate a substantive vegetated buffer adjoining electricity transmission line easements; and (c) ensure habitable buildings and recreation areas are well separated from electricity transmission line easements.	**AO20.1** Where on land that includes or adjoins a high voltage electricity easement (above 33kV), lot design and layout incorporates: (a) a vegetated buffer within a distance of 20m from the boundary of the electricity transmission line easement; and (b) the orientation of the primary lot frontage away from transmission line easement.
	AO20.2 Lots are designed and oriented to ensure that a habitable building or primary open space areas on each lot can comply with the separation distance set out in Table 9.3.4.3(b).

PO21 Reconfiguration ensures an appropriate level of amenity and safety is achieved for residential and other sensitive land uses through appropriate separation and buffering from nearby incompatible uses, including Department of Defence landholdings, major hazard facilities, intensive animal industries, major sport, recreation and entertainment facilities, sewerage, water and waste treatment and disposal facilities and industrial areas. The continued safe and efficient operation of these types of facilities is protected. **Editor's note—**A report by a suitably qualified person may be required to allow an assessment to be made of the potential environmental impacts of or affecting the proposed reconfiguration. Council recommends that applicants seeking approval for lots potentially affected by intensive animal industries refer tothe *Reference Manual for the Establishment and Operation or Beef Cattle Feedlots in Queensland, Queensland Dairy Farming Environmental Code of Practice, Environmental Code of Practice for Queensland Piggeries* and *Best Practice Technical Guide for the Meat Chicken Industry* and that applicants consult with Primary Industries and Fisheries prior to the lodgment of a development application. For other uses council may require a study that, amongst other matters, identifies how the development is in accordance with *Environmental Protection (Air) Policy 2008* or *Environmental Protection (Noise) Policy 2008*. **Editor's note—**Applicants may be required to prepare a Noise impact assessment as outlined in the Development manual planning scheme policy no. SC6.4 - SC6.4.19 Noise and Vibration.	No acceptable outcome is nominated.
PO22 Reconfiguration of land potentially affected by the impacts of a transport corridor or other noise generating activities ensures the development is designed to facilitate adequate noise management. **Editor's note—**Applicants may be required to prepare a Noise impact assessment in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.19 Noise and Vibration.	No acceptable outcome is nominated.
PO23 Where they are used, noise attenuation measures are: (a) compatible with the local streetscape and do not preclude the creation of active street frontages where desired; (b) durable and easily maintained; and (c) are designed to discourage crime and antisocial behaviour, having regard to: (i) opportunities for graffiti; (ii) provision of casual surveillance of public open space and movement networks; and (iii) opportunities for concealments or vandalism.	No acceptable outcome is nominated.

PO24 Reconfiguration does not result in lots being subject to adverse air quality impacts. **Editor's note—**A report by a qualified air quality expert may be required to allow an assessment to be made of the air quality or impacts. The Queensland Odour Impact Assessment Guidelines provides a methodology for assessing impact.	No acceptable outcome is nominated.

Table 9.3.4.3(a)-Assessable development (Part)

Performance outcomes	Acceptable outcomes
Services	
PO25 Services, including water supply, stormwater drainage management, sewerage infrastructure, reticulated gas, public lighting, waste disposal, electricity and telecommunications, are provided in a manner that: (a) is efficient; (b) is adaptable to allow for future infrastructure upgrades; (c) minimises risk of adverse environmental or amenity-related impacts; (d) promotes total water cycle management, the efficient use of water resources and the protection of environmental values and water quality objectives of receiving waters; and (e) minimises whole of life cycle costs for that infrastructure. **Editor's note—**The environmental values and water quality objectives are established under the *Environment Protection Policy (2009)*. For Townsville, they are specified in the Ross River Basin Environmental Values and Water Quality Objectives 2012 and Black River Basin Environmental Values and Water Quality Objectives (2012).	No acceptable outcome is nominated. **Editor's note—**Section 9.3.2 Healthy waters code, Section 9.3.6 Works code and the Development manual planning scheme policy SC6.4, set out standards for the design and construction of services.

Table 9.3.4.3(a)-Assessable development (Part)

Performance outcomes	Acceptable outcomes
Lot sizes and design	
PO26 Reconfiguration creates lot sizes that: (a) are consistent with the intended character of the zone, precinct or sub-precinct in which the land is located; (b) do not compromise the future development potential of land in the Emerging community zone for urban purposes; (c) are sufficient to protect the productive capacity, environmental and landscape values of rural land resources; (d) are sufficient to protect ground and surface water quality in the Rural residential zone; and (e) are sufficient to protect areas with significant ecological values.	**AO26** Minimum lot size is in accordance with Table 9.3.4.3(c).
PO27 Lots have regular shape and dimensions to facilitate the efficient development of the land for its intended purpose, and have sufficient area to provide for: (a) buildings and structures appropriate to the zone, precinct or sub-precinct; (b) adequate usable open space and landscaping; (c) ventilation and sunlight; (d) privacy for residents; (e) suitable vehicle access and on-site parking where required; and (f) any required on-site services and infrastructure such as effluent disposal areas.	**AO27** The dimensions of lots are in accordance with Table 9.3.4.3(c).
PO28 Where rear lots are created, they: (a) provide for an appropriate level of amenity; (b) incorporate direct access of a sufficient width for the use of the lot; and (c) ensure infrastructure services to the lot can be easily constructed, monitored and maintained. **Editor's note—** Applicants should also address any performance outcomes of the relevant zone code which may affect whether rear lots are appropriate.	**AO28.1** Only one rear lot is provided behind each standard lot. **AO28.2** No more than two rear lot access strips directly adjoin each other. **AO28.3** No more than two rear lots gain access from the head of a cul-de-sac. **AO28.4** Where a rear lot is proposed in a residential zone, a square building envelope with sides of 17m is capable of being contained entirely within the lot.

	AO28.5 An access strip for a rear lot has a minimum width of: (a) 8m in a rural or rural residential zone for access lengths up to 50m and greater than 50m, 15m width; or (b) 3.5m in urban residential zones; or (c) 8m in an industry zone; or (d) in any other zone, no acceptable outcome is nominated.
	AO28.6 A passing bay is provided for access strips greater than 30m in length.
PO29 Realignment of boundaries in the Rural zone only occurs where this contributes to: (a) a reduction in the number of lots or level of fragmentation in the zone; or (b) potential for improved land management practices; or (c) improved protection and management of significant ecological values.	No acceptable outcome is nominated.

Table 9.3.4.3(a)-Assessable development (Part)

Performance outcomes	Acceptable outcomes
Movement network design **Editor's note**—The Transport impact, access and parking code and the Development manual planning scheme policy no. SC6.4 sets out other requirements relating to movement network design.	
PO30 The movement network has a legible structure, with roads and streets that conform to their function in the network, having regard to: (a) traffic volumes, vehicle speeds and driver behaviour; (b) on street parking; (c) sight distance; (d) provision for public transport routes and stops; (e) provision for pedestrian and cyclist movement, prioritising these where appropriate; (f) provision for waste collection and emergency vehicles; (g) lot access; (h) convenience; (i) public safety; (j) amenity; (k) the incorporation of public utilities and drainage; and (l) landscaping and street furniture.	No acceptable outcome is nominated. **Editor's note—**The outcomes of a Traffic impact assessment report undertaken as per the Development manual planning scheme policy no.SC6.4.5.2 Traffic Impact Assessment (TIA) will assist in informing the movement network design. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4-SC6.4.5.3 Public Transport Facilities; SC6.4.5.4 Car Parking; SC6.4.22 Waste Management; SC6.4.5.1 Townsville Road Hierarchy; SC6.4.6.1 Geometric Road Design; SC6.4.12 Landscaping and Open Space; SC6.4.10.2 Water Sensitive Urban Design; SC6.4.14.2 Public Lighting (Urban, Urban Residential and Rural); SC6.4.14.3 Utility Services; and SC6.4.9 Stormwater Quantity to assist in complying with this outcome.

PO31 The road and street network provides for convenient and safe movement between local streets and higher order roads.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.5.1 Townsville Road Hierarchy, SC6.4.6.1 Geometric Road Design and SC6.4.5.2 Traffic Impact Assessment (TIA) to assist and comply with this outcome.
PO32 A cul—de—sac is not included in the road and street design unless no other practical options exist.	No acceptable outcome is nominated.
PO33 Local streets do not operate as through traffic routes for externally generated traffic (other than for pedestrians, cyclists and public transport).	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.6.1 Geometric Road Design, SC6.4.5.1 Townsville Road Hierarchy, and SC6.4.5.2 Traffic Impact Assessment (TIA) to assist and comply with this outcome.
PO34 Safe, convenient and efficient intersections are provided for vehicles, pedestrians, cyclists and public transport.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.6.1 Geometric Road Design, SC6.4.5.1 Townsville Road Hierarchy, and SC6.4.5.2 Traffic Impact Assessment (TIA) to assist and comply with this outcome.
PO35 Access arrangements for lots do not affect the function, vehicle speeds, safety, efficiency and capacity of streets and roads.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.6.1 Geometric Road Design, SC6.4.5.1 Townsville Road Hierarchy, and SC6.4.5.2 Traffic Impact Assessment (TIA) to assist and comply with this outcome.
PO36 Rear lanes are designed to: (a) provide enough width to enable safe vehicle movement, including service vehicles; (b) connect to other streets at both ends; (c) enable safe access into and out of garages without using doors that open into the lane; (d) not create a more direct through-route alternative for vehicles, cyclists or pedestrians than the adjoining street network; (e) ensure rear yards of properties can be fenced for security; (f) ensure any rear boundary treatment or tree planting does not create concealed recesses, obstructed access or allow uninvited access opportunities into rear yards; and (g) not provide for visitor parking within the lane.	**AO36** Rear lanes are designed and provided in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.21 Rear Lanes.
PO37 Reconfigurations, where involving a frontage to an existing or historical rear lane are designed to not diminish the character of the rear lane.	**AO37.1** Lots have primary frontage to a street or road, other than rear lane.
	AO37.2 Development is undertaken in accordance with the Development manual planning scheme policy SC6.4 - SC6.4.21 Rear Lanes.

Table 9.3.4.3(a)—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Road design **Editor's note—**The Transport impact, access and parking code sets out other requirements relating to road design.	
PO38 The geometric design features of each type of road: (a) convey its primary function for all relevant design vehicle types; (b) have an adequate horizontal and vertical alignment that is not conducive to excessive speeds; (c) encourage traffic speeds and volumes to levels commensurate with road hierarchy function; (d) ensure unhindered access by emergency and waste collection vehicles and buses; (e) ensures safe access to lots; (f) ensure design has regard and includes treatment to address the function, the necessary legibility and place making to support adjoining land uses; and (g) accommodate appropriate bicycle, pedestrian and shared paths.	**AO38** Roads are designed in accordance with the standards identified in Development manual planning scheme policy no. SC6.4 — SC6.4.6.1 Geometric Road Design, SC6.4.5.1 Townsville Road Hierarchy, SC6.4.5.2 Traffic Impact Assessments (TIA), SC6.4.22 Waste Management and SC6.4.3 Standard Drawings.

Table 9.3.4.3(a)—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Pedestrian and cyclist facilities	
PO39 A network of bicycle, pedestrian and shared paths is provided which encourage pedestrian activites and cycling for transportation and recreational purposes and that links open space networks, employment areas and community facilities, including public transport stops, activity centres and schools, and is designed having regard to: (a) topography; (b) cyclist and pedestrian safety; (c) cost effectiveness and maintenance costs; (d) likely user volumes and types; (e) convenience, including end of trip facilities; and (f) accessibility, including public lighting, signage and pavement making.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.6.1 Geometric Road Design, SC6.4.5.1 Townsville Road Hierarchy, and SC6.4.5.2 Traffic Impact Assessment (TIA)to assist in complying with this outcome.

PO40 The alignment of pedestrian paths and cycleways is designed so that they: (a) allow for the retention of trees and other significant features; (b) maximise the visual interest provided by views and landmarks where they exist; (c) do not compromise the operation of or access to other infrastructure services; and (d) minimise potential conflict points with vehicles.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4 for additional information to assist in achieving this outcome.
PO41 Where possible, the bicycle, pedestrian and shared path design facilitates uninterrupted movement of users and safe street crossings are provided for pedestrians and cyclists across major roads.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.5.1 Townsville Road Hierarchy, SC6.4.6.1 Geometric Road Design, and SC6.4.3 Standard Drawings to assist in complying with this outcome.

Table 9.3.4.3(a)—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Public transport	
PO42 The movement network caters for the extension of existing or future public transport routes to provide services that are convenient and accessible to the community.	**AO42** Except in the Rural zone and the Rural residential zone, at least 90% of proposed lots are within 400m walking distance from an existing or potential bus route or 500m walking distance of an identified bus stop. **Editor's note—**The outcomes of a Traffic impact assessment report undertaken as per the Development manual planning scheme policy no. SC6.4.5.2 Traffic Impact Assessment (TIA) will assist in informing the design outcomes and alignment for public transport routes. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no.SC6.4 - SC6.4.5.3 Public Transport Facilities, SC6.4.5.4 Car Parking, SC6.4.4 Active Transport Infrastructure and SC6.4.6.1 Geometric Road Design to assist in complying with this outcome.
PO43 Residential densities are optimised within walking distance of existing and potential public transport stations, where this is consistent with the intended character of the zone or precinct in which the land is located.	No acceptable outcome is nominated.

PO44 Public transport stops are located and designed to: (a) ensure adequate sight distances are available to and for passing traffic; (b) be part of the pedestrian network and allow for safe pedestrian crossing; (c) provide shelter or shade, seats, adequate lighting and timetable information; (d) be in keeping with the character of the locality; (e) be able to be overlooked from nearby buildings where in urban areas; and (f) minimise adverse impacts on the amenity of nearby dwellings.	No acceptable outcome is nominated. **Editor's note—**The outcomes of a Traffic impact assessment report undertaken as per the Development manual planning scheme policy no.SC6.4 - SC6.4.5.2 Traffic Impact Assessment (TIA) will assist in informing the design outcomes and alignment for public transport routes. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no.SC6.4 - SC6.4.5.3 Public Transport Facilities, SC6.4.5.4 Car Parking and SC6.4.4 Active Transport Infrastructure, and SC6.4.3 Standard Drawings and SC6.4.6.1 Geometric Road Design to assist in complying with this outcome.

Table 9.3.4.3(a)—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Additional requirements for volumetric subdivision	
PO45 The reconfiguration of the space above or below the surface of the land facilitates appropriate development in accordance with the intent of the zone or precinct in which the land is located or is consistent with a lawful approval that has not lapsed.	No acceptable outcome is nominated.

Table 9.3.4.3(b)-Separation distances to electricity transmission line easement for habitable building or primary open space areas

Column 1 Nominal operating voltage of the transmission line	Column 2 Separation distance – measured from the edge of the easement
Up to 132 kV	20m
275 kV and 330 kV	30m
500kV	40m

Table 9.3.4.3(c)-Minimum lot size dimensions

Zone	**Minimum Lot Size** (Exclusive of any accessway associated with a rear lot)	**Average Lot Size**	**Minimum Frontage** (other than for a rear lot)	**Minimum Depth**
Low density residential	1,000m² if in the Stables precinct	-	8m	25m
	If in the Marlow Street precinct, no acceptable outcome is nominated.	1,700m² if in the Marlow Street precinct	-	-
	400m² otherwise	-	8m	25m
Medium density residential	400m²	-	8m	25m
Character residential	500m² if In the Interwar to 1950s asymmetrical gable precinct or the Interwar gables and Queensland bungalows precinct or the Queenslanders precinct	-	8m	40m
	400m² otherwise	-	8m	25m
High density residential	800m²	-	15m	25m
Centres zones	450m²	-	8m	-
Mixed use	450m²	-	8m	-
Low impact industry	1,000m²	-	20m	50m
Medium impact industry	2,000m²	-	30m	50m
High impact industry	5,000m²	-	40m	50m
Special purpose	5,000m²	-	40m	50m
Emerging community	If in the Burdell precinct, no acceptable outcome is nominated.	-	-	-
	10ha	-	-	-
Rural	40ha if in the Horticulture precinct	-	300m	-
	If in the Mixed farming precinct: (a) 400ha if on land to which the water resource catchment overlay applies; or (b) 40ha otherwise.	-	300m	-
	400ha if in the Grazing precinct	-	300m	-
	10ha if in the Jensen precinct	-	300m	-
	10ha if in the Cungulla precinct	-	300m	-
Rural residential	4ha if on land to which the water resource catchment overlay applies	-	40m	50m
	4,000m² otherwise	-	40m	50m
Sport and recreation zone	400m² if in the Balgal Beach golf course precinct	600m² if in the Balgal Beach golf course precinct	8m	25m

	Otherwise, no acceptable outcome is nominated	-	-	-
Any other zone	No acceptable outcome is nominated	-	-	-

9.3.5 Transport impact, access and parking code

9.3.5.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

9.3.5.2 Purpose

(1) The purpose of the Transport impact, access and parking code is to ensure appropriate provision for transport and end of trip facilities, and to facilitate, as far as practicable, an environmentally sustainable transport network.

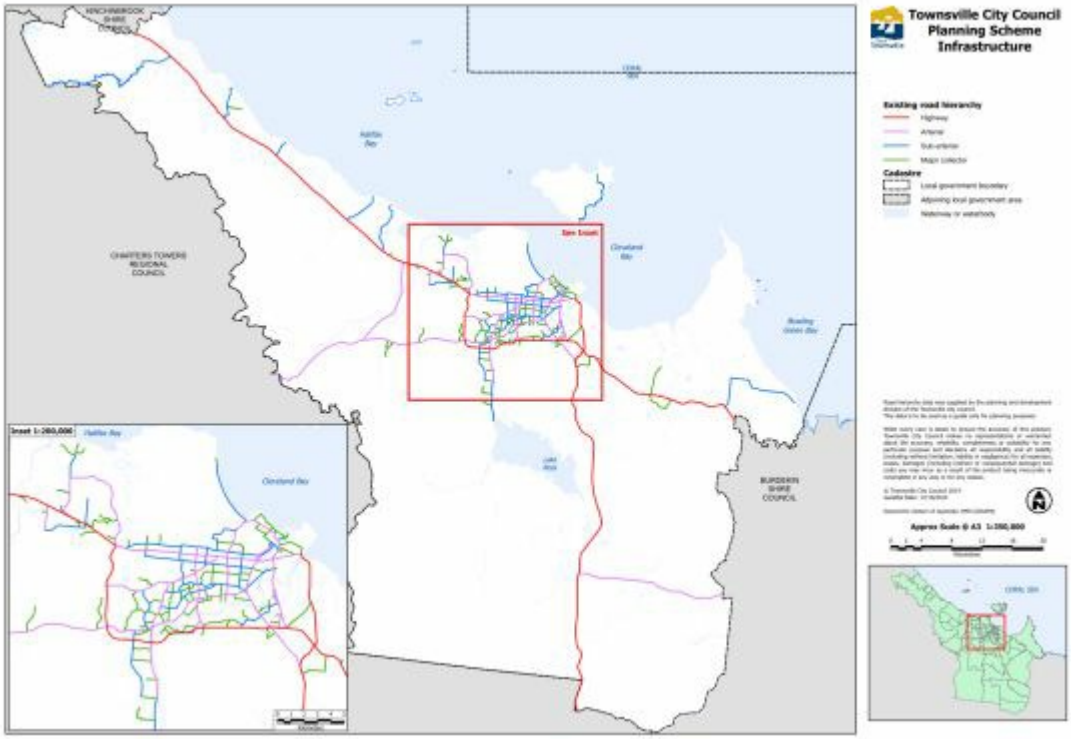
(2) The purpose of the code will be achieved through the following overall outcomes:

- (a) the function, safety and efficiency of the transport network are optimised;
- (b) pedestrians (including people with a disability) and cyclists are provided with a high level of accessibility, safety, amenity and convenience within a development site and on-site facilities are integrated with external walking and cyclist networks and public transport nodes;
- (c) the use of public transport is facilitated wherever appropriate;
- (d) access, parking, servicing and associated manoeuvring areas are designed to be safe, functional and meet the reasonable demands generated by the development;
- (e) access, parking, servicing and associated manoeuvring areas do not detract from streetscape character, and are designed to discourage crime and antisocial behaviour; and
- (f) adverse impacts on the environment and the amenity of the locality are avoided.

9.3.5.3 Assessment benchmarks

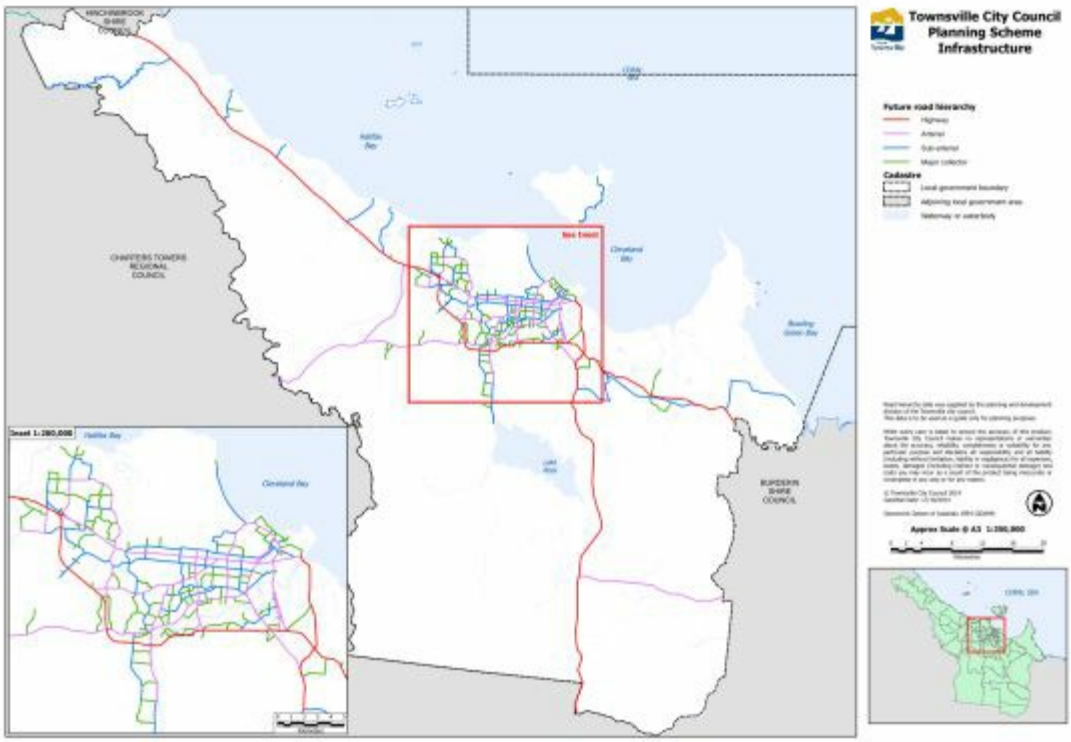
Table 9.3.5.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Transport impact **Editor's note—**Applicants should note that the Department of Transport and Main Roads may have additional requirements. **Editor's note—**Applicants should also note that a transport impact assessment may be required to demonstrate compliance with this code.	
PO1 The development is located on roads that are appropriate for the nature of traffic generated, having regard to the safety and efficiency of the transport network, and the functions and characteristics identified of the road hierarchy. The road hierarchy is shown on Figure 9.5 — Road hierarchy existing and Figure 9.6 Road Hierarchy Future	No acceptable outcome is nominated. **Editor's note—** Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.5.1 Townsville Road Hierarchy, SC6.4.6.1 Geometric Road Design and SC6.4.5.2 Traffic Impact Assessment (TIA).



Click here to view PDF high resolution map.

Figure 9.5 - Road hierarchy existing



Click here to view PDF high resolution map.

Figure 9.6 - Road hierarchy future

PO2 Development does not compromise the orderly provision or upgrading of the transport network.	No acceptable outcome is nominated. **Editor's note—** Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.5.1 Townsville Road Hierarchy, SC6.4.6.1 Geometric Road Design and SC6.4.5.2 Traffic Impact Assessment (TIA).
PO3 On-site transport network infrastructure (including roads, parking, access and public transport, pedestrian and cyclist facilities) appropriately integrates and connects with surrounding networks. **Editor's note—**To demonstrate compliance with this performance outcome with regard to pedestrian and cyclist elements, applicants may be requested to provide a walk and cycle network plan to show connections to internal and external attractions, existing and proposed walk and cycle facilities and which respond to desire lines of all users.	No acceptable outcome is nominated. **Editor's note—** Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.5.3 Public Transport Facilities, SC6.4.5.4 Car Parking, SC6.4.5.2 Traffic Impact Assessments (TIA), SC6.4.4 Active Transport Infrastructure, SC6.4.6.1 Geometric Road Designs, and SC6.4.5.1 Townsville Road Hierarchy.
PO4 As far as practicable, development is designed to encourage travel by public transport, walking and cycling.	No acceptable outcome is nominated. **Editor's note—** Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.5.3 Public Transport Facilities, SC6.4.5.4 Car Parking, SC6.4.5.2 Traffic Impact Assessments (TIA), SC6.4.4 Active Transport Infrastructure, SC6.4.6.1 Geometric Road Design, and SC6.4.5.1 Townsville Road Hierarchy.

Table 9.3.5.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Site access **Editor's note—**Local government (or other service owner) approval must be obtained before interfering with any infrastructure or undertaking works in the road reserve. In addition, be aware that the location of a driveway may be influenced by an approved plan of development that applies to the site or by the location of existing infrastructure or existing vehicle crossovers.	
PO5 Access arrangements are appropriate for: (a) the capacity of the parking area; (b) the volume, frequency and type of vehicle usage; (c) the function and characteristics of the access road and adjoining road network; and (d) the safety and efficiency of the road network.	**AO5** Access is provided in accordance with the standards identified in the Development manual planning scheme policy SC6.4 — SC6.4.5.5 Driveways, SC6.4.5.3 Public Transport Facilities and SC6.4.5.4 Car Parking. **Editor's note—** Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.5.1 Townsville Road Hierarchy and SC6.4.5.2 Traffic Impact Assessment (TIA).
PO6 Where practical, access for cyclists and pedestrians is clearly distinguished from vehicle access.	No acceptable outcome is nominated. **Editor's note—** Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.5.3 Public Transport Facilities and SC6.4.5.4 Car Parking.
PO7 Access is located and designed to provide safe and easy access to the site, having regard to its position, width and gradient.	**AO7** Access is provided in accordance with the standards identified in the Development manual planning scheme policy no. SC6.4 — SC6.4.5.5 Driveways and SC6.4.3 Standard Drawings **Editor's note—** Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.5.3 Public Transport Facilities, SC6.4.5.4 Car Parking, SC6.4.5.2 Traffic Impact Assessment (TIA) and SC6.4.5.1 Townsville Road Hierarchy.
PO8 All vehicles reasonably expected to use the site are able to travel the length of the driveway or driveway access without damage to vehicle or the driveway surface.	**AO8** Access is provided in accordance with the standards identified in the Development manual planning scheme policy no. SC6.4 — SC6.4.5.5 Driveways, SC6.4.5.3 Public Transport Facilities and SC6.4.5.4 Car Parking.

PO9 A driveway does not cause change in the level of a footpath that is unsafe or inaccessible for people with mobility difficulties.	**AO9** Access is provided in accordance with the standards identified in the Development manual planning scheme policy no. SC6.4 — SC6.4.5.5 Driveways and SC6.4.3 Standard Drawings.
PO10 Driveways are designed to withstand loadings from all vehicles reasonably expected to use the site.	**AO10** Access is provided in accordance with the standards identified in the Development manual planning scheme policy no. SC6.4 — SC6.4.5.5 Driveways.
PO11 A driveway does not allow water to pond on adjacent properties or adjacent buildings and does not allow water to enter a building or property.	**AO11** Access is provided in accordance with the standards identified in the Development manual planning scheme policy no. SC6.4 — SC6.4.5.5 Driveways.
PO12 Construction of a driveway does not damage or interfere with the location, function of or access to any services and infrastructure.	**AO12** Access is provided in accordance with the standards identified in the Development manual planning scheme policy no. SC6.4 — SC6.4.5.5 Driveways, SC6.4.5.3 Public Transport Facilities, SC6.4.5.4 Car Parking and SC6.4.3 Standard Drawings.
PO13 All vehicles reasonably expected to access the site can safely manoeuvre to allow vehicles to exit and enter in a forward motion.	**AO13** Access is provided in accordance with the standards identified in Development manual planning scheme policy no. SC6.4 - SC6.4.5.5 Driveways, SC6.4.5.3 Public Transport Facilities, SC6.4.5.4 Car Parking and SC6.4.3 Standard Drawings such that all vehicles reasonably expected to access the site, can exit and enter in a forward motion with no more than a three-point turn.

Table 9.3.5.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Pedestrian and cyclist facilities	
PO14 Provision is made for the safe and convenient movement of pedestrians on-site and connecting to the external network, having regard to desire lines, legibility, safety, topographical constraints, shading and other weather protection and equitable access arrangements.	No acceptable outcome is nominated. **Editor's note—** Applicants should refer to the Development manual planning scheme policy no.SC6.4 — SC6.4.5.3 Public Transport Facilities, SC6.4.5.4 Car Parking, SC6.4.4 Active Transport Infrastructure, SC6.4.5.1 Townsville Road Hierarchy, SC6.4.6.1 Geometric Road Design and SC6.4.12 Landscaping and Open Space to assist in complying with this outcome.
PO15 Provision is made for safe and convenient cycle movement to the site and within the site and connecting to the external network having regard to desire lines, users' needs, safety, topographical constraints and legibility. **Editor's note—**End of trip bicycle facilities will need to be provided for major development in accordance with the Queensland Development Code Mandatory Part 4.1 — Sustainable Buildings. "Major development" is defined in MP4.1.	No acceptable outcome is nominated. **Editor's note—** Applicants should refer to the Development manual planning scheme policy no. SC6.4 — SC6.4.5.3 Public Transport Facilities, SC6.4.5.4 Car Parking, SC6.4.4 Active Transport Infrastructure, SC6.4.5.1 Townsville Road Hierarchy, SC6.4.6.1 Geometric Road Design and SC6.4.12 Landscaping and Open Space to assist in complying with this outcome.

PO16 Parking areas, pathways and other elements of transport network infrastructure are designed to enhance public safety by discouraging crime and antisocial behaviour, having regard to: (a) provision of opportunities for casual surveillance; (b) provision of lighting; (c) the use of fencing to define public and private spaces, whilst allowing for appropriate sight lines; (d) minimising potential concealment points and assault locations; (e) minimising opportunities for graffiti and other vandalism; and (f) restricting unlawful access to buildings and between buildings. **Editor's note—**Crime Prevention through Environmental Design Guidelines for Queensland prepared by the State Government may provide applicants with guidance on these matters.	No acceptable outcome is nominated. **Editor's note—** Applicants should refer to the Development manual planning scheme policy no. SC6.4 — SC6.4.4 Active Transport Infrastructure, SC6.4.5.3 Public Transport Facilities, SC6.4.5.4 Car Parking, SC6.4.5.1 Townsville Road Hierarchy, SC6.4.6.1 Geometric Road Design, SC6.4.14.2 Public Lighting (Urban, Urban Residential and Rural), SC6.4.14.3 Utility Services and SC6.4.12 Landscaping and Open Space to assist in complying with this outcome.

Table 9.3.5.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Parking	
PO17 Provision is made for on-site vehicle parking to: (a) meet the demand likely to be generated by the development; and (b) avoid on street parking that would adversely impact on the safety or capacity of the road network or unduly impact on local amenity.	**AO17** Parking is provided in accordance with the standards identified in Parking rates planning scheme policy no. SC6.10. **Editor's note—** Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.5.3 Public Transport Facilities, SC6.4.5.4 Car Parking, SC6.4.5.2 Traffic Impact Assessments (TIA), SC6.4.6.1 Geometric Road Design, and SC6.4.5.1 Townsville Road Hierarchy to assist in complying with this outcome.
PO18 Parking ensures access is provided for people with disabilities.	**AO18** Parking areas are designed in accordance with the standards identified in the Development manual planning scheme policy no. SC6.4 — SC6.4.5.4 Car Parking.
PO19 Where the nature of the proposed development creates a demand, provision is made for set-down and pick-up facilities by bus, taxis or private vehicle, which: (a) are safe for pedestrians and vehicles; (b) are conveniently connected to the main component of the development by pedestrian pathway; and (c) provide for pedestrian priority and clear sight lines.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.5.3 Public Transport Facilities, SC6.4.5.4 Car Parking, SC6.4.5.2 Traffic Impact Assessments (TIA), SC6.4.6.1 Geometric Road Design, SC6.4.5.1 Townsville Road Hierarchy and SC6.4.12 Landscaping and Open Space to assist in complying with this outcome.

PO20 Parking and servicing areas are designed to: (a) be clearly defined, marked and signed; (b) be convenient and accessible; (c) minimise large unbroken areas of hardstand to the extent practicable; (d) be safe for vehicles, pedestrians and cyclists; (e) provide shading; (f) be located to encourage multi-purpose trip ends and minimise vehicle movements within the site; and (g) minimise any adverse impacts on the amenity of surrounding land.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.5.3 Public Transport Facilities, SC6.4.5.4 Car Parking, SC6.4.5.5 Driveways, SC6.4.5.2 Traffic Impact Assessments (TIA), SC6.4.6.1 Geometric Road Design, and SC6.4.12 Landscaping and Open Space.
PO21 Vehicle spaces have adequate dimensions to meet user requirements.	**AO21** Parking areas are designed in accordance with the standards identified in the Development manual planning scheme policy no. SC6.4 — SC6.4.5.3 Public Transport Facilitiesand SC6.4.5.4 Car Parking.
PO22 Pavement is constructed to an appropriate standard.	No acceptable outcome is nominated.
PO23 Parking and servicing areas are kept accessible and available for use as a parking area at all times during the normal business hours of the activity.	No acceptable outcome is nominated.
PO24 Visitor parking for accommodation activities remains accessible and useable to visitors at all times.	No acceptable outcome is nominated.
PO25 Multi-level parking areas are designed, articulated and finished to make a positive contribution to the local external streetscape character, as well as the internal user experience of the facility ensuring way finding technologies and aesthetic treatments are provided.	No acceptable outcome is nominated.

Table 9.3.5.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Servicing	
PO26 Provision is made for the on-site loading, unloading, manoeuvring and access by service vehicles that: (a) are adequate to meet the demands generated by the development; (b) are able to accommodate the design service vehicle requirements; and (c) does not unduly impede vehicular, cyclist and pedestrian safety and convenience both within the site and external to the site.	**AO26** Servicing areas are provided and designed in accordance with the standards identified in the Development manual planning scheme policy no. SC6.4 – SC6.4.5.3 Public Transport Facilities and SC6.4.5.4 Car Parking.
PO27 Refuse collection vehicles are able to safely access on-site refuse collection facilities.	**AO27** Refuse collection areas are provided and designed in accordance with the standards identified in the Development manual planning scheme policy no. SC6.4 – SC6.4.22 Waste Management, SC6.4.5.3 Public Transport Facilities and SC6.4.5.4 Car Parking.
PO28 Servicing arrangements minimise any adverse impact on the amenity of premises in the vicinity, having regard to operating hours, noise generation, proximity to sensitive uses, odour generation and dust.	No acceptable outcome is nominated.

9.3.6 Works code

9.3.6.1 Application

This code applies to development where the code is identified as applicable in the categories of development and assessment.

When using this code, reference should be made to section 5.3.2 and where applicable, section 5.3.3 located in Part 5.

9.3.6.2 Purpose

(1) The purpose of the Works code is to ensure development is provided with a level of infrastructure which maintains or enhances community health, safety and amenity and which avoids or minimises impacts on the natural environment.

(2) The purpose of the code will be achieved through the following overall outcomes:

- (a) premises are provided with a level of service which is appropriate to the intended character and function of the zone;
- (b) risk to life and property is avoided;
- (c) development does not detract from environmental values, including the quality of receiving waters;
- (d) development does not detract from the desired character and amenity of the locality;
- (e) the integrity and quality of existing infrastructure is maintained;
- (f) access, parking, streets and pedestrian and cycle paths are provided to standards that ensure safe, convenient and efficient operation of movement networks;
- (g) development facilitates an efficient provision of infrastructure and use of resources; and
- (h) whole of life cycle costs for infrastructure are minimised.

9.3.6.3 Assessment benchmarks

Accepted development subject to requirements-Access and parking

Table 9.3.6.3—Accepted development subject to requirements (Part)

Performance outcomes	Acceptable outcomes
Access and parking	
PO1 Access arrangements are appropriate for: (a) the capacity of the parking area; (b) the volume, frequency and type of vehicle usage; and (c) the function and characteristics of the access road and adjoining road network.	**AO1** Access is provided in accordance with Australian Standard AS2890.1.
PO2 Provision is made for on-site vehicle parking to meet the demand likely to be generated by the development and to avoid on street parking where that would adversely impact on the safety or capacity of the road network or unduly impact on local amenity.	**AO2.1** Parking is provided at the rates set out in Parking rates planning scheme policy no. SC6.10. OR **AO2.2** Where an existing lawful premises and involves not more than 5% or 50m^2 (whichever is the greater) of additional gross floor area, the existing number of on-site parking is retained or increased.

PO3 Parking areas are designed to: (a) be clearly defined, marked and signed; (b) be convenient and accessible; (c) be safe for vehicles, pedestrians and cyclists; and (d) provide spaces which meet the needs of people with disabilities.	**AO3.1** Parking areas are designed in accordance with Australian Standard AS2890.1. OR **AO3.2** Where an existing lawful premises and involves not more than 5% or 50m² (whichever is the greater) of additional gross floor area, the existing standard of on-site parking is maintained or improved.
PO4 Landscaping is provided to soften the visual impact of parking areas and to provide shading.	**AO4.1** Shade trees within parking areas are provided at the following rate: (a) in single sided, angle or parallel bays - 1 tree per 3 parking spaces; and (b) in double sided, angle or parallel bays - 1 tree per 6 parking spaces. **Editor's note—**The Development manual planning scheme policy no. SC6.4 - SC6.4.12 Landscaping and Open Space sets out guidance on tree species and planting standards. OR **AO4.2** Where an existing lawful premises and involves not more than 5% or 50m² (whichever is the greater) of additional gross floor area, the existing standard of landscaping is maintained or improved.
PO5 Provision is made for the onsite loading, unloading, manoeuvring and access by service vehicles that: (a) is adequate to meet the demands generated by the development; (b) is able to accommodate the design service vehicle requirements; (c) is wholly contained within the site; and (d) does not unduly impede vehicular, cyclist and pedestrian safety and convenience within the site.	**AO5.1** Servicing areas are provided and designed in accordance with Australian Standard AS2890.2. OR **AO5.2** Where an existing lawful premises and involves not more than 5% or 50m² (whichever is the greater) of additional gross floor area, the existing provision for service vehicles is maintained or improved.

Table 9.3.6.3—Accepted development subject to requirements (Part)

Performance outcomes	Acceptable outcomes
Services and utilities	
PO6 A potable water supply is provided that is adequate for the needs of the intended use.	**AO6.1** The development is connected to council's reticulated water supply system in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.11.2 Water Supply Planning and Design Guidelines and SC6.4.3 Standard Drawings. **Editor's note—**If a main exists, then an application for a water meter will be required.
	AO6.2 Water supply systems and connections are designed and constructed in accordance with Development manual planning scheme policy no. SC6.4 - SC6.4.11.2 Water Supply Planning and Design Guidelines and SC6.4.3 Standard Drawings.

PO7 Wastewater treatment and disposal is provided that is appropriate for the level of demand generated, protects public health and avoids environmental harm.	**AO7.1** The development is connected to council's reticulated sewerage system via an existing sewer connection to the site.
	AO7.2 Waste water systems and connections are designed and constructed in accordance with Development manual planning scheme policy no. SC6.4 - SC6.4.11.2 Water Supply Planning and Design Guidelines, SC6.4.11.4 Sewerage Planning and Design Guidelines and SC6.4.3 Standard Drawings.
PO8 Provision is made for waste management that is appropriate to the use, protects the health and safety of people and the environment. **Editor's note—**Applicants should also be aware that any provision for disposal of any trade waste is to be made in accordance council's Trade Waste Policy supporting the Water Act 2000, Plumbing and Drainage Act 2002 and the Standard Plumbing Regulation 2003	**AO8.1** The development provides a bin container storage area that has an imperviously sealed pad and is screened to the height of the bins.
	AO8.2 On sites in an industrial zone that are greater than 2,000m^2 in area, provision is made for refuse collection vehicles to access the collection area, undertake the collection activity and to enter and leave the site in a forward direction without having to make more than a 3 point turn.
PO9 The proposed stormwater management system or site works does not adversely affect flooding or drainage characteristics of properties that are upstream, downstream or adjacent to the development site.	**AO9.1** The development does not result in an increase in flood level or flood duration on upstream, downstream or adjacent properties.
	AO9.2 Roof and surface water is conveyed to the kerb and channel or an inter-allotment drainage system in accordance with Australian Standard AS/NZS3500.3:2003.
PO10 The drainage network has sufficient capacity to safely convey stormwater run-off from the site and development does not cause a drainage nuisance to a downstream or adjoining property.	**AO10** Post development discharge of stormwater from the subject land does not exceed predevelopment peak flows and no change to flows across a downstream or adjoining property is created.

Assessable development-Services and utilities

Table 9.3.6.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Services and utilities	
PO11 A potable water supply is provided that is adequate for the needs of the intended use.	**AO11.1** Where within an area designated for urban or rural residential development, the development is connected to council's reticulated water supply system in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.11.2 Water Supply Planning and Design Guidelines. OR **AO11.2** Otherwise, the development is provided with an on-site water supply in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.11.7 On-Site Water Supply.
	AO11.3 Water supply systems and connections are designed and constructed in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.11.2 Water Supply Planning and Design Guidelines, SC6.4.11.3 Water Supply Construction andSC6.4.3 Standard Drawings.
PO12 Wastewater treatment and disposal is provided that is appropriate for the level of demand generated, protects public health and avoids adverse impacts on environmental values.	**AO12.1** Where within an area designated for urban development, the development is connected to the council's reticulated sewerage system in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.11.2 Water Supply Planning and Design Guidelines. OR **AO12.2** Otherwise, on-site waste water treatment and disposal is provided which complies with the Development manual planning scheme policy no. SC6.4 - SC6.4.11.8 On-Site Sewerage Facilities.
	AO12.3 Waste water systems and connections are designed and constructed in accordance with the Development manual planning scheme policy no. SC6.4-SC6.4.11.2 Water Supply Planning and Design Guidelines, SC6.4.11.3 Water and Sewerage Infrastructure,SC6.4.11.5 Sewerage System Constructions and SC6.4.3 Standard Drawings.

PO13 The design and management of the development integrates water cycle elements having regard to: (a) reducing potable water demand; (b) minimising wastewater production; (c) minimising stormwater peak discharges and run-off volumes; (d) maintaining natural drainage lines and hydrological regimes as far as possible; (e) reusing stormwater and greywater is encouraged where public safety and amenity will not be compromised; and (f) efficient use of water.	**AO13** Integrated water management practices and infrastructure are implemented in accordance with Development manual planning scheme policy no. SC6.4 - SC6.4.10 Stormwater Quality and SC6.4.10.2 Water Sensitive Urban Design.
PO14 The development is provided with an adequate energy supply which maintains acceptable standards of public health, safety, environmental quality and amenity.	**AO14** For other than the Rural zone, premises are serviced by: (a) an underground electricity supply approved by the relevant energy authority; or (b) an overhead supply approved by the relevant energy authority where in the Rural residential zone, Special purpose zone or High impact industry zone or where on a lot of less than 2,500m^2 within an area where the existing supply is overhead. **Editor's note—**Applicants should also have regard to the Development manual planning scheme policy no. SC6.4 - SC6.4.14.2 Public Lighting (Urban, Urban Residential and Rural) and SC6.4.12.3 Utility Services.
PO15 Premises are connected to a telecommunications service approved by the relevant authority.	**AO15** The development is connected to telecommunications infrastructure in accordance with the standards of the relevant regulatory authority. **Editor's note—**The Development manual planning scheme policy no. SC6.4 - SC6.4.14.2 Public Lighting (Urban, Urban Residential and Rural) and SC6.4.14.3 Utility Services provides additional information regarding the supply of telecommunications.
PO16 Provision is made for future telecommunications services (for example fibre optic cable).	No acceptable outcome is nominated.
PO17 Where available, provision is made for reticulated gas.	**AO17** Design and provision of reticulated gas is undertaken in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.14.2 Public Lighting (Urban, Urban Residential and Rural). **Editor's note—**Applicants should also have regard to the metering requirements of other relevant authorities.
PO18 Adequate access is provided to public services and utilities for future maintenance.	No acceptable outcome is nominated. **Editor's note—**The Development manual planning scheme policy no. SC6.4 provides additional information and requirements for applicants, including when council will require easements over public services and utilities.

Table 9.3.6.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Earthworks **Editor's note—**Applicants should be aware that some retaining walls constitute building works that are assessable under the *Building Regulation 2006*. No approval is required under the *Building Regulation 2006* for retaining walls if: (a) there is no surcharge loading; and (b) the height of wall or height of fill or excavation is not more than 1m; and (c) the wall is no closer than 1.5m to a building, structure (e.g. a swimming pool) or other retaining wall. In these cases, the "applicable code" for the purposes of the Act is the Building Code of Australia (refer to BCA Volume 2, Part 3.1.1). Retaining walls not more than 1m in height may be constructed in accordance with an accepted industry standard publication (e.g. timber, concrete masonry or similar). **Editor's note—**Applicants should note that council may request the submission of an engineering report undertaken by suitably qualified engineer to demonstrate compliance with the performance outcomes, particularly where alternative solutions are proposed.	
PO19 Filling and excavation does not result in contamination of land or pose a health and safety risk.	**AO19** Filling and excavation does not: (a) use contaminated materials as fill; (b) excavate contaminated material; and (c) use waste material as fill. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no. SC6.4 - SC6.4.7.4 Earthworks Construction and SC6.4.23.1 Construction Management.
PO20 Earthworks result in stable landforms and structures.	**AO20** Earthworks and the construction of retaining walls and batters are undertaken in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.7.3 Earthworks Design and SC6.4.7.4 Earthworks Construction.
PO21 Earthworks are undertaken in a manner that: (a) maintains natural landforms as far as possible; and (b) minimises height of retaining walls and batter faces.	**AO21.1** Earthworks are undertaken in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.7.3 Earthworks Design and SC6.4.7.4 Earthworks Construction. **AO21.2** Retaining walls are designed and constructed: (a) certified as stable by a Registered Professional Engineer of Queensland; and (b) have a combined height of retaining wall and fence of not more than 2 metres.
PO22 Earthworks do not unduly impact on amenity or privacy for occupants of the site or on adjoining land.	No acceptable outcome is nominated.
PO23 Earthworks do not cause environmental harm.	No acceptable outcome is nominated.
PO24 Filling or excavation does not worsen any flooding or drainage problems on the site or on neighbouring properties.	**AO24** Earthworks are undertaken in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.7.3 Earthworks Design and SC6.4.7.4 Earthworks Construction.

PO25 Any structure used to restrain fill or excavation does not worsen drainage problems or cause surface water to be a nuisance to neighbouring properties.	**AO25** Earthworks are undertaken in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.7.3 Earthworks Design and SC6.4.7.4 Earthworks Construction.
PO26 Filling or excavation does not adversely affect sewer, stormwater or water utility infrastructure or access to them for maintenance purposes.	**AO26** Earthworks are undertaken in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.7.3 Earthworks Design and SC6.4.7.4 Earthworks Construction.
PO27 Filling or excavation does not prevent or create difficult access to any property.	**AO27** Earthworks a re undertaken in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.7.3 Earthworks Design and SC6.4.7.4 Earthworks Construction.
PO28 Earthworks do not cause significant impacts through truck movements, dust or noise on the amenity of the locality in which the works are undertaken or along routes taken to transport the material and the transportation of materials minimises adverse impacts on the road network.	**AO28** Earthworks are undertaken in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.7.4 Earthworks Construction and SC6.4.23.1 Construction Management.

Table 9.3.6.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Movement networks	
PO29 The following are provided along the full extent of the road frontage and to a standard that is appropriate to the function of the road or street and the character of the locality: (a) paved roadway; (b) appropriate pavement edging (including kerb and channel); (c) pedestrian paths and cycleways; (d) streetscaping and street tree planting; (e) stormwater drainage; (f) street lighting systems; and (g) conduits to facilitate the provision of and other utility services.	**AO29** Design and construction of external road works are undertaken in accordance with the Development manual planning scheme policy no. SC6.4. **Editor's note—**Applicants should have regard to the following sub-sections of the Development manual planning scheme policy no. SC6.4 - SC6.4.14.2 Public Lighting (Urban, Urban Residential and Rural); SC6.4.14.3 Utility Services; SC6.4.9 Stormwater Quantity; SC6.4.10 Stormwater Quality; SC6.4.4 Active Transport Infrastructure; SC6.4.12 Landscaping and Open Space; SC6.4.6.1 Geometric Road Design; SC6.4.20.1 Footpath Treatment Policy; and SC6.4.23 Construction Management, Quality Management, Inspection and Testing.

PO30 Provision is made in the road reserve for streetscaping, pedestrians and cyclists in a manner consistent with: (a) the current and projected level of usage; (b) the desired streetscape character; and (c) activities which are anticipated to occur within the verge.	**AO30** Streetscaping works, footpaths and cycle paths are provided in accordance with Development manual planning scheme policy no. SC6.4. **Editor's note—**Applicants should have regard to the following sub-sections of the Development manual planning scheme policy no. SC6.4 -SC6.4.20.1 Footpath Treatment Policy; SC6.4.6.1 Geometric Road Design; SC6.4.5.1 Townsville Road Hierarchy; SC6.4.4 Active Transport Infrastructure; SC6.4.12 Landscaping and Open Space; SC6.4.14.2 Public Lighting (Urban, Urban Residential and Rural); and SC6.4.14.3 Utility Services in demonstrating compliance.
PO31 Parking areas are designed and constructed in a manner that is sufficiently durable for the intended function, maintains all weather access and ensures the safe passage of vehicles, pedestrians and cyclists.	**AO31** Parking area design and construction is undertaken in accordance with the Development manual planning scheme policy no. SC6.4 — SC6.4.5.3 Public Transport Facilities and SC6.4.5.4 Car Parking.
PO32 Movement networks can be easily and efficiently maintained.	**AO32** Infrastructure is provided in accordance with the Development manual planning scheme policy no. SC6.4 — SC6.4.6.1 Geometric Road Design, SC6.4.5.1 Townsville Road Hierarchy and SC6.4.5.2 Traffic Impact Assessment (TIA).

Table 9.3.6.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Waste management	
PO33 Development provides adequate waste management facilities on site for the storage of waste and recyclable material in a manner which: (a) is of adequate size to accommodate the expected amount of refuse to be generated by the use; (b) is in a position that is conveniently accessible for collection at all times; (c) is able to be kept in a clean, safe and hygienic state at all times; and (d) minimises the potential for environmental harm, environmental nuisance and adverse amenity impacts.	**AO33** Waste management facilities are provided in accordance with the Development manual planning scheme policy no. SC6.4 – SC6.4.22 Waste Management. **Editor's note—**Applicants may be requested to prepare a Waste management plan in accordance with the Development manual planning scheme policy no.SC6.4-SC6.4.22 Waste Management.

Table 9.3.6.3—Assessable development (Part)

Performance outcomes	Acceptable outcomes
Construction management	
PO34 Work is undertaken in a manner which does not cause unacceptable impacts on surrounding areas as a result of dust, odour, noise or lighting.	No acceptable outcome is nominated. **Editor's note**—Applicants should refer to the Development manual planning scheme policy no.SC6.4 for assistance in complying with this outcome.
PO35 While undertaking development works, the site and adjoining road are maintained in a tidy, safe and hygienic manner.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no.SC6.4 for assistance in complying with this outcome.

PO36 Traffic and parking generated during construction are managed to minimise impact on the amenity of the surrounding area.	No acceptable outcome is nominated. **Editor's note**—Applicants should refer to the Development manual planning scheme policy no.SC6.4 for assistance in complying with this outcome.
PO37 Council's infrastructure is not damaged by construction activities.	No acceptable outcome is nominated. **Editor's note—**Applicants should refer to the Development manual planning scheme policy no.SC6.4 for assistance in complying with this outcome
PO38 The integrity of new infrastructure is maintained.	No acceptable outcome in nominated. **Editor's note—**Applicants should have regard to the following sections of the Development manual planning scheme policy no. SC6.4 - SC6.4.23.1 Construction Management; and SC6.4.24 Acceptance of Completed Works in demonstrating compliance.
PO39 Construction activities and works are carried out in a manner which avoids damage to the environment, retained vegetation and impacts on fauna.	**AO39** Construction activities and works are undertaken in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.23.1 Construction Management.
PO40 Vegetation cleared from a site is disposed of in a manner that maximises reuse and recycling and minimises impacts on public health and safety.	**AO40** Construction activities and works are carried out in accordance with Development manual planning scheme policy no. SC6.4 - SC6.4.7.1 Clearing and Grubbing. **Editor's note—**Applicants shall also refer to Development manual planning scheme policy no. SC6.4 for assistance in complying with this outcome.

Part 10 Other plans

10.1 Preliminary

(1) Other plans provide the planning framework for priority development areas (PDAs) under the Economic Development Act 2012.

(2) The following are the development schemes for the PDAs:

  (a) Oonoonba Urban Development Area Development Scheme; and

  (b) Townsville City Waterfront Priority Development Area Development Scheme.

(3) Priority development area maps are included in Schedule 2 Mapping, SC6.2 Other plans maps.

10.2 Oonoonba Urban Development Area Development Scheme

The Oonoonba Urban Development Area Development Scheme was approved by the state government on 15 April 2011.

The development scheme is the planning document which will assist in the planning, carrying out, promoting, coordinating and controlling of development within the Oonoonba PDA.

All development applications within the PDA are assessed against the development scheme.

In the Oonoonba PDA, development applications are assessed by staff within the Department of Infrastructure, Local Government State Development, Infrastructure and Planning.

10.3 Townsville City Waterfront Priority Development Area Development Scheme

The Townsville City Waterfront PDA Development Scheme was approved by the state government on 23 October 2015.

The Townsville City Waterfront PDA Development Scheme is the planning document that will assist in the planning, carrying out, promoting, coordinating and controlling of development within the Townsville City Waterfront PDA.

All development applications within the PDA are assessed against the development scheme.

Development assessment for land within the Townsville City Waterfront PDA, which is strategic port land, will be managed by the Minister for Economic Development Queensland (MEDQ). For the remainder of land within the PDA, development assessment powers have been delegated by the MEDQ to Townsville City Council.

Schedule 1 Definitions

SC1.1 Use definitions

(1) Use definitions have a particular meaning for the purpose of the planning scheme.

(2) Any use not listed in Table SC1.1.2 column 1 is an undefined use.

Note—Development comprising a combination of defined uses is not considered to be an undefined use.

(3) A use listed in Table SC1.1.2 column 1 has the meaning set out beside that term in column 2.

(4) The use definitions listed here are the definitions used in this planning scheme.

(5) Column 3 of Table SC1.1.2 identifies examples of the types of activities that are consistent with the use identified in column 1.

(6) Column 4 of Table SC1.1.2 identifies examples of activities that are not consistent with the use identified in column 1.

(7) Columns 3 and 4 of Table SC1.1.2 are not exhaustive lists.

(8) Uses listed in Table SC1.1.2 columns 3 and 4 that are not listed in column 1, do not form part of the definition.

Table SC1.1.1 - Index of use definitions

- Adult store
- Agricultural supplies store
- Air services
- Animal husbandry
- Animal keeping
- Aquaculture
- Bar
- Brothel
- Bulk landscape supplies
- Caretaker's accommodation
- Car wash
- Cemetery
- Child care centre
- Club
- Community care centre
- Community residence
- Community use
- Crematorium
- Cropping
- Detention facility
- Dual occupancy
- Dwelling house
- Dwelling unit
- Educational establishment
- Emergency services
- Environment facility
- Extractive industry
- Food and drink outlet
- Function facility
- Funeral parlour
- Garden centre
- Hardware and trade supplies
- Health care services
- High impact industry
- Home based business
- Hospital
- Hotel
- Indoor sport and recreation
- Intensive animal industry
- Intensive horticulture
- Landing
- Low impact industry
- Major electricity infrastructure
- Major sport, recreation and entertainment facility
- Marine industry
- Market
- Medium impact industry
- Motor sport facility
- Multiple dwelling
- Nature-based tourism
- Nightclub entertainment facility
- Non-resident workforce accommodation
- Office
- Outdoor sales
- Outdoor sport and recreation
- Park
- Parking station
- Permanent plantation
- Place of worship
- Port services
- Relocatable home park
- Renewable energy facility
- Research and technology industry
- Residential care facility
- Resort complex
- Retirement facility
- Roadside stall
- Rooming accommodation
- Rural industry
- Rural workers' accommodation
- Sales office
- Service industry
- Service station
- Shop
- Shopping centre
- Short-term accommodation
- Showroom
- Special industry
- Substation
- Telecommunications facility
- Theatre
- Tourist attraction
- Tourist park
- Transport depot
- Utility installation
- Veterinary services
- Warehouse
- Wholesale nursery
- Winery

Table SC1.1.2 - Use definitions

Column 1 Use	Column 2 Definition	Column 3 Examples include	Column 4 Does not include the following examples
Adult store	Premises used as a shop where the primary purpose is for the display or sale of sexually explicit materials, products and devices associated with or used in a sexual practice or activity.	Sex shop	Shop, newsagent, registered pharmacist or video hire, where the primary use of these are concerned with: • the sale, display or hire of printed or recorded matter (not of a sexually explicit nature); or • the sale or display of underwear or lingerie; or • the sale or display of an article or thing primarily concerned with or used in association with a medically recognised purpose.
Agricultural supplies store	Premises used for the sale of agricultural products and supplies including agricultural chemicals and fertilisers, seeds, bulk veterinary supplies, farm clothing, saddlery, animal feed and irrigation materials.		Bulk landscape supplies, garden centre, outdoor sales, wholesale nursery
Air services	Premises used for any of the following: • the arrival and departure of aircraft; • the housing, servicing, refuelling, maintenance and repair of aircraft; • the assembly and dispersal of passengers or goods on or from an aircraft; • any ancillary activities directly serving the needs of passengers and visitors to the use; • associated training and education facilities; • aviation facilities.	Airport, airstrip, helipad, public or private airfield	
Animal husbandry	Premises used for production of animals or animal products on either native or improved pastures or vegetation. The use includes ancillary yards, stables and temporary holding facilities and the repair and servicing of machinery.	Cattle studs, grazing of livestock, non-feedlot dairying	Animal keeping, intensive animal industry, aquaculture, feedlots, piggeries

Column 1 Use	Column 2 Definition	Column 3 Examples include	Column 4 Does not include the following examples
Animal keeping	Premises used for boarding, breeding or training of animals. The use may include ancillary temporary or permanent holding facilities on the same site and ancillary repair and servicing of machinery.	Aviaries, catteries, kennels, stables, wildlife refuge	Aquaculture, cattle studs, domestic pets, feedlots, grazing of livestock, non-feedlot dairying, piggeries, poultry meat and egg production, animal husbandry
Aquaculture	Premises used for the cultivation of aquatic animals or plants in a confined area that may require the provision of food either mechanically or by hand.	Pond farms, tank systems, hatcheries, raceway system, rack and line systems, sea cages	Intensive animal industry
Bar	Premises used primarily to sell liquor for consumption on the premises and that provides for a maximum capacity to seat sixty persons at any one time. The use may include ancillary sale of food consumption on the premises and entertainment activities.		Club, hotel, nightclub entertainment facility, tavern
Brothel	Premises made available for prostitution by two or more prostitutes at the premises.		Adult store, club, nightclub entertainment facility, shop
Bulk landscape supplies	Premises used for bulk storage and sale of landscaping and gardening supplies, which may include soil, gravel, potting mix and mulch, where the majority of materials sold from the premises are not in pre-packaged form.		Garden centre, outdoor sales, wholesale nursery
Caretaker's accommodation	A dwelling provided for a caretaker of a non-residential use on the same premises.		Dwelling house
Car wash	Premises primarily used for commercially cleaning motor vehicles by an automatic or partly automatic process.		Service station
Cemetery	Premises used for interment of bodies or ashes after death.	Burial ground, crypt, columbarium, lawn cemetery, pet cemetery, mausoleum	Crematorium, funeral parlour

Column 1 Use	Column 2 Definition	Column 3 Examples include	Column 4 Does not include the following examples
Child care centre	Premises used for minding, education and care, but not residence, of children.	Crèche, early childhood centre, kindergarten, outside hours school care	Educational establishment, home based child care, family day care
Club	Premises used by persons associated for social, literary, political, sporting, athletic or other similar purposes for social interaction or entertainment. The use may include the ancillary preparation and service of food and drink.	Club house, guide and scout clubs, surf lifesaving club, RSL, bowls club	Hotel, nightclub entertainment facility, place of worship, theatre
Community care centre	Premises used to provide social support where no accommodation is provided. Medical care may be provided but is ancillary to the primary use.	Disability support services, drop in centre, respite centre, integrated Indigenous support centre	Child care centre, family day care, home based child care, health care services, residential care facility
Community residence	Any dwelling used for accommodation for a maximum of six persons who require assistance or support with daily living needs, share communal spaces and who may be unrelated. The use may include a resident support worker engaged or employed in the management of the residence.	Hospice	Dwelling house, dwelling unit, residential care facility, rooming accommodation, short-term accommodation
Community use	Premises used for providing artistic, social or cultural facilities and community support services to the public and may include the ancillary preparation and provision of food and drink.	Art gallery, community centre, community hall, library, museum	Cinema, club, hotel, nightclub, entertainment facility, place of worship
Crematorium	Premises used for the cremation or aquamation of bodies.		Cemetery
Cropping	Premises used for growing plants or plant material for commercial purposes where dependent on the cultivation of soil. The use includes harvesting and the storage and packing of produce and plants grown on the site and the ancillary repair and servicing of machinery used on the site.	Fruit, nut, vegetable and grain production, forestry for wood production, fodder and pasture production, plant fibre production, sugar cane growing, vineyard	Permanent plantations, intensive horticulture, rural industry

Column 1 **Use**	**Column 2** **Definition**	**Column 3** **Examples include**	**Column 4** **Does not include the following examples**
Detention facility	Premises used for the confinement of persons committed by a process of law.	Prison, detention centre	
Dual occupancy	Premises containing two dwellings, each for a separate household, and consisting of: • a single lot, where neither dwelling is a secondary dwelling; or • two lots sharing common property where one dwelling is located on each lot.	Duplex, two dwellings on a single lot (whether attached or not attached), two dwellings within one single community title scheme under the *Body Corporate and Community Management Act 1997*, two dwellings within the one body corporate to which the *Building Units and Group Title Act 1980* continues to apply.	Dwelling house, multiple dwelling
Dwelling house	A residential use of premises for one household that contains a single dwelling. The use includes outbuildings and works normally associated with a dwelling and may include a secondary dwelling.		Caretaker's accommodation, dual occupancy, rooming accommodation, short-term accommodation, student accommodation, multiple dwelling
Dwelling unit	A single dwelling within a premises containing non-residential use(s).	'Shop-top' apartment	Caretaker's accommodation, dwelling house
Educational establishment	Premises used for training and instruction designed to impart knowledge and develop skills. The use may include outside hours school care for students or on-site student accommodation.	Pre-preparatory, preparatory and primary school, secondary school, special education, college, university, technical institute, outdoor education centres	Child care centre, home based child care, family day care

Column 1 Use	Column 2 Definition	Column 3 Examples include	Column 4 Does not include the following examples
Emergency services	Premises used by government bodies or community organisations to provide essential emergency services, disaster management services including management support facilities for the protection of persons, property and the environment.	State emergency service facility, ambulance station, rural fire brigade, auxiliary fire and rescue station, urban fire and rescue station, police station, emergency management support facility, evacuation centres	Community use, hospital, residential care facility
Environment facility	Facilities used for the conservation, interpretation and appreciation of areas of environmental, cultural or heritage value.	Nature-based attractions, walking tracks, seating, shelters, boardwalks, observation decks, bird hides	
Extractive industry	Premises used for the extraction and/or processing of extractive resources and associated activities, including their transportation to market.	Quarry	
Food and drink outlet	Premises used for preparation and sale of food and drink to the public for consumption on or off the site. The use may include the ancillary sale of liquor for consumption on site.	Bistro, café, coffee shop, drive-through facility, kiosk, milk bar, restaurant, snack bar, take-away, tea room	Bar, club, hotel, shop, theatre, nightclub entertainment facility
Function facility	Premises used for conducting receptions or functions that may include the preparation and provision of food and liquor for consumption on site.	Conference centre, reception centre	Community use, hotel
Funeral parlour	Premises used to arrange and conduct funerals, memorial services and the like, but do not include burial or cremation. The use includes a mortuary and the storage and preparation of bodies for burial or cremation.		Cemetery, crematorium, place of worship

Column 1 Use	Column 2 Definition	Column 3 Examples include	Column 4 Does not include the following examples
Garden centre	Premises used primarily for the sale of plants and may include sale of gardening and landscape products and supplies where these are sold mainly in pre-packaged form. The use may include an ancillary food and drink outlet.	Retail plant nursery	Bulk landscape supplies, wholesale nursery, outdoor sales
Hardware and trade supplies	Premises used for the sale, display or hire of hardware and trade supplies including household fixtures, timber, tools, paint, wallpaper, plumbing supplies and the like.		Shop, showroom, outdoor sales and warehouse
Health care services	Premises for medical, paramedical, alternative therapies and general health care and treatment of persons that involves no overnight accommodation.	Dental clinics, medical centres, natural medicine practices, nursing services, physiotherapy clinic	Community care centre, hospital
High impact industry	Premises used for industrial activities that include the manufacturing, producing, processing, repairing, altering, recycling, storing, distributing, transferring or treating of products and have one or more of the following attributes: • potential for significant impacts on sensitive land uses due to offsite emissions including aerosol, fume, particle, smoke, odour and noise; • potential for significant offsite impacts in the event of fire, explosion or toxic release; • generates high traffic flows in the context of the locality or the road network; • generates a significant demand on the local infrastructure network; • the use may involve night time and outdoor activities; • on-site controls are required for emissions and dangerous goods risks.	Abattoirs, asphalt plant, concrete batching plant, boiler making and engineering and metal foundry **Note**—Additional examples may be shown in SC1.1.2 industry thresholds.	Tanneries, rendering plants, oil refineries, waste incineration, manufacturing or storing explosives, power plants, manufacturing fertilisers, service industry, low impact industry, medium impact industry, special industry
Home based business	A dwelling used for a business activity where subordinate to the residential use.	Bed and breakfast, home office, home based child care	Hobby, office, shop, warehouse, transport depot

Column 1 Use	Column 2 Definition	Column 3 Examples include	Column 4 Does not include the following examples
Hospital	Premises used for medical or surgical care or treatment of patients whether or not involving overnight accommodation. The use may include ancillary accommodation for employees and ancillary activities directly serving the needs of patients and visitors.		Health care services, residential care facility
Hotel	Premises used primarily to sell liquor for consumption. The use may include short-term accommodation, dining and entertainment activities and facilities.	Pub, tavern	Nightclub entertainment facility
Indoor sport and recreation	Premises used for leisure, sport or recreation conducted wholly or mainly indoors.	Amusement parlour, bowling alley, gymnasium, squash courts, enclosed tennis courts	Cinema, hotel, nightclub entertainment facility, theatre
Intensive animal industry	Premises used for the intensive production of animals or animal products in an enclosure that requires the provision of food and water either mechanically or by hand. The use includes the ancillary storage and packing of feed and produce.	Feedlots, piggeries, poultry and egg production	Animal husbandry, aquaculture, drought feeding, milking sheds, shearing sheds, weaning pens
Intensive horticulture	Premises used for the intensive production of plants or plant material on imported media and located within a building or structure or where outdoors, artificial lights or containers are used. The use includes the storage and packing of produce and plants grown on the subject site.	Greenhouse and shade house plant production, hydroponic farms, mushroom farms	Wholesale nursery
Landing	A structure for mooring, launching, storage and retrieval of vessels where passengers embark and disembark.	Boat ramp, jetty, pontoon	Marina

Column 1 Use	Column 2 Definition	Column 3 Examples include	Column 4 Does not include the following examples
Low impact industry	Premises used for industrial activities that include the manufacturing, producing, processing, repairing, altering, recycling, storing, distributing, transferring or treating of products and have one or more of the following attributes: • negligible impacts on sensitive land uses due to offsite emissions including aerosol, fume, particle, smoke, odour and noise; • minimal traffic generation and heavy-vehicle usage; • demands imposed upon the local infrastructure network consistent with surrounding uses; • the use generally operates during the day (e.g. 7am to 6pm); • offsite impacts from storage of dangerous goods are negligible; • the use is primarily undertaken indoors.	Repairing motor vehicles, fitting and turning workshop **Note**—Additional examples may be shown in SC1.1.2 industry thresholds.	Panel beating, spray painting or surface coating, tyre recycling, drum re-conditioning, wooden and laminated product manufacturing, service industry, medium impact industry, high impact industry, special industry
Major electricity infrastructure	All aspects of development for either the transmission grid or electricity supply networks as defined under the *Electricity Act 1994*. The use may include ancillary telecommunication facilities.	Powerlines greater than 66kV	Minor electricity infrastructure, substation
Major sport, recreation and entertainment facility	Premises with large scale built facilities designed to cater for large scale events including major sporting, recreation, conference and entertainment events.	Convention and exhibition centres, entertainment centres, sports stadiums, horse racing	Indoor sport and recreation, local sporting field, motor sport, park, outdoor sport and recreation
Marine industry	Premises used for waterfront based marine industries involved in any activity relating to the manufacturing, storage, repair or servicing of vessels and maritime infrastructure. The use may include the provision of fuel and disposal of waste.	Boat building, boat storage, dry dock	Marina

Column 1 Use	Column 2 Definition	Column 3 Examples include	Column 4 Does not include the following examples
Market	Premises used for the sale of goods to the public on a regular basis, where goods are primarily sold from temporary structures such as stalls, booths or trestle tables. The use may include entertainment provided for the enjoyment of customers.	Flea market, farmers market, car boot sales	Shop, roadside stall
Medium impact industry	Premises used for industrial activities that include the manufacturing, producing, processing, repairing, altering, recycling, storing, distributing, transferring or treating of products and have one or more of the following attributes: • potential for noticeable impacts on sensitive land uses due to offsite emissions including aerosol, fume, particle, smoke, odour and noise; • potential for noticeable offsite impacts in the event of fire, explosion or toxic release; • generates high traffic flows in the context of the locality or the road network; • generates an elevated demand on the local infrastructure network; • onsite controls are required for emissions and dangerous goods risks; • the use is primarily undertaken indoors; • evening or night activities are undertaken indoors and not outdoors.	Spray painting and surface coating, wooden and laminated product manufacturing (including cabinet making, joining, timber truss making or wood working) **Note**—Additional examples may be shown in SC1.1.2 industry thresholds.	Concrete batching, tyre manufacturing and retreading, metal recovery (involving a fragmentiser), textile manufacture, chemically treating timber and plastic product manufacture, service industry, low impact industry, high impact industry, special industry
Motor sport facility	Premises used for organised or recreational motor sports whether on or off-road, which may include permanent, temporary or informal provision for spectators and other supporting uses.	Go-karting, lawn mower race tracks, trail bike parks, 4WD and all terrain parks, motocross tracks, off road motorcycle facility, motorcycle or car race tracks	Major sport, recreation and entertainment facility, outdoor sport and recreation
Multiple dwelling	Premises containing three or more dwellings for separate households.	Apartments, flats, units, townhouses, row housing, triplex	Rooming accommodation, dual occupancy, duplex, granny flat, residential care facility, retirement facility

Column 1 Use	Column 2 Definition	Column 3 Examples include	Column 4 Does not include the following examples
Nature-based tourism	The use of land or premises for a tourism activity, including tourist and visitor short-term accommodation, that is intended for the conservation, interpretation and appreciation of areas of environmental, cultural or heritage value, local ecosystem, and attributes of the natural environment. Nature-based tourism activities typically: • maintain a nature-based focus or product; • promote environmental awareness, education and conservation; • carry out sustainable practices.	Environmentally responsible accommodation facilities including lodges, cabins, huts and tented camps	Environment facility
Nightclub entertainment facility	Premises used to provide entertainment, which may include cabaret, dancing and music. The use generally includes the sale of liquor and food for consumption on site.		Club, hotel, tavern, pub, indoor sport and recreation, theatre, concert hall
Non-resident workforce accommodation	Premises used to provide accommodation for non-resident workers. The use may include provision of recreational and entertainment facilities for the exclusive use of residents and their visitors.	Contractor's camp, construction camp, single person's quarters, temporary workers' accommodation	Relocatable home park, short-term accommodation, tourist park.
Office	Premises used for an administrative, secretarial or management service or the practice of a profession, where no goods or materials are made, sold or hired and where the principal activity provides for one or more of the following: • business or professional advice; • service of goods that are not physically on the premises; • office based administrative functions of an organisation.	Bank, real estate agent, administration building	Home based business, home office, shop, outdoor sales

Column 1 Use	Column 2 Definition	Column 3 Examples include	Column 4 Does not include the following examples
Outdoor sales	Premises used for the display, sale, hire or lease of products where the use is conducted wholly or predominantly outdoors and may include construction, industrial or farm plant and equipment, vehicles, boats and caravans. The use may include ancillary repair or servicing activities and sale or fitting of accessories.	Agricultural machinery sales yard, motor vehicles sales yard	Bulk landscape supplies, market
Outdoor sport and recreation	Premises used for a recreation or sport activity that is carried on outside a building and requires areas of open space and may include ancillary works necessary for safety and sustainability. The use may include ancillary food and drink outlet(s) and the provision of ancillary facilities or amenities conducted indoors such as changing rooms and storage facilities.	Driving range, golf course, swimming pool, tennis courts, football ground, cricket oval	Major sport, recreation and entertainment facility, motor sport, park, community use
Park	Premises accessible to the public generally for free sport, recreation and leisure, and may be used for community events or other community activities. Facilities may include children's playground equipment, informal sports fields and ancillary vehicle parking and other public conveniences.	Urban common	Tourist attraction, outdoor sport and recreation
Parking station	Premises used for parking vehicles where the parking is not ancillary to another use.	Car park, 'park and ride', bicycle parking	
Permanent plantation	Premises used for growing plants not intended to be harvested.	Permanent plantations for carbon sequestration, biodiversity or natural resource management	Forestry for wood production, biofuel production
Place of worship	Premises used by an organised group for worship and religious activities. The use may include ancillary facilities for social, educational and associated charitable activities.	Church, chapel, mosque, synagogue, temple	Community use, child care centre, funeral parlour, crematorium

Column 1 Use	Column 2 Definition	Column 3 Examples include	Column 4 Does not include the following examples
Port services	Premises used for the following: • the arrival and departure of vessels; • the movement of passengers or goods on or off vessels; • any ancillary activities directly serving the needs of passengers and visitors or the housing, servicing, maintenance and repair of vessels.	Marina, ferry terminal	Landing
Relocatable home park	Premises used for relocatable dwellings (whether they are permanently located or not) that provides long-term residential accommodation. The use may include a manager's residence and office, ancillary food and drink outlet, kiosk, amenity buildings and the provision of recreation facilities for the exclusive use of residents.		Tourist park
Renewable energy facility	Premises used for the generation of electricity or energy from renewable (naturally reoccurring) sources.	Solar farm, wind farm, tidal power	Wind turbine or solar panels supplying energy to domestic or rural activities on the same site
Research and technology industry	Premises used for innovative and emerging technological industries involved in research design, manufacture, assembly, testing, maintenance and storage of machinery, equipment and components. The use may include emerging industries such as energy, aerospace, and biotechnology.	Aeronautical engineering, computer component manufacturing, medical laboratories, computer server facility	
Residential care facility	A residential use of premises for supervised accommodation where the use includes medical and other support facilities for residents who cannot live independently and require regular nursing or personal care.	Convalescent home, nursing home	Community residence, dwelling house, dual occupancy, hospital, multiple dwelling, retirement facility

Column 1 Use	Column 2 Definition	Column 3 Examples include	Column 4 Does not include the following examples
Resort complex	Premises used for tourist and visitor short-term accommodation that include integrated leisure facilities including: • restaurants and bars; • meeting and function facilities; • sporting and fitness facilities; • staff accommodation; • transport facilities directly associated with the tourist facility such as a ferry terminal and air services.	Island resort	
Retirement facility	A residential use of premises for an integrated community and specifically built and designed for older people. The use includes independent living units and may include serviced units where residents require some support with health care and daily living needs. The use may also include a manager's residence and office, food and drink outlet, amenity buildings, communal facilities and accommodation for staff.	Retirement village	Residential care facility
Roadside stall	Premises used for the roadside display and sale of goods in rural areas.	Produce stall	Market

Column 1 **Use**	**Column 2** **Definition**	**Column 3** **Examples include**	**Column 4** **Does not include the following examples**
Rooming accommodation	Premises used for the accommodation of one or more households where each resident: • has the right to occupy one or more rooms; • does not have a right to occupy the whole of the premises in which the rooms are situated; • may be provided with separate facilities for private use; • may share communal facilities or communal space with one or more of the residents; The use may include: • rooms not in the same building on site; • provision of a food or other service; • on-site management or staff and associated accommodation. Facilities includes furniture and equipment as defined in the *Residential Tenancies and Rooming Act 2008*	Boarding house, hostel, monastery, off-site student accommodation	Hospice, community residence, dwelling house, short-term accommodation, multiple dwelling
Rural industry	Premises used for storage, processing and packaging of products from a rural use. The use includes processing, packaging and sale of products produced as a result of a rural use where these activities are ancillary to a rural use on or adjacent to the site.	Packing shed	Intensive animal husbandry, intensive horticulture, roadside stall, wholesale nursery, winery, abattoir, agricultural supply store
Rural workers' accommodation	Any premises used as quarters for staff employed in the use of land for rural purposes, such as agriculture, intensive animal husbandry and forestry, conducted on a lot in the same ownership whether or not such quarters are self-contained.	Farm workers' accommodation	Short-term accommodation building, caretaker's accommodation, dual occupancy, dwelling house, nature or rural based tourist accommodation, non-resident workforce accommodation, multiple dwellings

Column 1 Use	Column 2 Definition	Column 3 Examples include	Column 4 Does not include the following examples
Sales office	The temporary use of premises for displaying a land parcel or buildings that can be built for sale or can be won as a prize. The use may include a caravan or relocatable dwelling or structure.	Display dwelling	Bank, office
Service industry	Premises used for industrial activities that have no external air, noise or odour emissions from the site and can be suitably located with other non-industrial uses.	Audio visual equipment repair, film processing bicycle repairs, clock and watch repairs, computer repairs, dry cleaning, hand engraving, jewellery making, laundromat, locksmith, picture framing, shoe repairs, tailor	Small engine mechanical repair workshop, cabinet making, shop fitting, sign writing, tyre depot, low impact industry, medium impact industry, high impact industry, special industry
Service station	Premises used for the sale of fuel including petrol, liquid petroleum gas, automotive distillate and alternative fuels. The use may include, where ancillary, a shop, food and drink outlet, maintenance, repair servicing and washing of vehicles, the hire of trailers, and supply of compressed air.		Car wash
Shop	Premises used for the display, sale or hire of goods or the provision of personal services or betting to the public.	Hairdresser, liquor store, department store, discount department store, discount variety stores, betting agencies, supermarket, corner store	Adult shop, food and drink outlet, showroom, market
Shopping centre	Premises comprising two or more individual tenancies that is comprised primarily of shops, and that function as an integrated complex.		

Column 1 Use	Column 2 Definition	Column 3 Examples include	Column 4 Does not include the following examples
Short-term accommodation	Premises used to provide short-term accommodation for tourists or travellers for a temporary period of time (typically not exceeding three consecutive months) and may be self-contained. The use may include a manager's residence and office and the provision of recreation facilities for the exclusive use of visitors.	Motel, backpackers accommodation, cabins, serviced apartments, hotel, farm stay	Hostel, rooming accommodation, tourist park
Showroom	Premises used primarily for the sale of goods of a related product line that are of a size, shape or weight that requires: • a large area for handling, display or storage; • direct vehicle access to the building by members of the public for loading and unloading items purchased or hired.	Bulky goods sales, motor vehicles sales showroom, bulk stationary supplies	Food and drink outlet, shop, outdoor sales
Special industry	Premises used for industrial activities that include the manufacturing, producing, processing, repairing, altering, recycling, storing, distributing, transferring or treating of products and have one or more of the following attributes: • potential for extreme impacts on sensitive land uses due to offsite emissions including aerosol, fume, particle, smoke, odour and noise; • potential for extreme offsite impacts in the event of fire, explosion or toxic release; • onsite controls are required for emissions and dangerous goods risks; • the use generally involves night time and outdoor activities; • the use may involve the storage and handling of large volumes of dangerous goods; • requires significant separation from non-industrial uses.	Tanneries, rendering plants, oil refineries, waste incineration, manufacturing or storing explosives, power plants, manufacturing fertilisers **Note**—Additional examples may be shown in SC1.1.2 industry thresholds.	Low impact industry, medium impact industry, high impact industry, service industry

Column 1 Use	Column 2 Definition	Column 3 Examples include	Column 4 Does not include the following examples
Substation	Premises forming part of a transmission grid or supply network under the *Electricity Act 1994*, and used for: • converting or transforming electrical energy from one voltage to another; • regulating voltage in an electrical circuit; • controlling electrical circuits; • switching electrical current between circuits; • a switchyard; or • communication facilities for 'operating works' as defined under the *Electricity Act 1994* or for workforce operational and safety communications.	Substations, switching yards	Major electricity infrastructure, minor electricity infrastructure
Telecommunications facility	Premises used for systems that carry communications and signals by means of radio, including guided or unguided electromagnetic energy, whether such facility is manned or remotely controlled.	Telecommunication tower, broadcasting station, television station	Aviation facility, 'low-impact telecommunications facility' as defined under the *Telecommunications Act 1997*
Theatre	Premises used for presenting movies, live entertainment or music to the public and may include provision of food and liquor for consumption on the premises. The use may include the production of film or music, including associated ancillary facilities, which are associated with the production, such as sound stages, wardrobe and laundry facilities, makeup facilities, set construction workshops, editing and post-production facilities.	Cinema, movie house, concert hall, dance hall, film studio, music recording studio	Community hall, hotel, indoor sport and recreation facility, temporary film studio
Tourist attraction	Premises used for providing on-site entertainment, recreation or similar facilities for the general public. The use may include provision of food and drink for consumption on site.	Theme park, zoo	Hotel, major sport, recreation and entertainment facility, nightclub entertainment facility

Column 1 **Use**	**Column 2** **Definition**	**Column 3** **Examples include**	**Column 4** **Does not include the following examples**
Tourist park	Premises used to provide for accommodation in caravans, self-contained cabins, tents and similar structures for the public for short term holiday purposes. The use may include, where ancillary, a manager's residence and office, kiosk, amenity buildings, food and drink outlet, or the provision of recreation facilities for the use of occupants of the tourist park and their visitors, and accommodation for staff.	Camping ground, caravan park, holiday cabins	Relocatable home park, tourist attraction, short term accommodation, non-resident workforce accommodation
Transport depot	Premises used for the storage, for commercial or public purposes, of more than one motor vehicle. The use includes premises for the storage of taxis, buses, trucks, heavy machinery and uses of a like nature. The term may include the ancillary servicing, repair and cleaning of vehicles stored on the premises.	Contractor's depot, bus depot, truck yard, heavy machinery yard	Home based business, warehouse, low impact industry, service industry
Utility installation	Premises used to provide the public with the following services: • supply or treatment of water, hydraulic power or gas; • sewerage, drainage or stormwater services; • transport services including road, rail or water; • waste management facilities; or • network infrastructure. The use includes maintenance and storage depots and other facilities for the operation of the use.	Sewerage treatment plant, mail depot, pumping station, water treatment plant	Telecommunications tower, major electricity infrastructure, minor electricity infrastructure, substation, renewable energy facility, transport depot
Veterinary services	Premises used for veterinary care, surgery and treatment of animals that may include provision for the short-term accommodation of the animals on the premises.		Animal keeping

Column 1 Use	Column 2 Definition	Column 3 Examples include	Column 4 Does not include the following examples
Warehouse	Premises used for the storage and distribution of goods, whether or not in a building, including self-storage facilities or storage yards. The use may include sale of goods by wholesale where ancillary to storage. The use does not include retail sales from the premises or industrial uses.	Self-storage sheds	Hardware and trade supplies, outdoor sales, showroom, shop
Wholesale nursery	Premises used for the sale of plants, but not to the general public, where the plants are grown on or adjacent to the site. The use may include sale of gardening materials where these are ancillary to the primary use.		Bulk landscape supplies, garden centre
Winery	Premises used for manufacturing of wine, which may include the sale of wine manufactured on site.		Rural industry

SC1.1.1 Defined activity groups

There are no defined activity groups for the planning scheme.

SC1.1.2 Industry thresholds

(1) The industry thresholds listed below are to be used in conjunction with the defined uses listed in Table SC1.1.2- low impact industry, medium impact industry, high impact industry and special industry.

Table SC1.1.2.1 - Industry thresholds

Column 1 Use	Column 2 Additional examples include
Low impact industry	(1) Repairing and servicing motor vehicles, including mechanical components, radiators, electrical components, wheel alignments, exhausts, tyres, suspension or air conditioning, not including spray painting. (2) Repairing and servicing lawn mowers and outboard engines. (3) Fitting and turning workshop. (4) Assembling or fabricating products from sheet metal or welding steel, producing less than 10 tonnes a year and not including spray painting. (5) Assembling wood products not involving cutting, routing, sanding or spray painting. (6) Dismantling automotive or mechanical equipment, not including debonding brake or clutch components.
Medium impact industry	(1) Metal foundry producing less than 10 tonnes of metal castings per annum. (2) Boiler making or engineering works producing less than 10,000 tonnes of metal product per annum. (3) Facility, goods yard or warehouse for the storage or distribution of dangerous goods not involving manufacturing processes and not a major hazard facility under the *Work Health and Safety Act 2011.* (4) Abrasive blasting facility using less than 10 tonnes of abrasive material per annum. (5) Enamelling workshop using less than 15,000 litres of enamel per annum. (6) Galvanising works using less than 100 tonnes of zinc per annum. (7) Anodising or electroplating workshop where tank area is less than 400 square meters. (8) Powder coating workshop using less than 500 tonnes of coating per annum. (9) Spray painting workshop (including spray painting vehicles, plant, equipment or boats) using less than 20,000 litres of paint per annum. (10) Scrap metal yard (not including a fragmentiser), dismantling automotive or mechanical equipment including debonding brake or clutch components. (11) Manufacturing clay or ceramic products including bricks, tiles, pipes and pottery goods, less than 200 tonnes per annum. (12) Processing, smoking, drying, curing, milling, bottling or canning food, beverages or pet food, less than 200 tonnes per annum. (13) Vegetable oil or oilseed processing in works with a design production capacity of less than 1,000 tonnes per annum. (14) Manufacturing wooden products including cabinet making, joinery, wood working, producing less than 500 tonnes per annum. (15) Manufacturing medium density fibreboard, chipboard, particle board, plywood, laminated board or wood veneer products, less than 250 tonnes per annum.

	(16)	Sawmilling, wood chipping and kiln drying timber and logs, producing less than 500 tonnes per annum.
	(17)	Recycling and reprocessing batteries.
	(18)	Repairing or maintaining boats.
	(19)	Manufacturing substrate for mushroom growing.
	(20)	Manufacturing or processing plaster, producing less than 5,000 tonnes per annum.
	(21)	Recycling or reprocessing tyres including retreading.
	(22)	Printing advertising material, magazines, newspapers, packaging and stationery.
	(23)	Manufacturing fibreglass, foam plastic, composite plastic or rigid fibre-reinforced plastic or plastic products, less than 5 tonnes per annum (except fibreglass boats, tanks and swimming pools).
	(24)	Manufacturing PET, PETE, polypropylene and polystyrene plastic or plastic products, less than 10,000 tonnes per annum.
	(25)	Reconditioning metal or plastic drums.
	(26)	Glass fibre manufacture less than 200 tonnes per annum.
	(27)	Manufacturing glass or glass products, where not glass fibre, less than 250 tonnes per annum.
High impact industry	(1)	Metal foundry producing 10 tonnes or greater of metal castings per annum.
	(2)	Boiler making or engineering works producing 10,000 tonnes or greater of metal product per annum.
	(3)	Major hazard facility for the storage and distribution of dangerous goods not involving manufacturing processes.
	(4)	Scrap metal yard including a fragmentiser.
	(5)	Manufacturing clay or ceramic products including bricks, tiles, pipes and pottery goods, greater than 200 tonnes per annum.
	(6)	Processing, smoking, drying, curing, milling, bottling or canning food, beverages or pet food, greater than 200 tonnes per annum.
	(7)	Vegetable oil or oilseed processing in works with a design production capacity of greater than 1,000 tonnes per annum.
	(8)	Manufacturing wooden products including cabinet making, joinery, wood working, producing greater than 500 tonnes per annum.
	(9)	Manufacturing medium density fibreboard, chipboard, particle board, plywood, laminated board or wood veneer products, 250 tonnes or greater per annum.
	(10)	Sawmilling, wood chipping and kiln drying timber and logs, producing greater than 500 tonnes per annum.
	(11)	Manufacturing or processing plaster, producing greater than 5,000 tonnes per annum.
	(12)	Enamelling workshop using 15,000 litres or greater of enamel per annum.
	(13)	Galvanising works using 100 tonnes or greater of zinc per annum.
	(14)	Anodising or electroplating workshop where tank area is 400 square meters or greater.
	(15)	Powder coating workshop using 500 tonnes or greater of coating per annum.
	(16)	Spray painting workshop (including spray painting vehicles, plant, equipment or boats) using 20,000 litres or greater of paint per annum.
	(17)	Concrete batching and producing concrete products.
	(18)	Treating timber for preservation using chemicals including copper, chromium, arsenic, borax and creosote.
	(19)	Manufacturing soil conditioners by receiving, blending, storing, processing, drying or composting organic material or organic waste, including animal manures, sewage,

	septic sludges and domestic waste. (20) Manufacturing fibreglass pools, tanks and boats. (21) Manufacturing, fibreglass, foam plastic, composite plastic or rigid fibre-reinforced plastic or plastic products, 5 tonnes or greater per annum (except fibreglass boats, tanks and swimming pools). (22) Manufacturing PET, PETE, polypropylene and polystyrene plastic or plastic products, 10,000 tonnes or greater per annum. (23) Manufacturing tyres, asbestos products, asphalt, cement; glass or glass fibre, mineral wool or ceramic fibre. (24) Abattoir. (25) Recycling chemicals, oils or solvents. (26) Waste disposal facility (other than waste incinerator). (27) Recycling, storing or reprocessing regulated waste. (28) Manufacturing batteries. (29) Manufacturing wooden products including cabinet making, joinery, wood working, producing greater than 500 tonnes per annum. (30) Abrasive blasting facility using 10 tonnes or greater of abrasive material per annum. (31) Crematoria. (32) Glass fibre manufacture producing 200 tonnes or greater per annum. (33) Manufacturing glass or glass products, where not glass fibre, less than 250 tonnes per annum.
Special industry	(1) Oil refining or processing. (2) Producing, refining or processing gas or fuel gas. (3) Distilling alcohol in works producing greater than 2500 litres per annum. (4) Power station. (5) Producing, quenching, cutting, crushing or grading coke. (6) Waste incinerator. (7) Sugar milling or refining. (8) Pulp or paper manufacturing. (9) Tobacco processing. (10) Tannery or works for curing animal skins, hides or finishing leather. (11) Textile manufacturing, including carpet manufacturing, wool scouring or carbonising, cotton milling, or textile bleaching, dyeing or finishing. (12) Rendering plant. (13) Manufacturing chemicals, poisons and explosives. (14) Manufacturing fertilisers involving ammonia. (15) Manufacturing polyvinyl chloride plastic.

SC1.2 Administrative definitions

(1) Administrative definitions assist with the interpretation of the planning scheme but do not have a meaning in relation to a use.

(2) A term listed in Table SC1.2.2 column 1 has the meaning set out beside that term in column 2 under the heading.

(3) The administrative definitions listed here are the definitions for the purpose of the planning scheme.

Table SC1.2.1-Index of administrative definitions

• Adjoining premises	• Domestic outbuilding	• Outermost projection
• Advertising device	• Dwelling	• Planning assumptions
• Affordable housing	• Full time equivalent	• Plot ratio
• Average width	• Gross floor area	• Projection area(s)
• Base date	• Ground level	• Rear lot
• Basement	• Household	• Secondary dwelling
• Boundary clearance	• Major road	• Setback
• Building height	• Minor building work	• Service catchment
• Contributing character building	• Minor electricity infrastructure	• Site
• Defined flood event	• Net developable area	• Site cover
• Defined flood level	• Net residential density	• Storey
• Defined storm tide event	• Netserv plan	• Temporary use
• Defined storm tide event level	• Non-contributing property	• Total use area
• Demand unit	• Non-resident workers	• Ultimate development
• Development footprint		• Urban purposes

Table SC1.2.2 Administrative definitions

Column 1 Activity group	Column 2 Uses
Adjoining premises	Premises that share all or part of a common boundary. A common boundary might be a single point such as a corner point.
Advertising device	Any permanent structure, device, sign or the like intended for advertising purposes. It includes any framework, supporting structure or building feature that is provided exclusively or mainly as part of the advertisement.
Affordable housing	Housing that is appropriate to the needs of households with low to moderate incomes.
Average width	In regard to a lot, the distance between the midpoints of the side boundaries of the lot.
Base date	The date from which a local government has estimated its projected infrastructure demands and costs.
Basement	A space that is situated between one floor level and the floor level below where not part of the space projects more than one metre above ground level.
Boundary clearance	The shortest distance from the outermost projection of a structural part of the building or structure to the property boundary, including: (a) if the projection is a roof and there is a fascia – the outside face of the fascia; or (b) if the projection is a roof and there is no fascia – the roof structure. The term does not include rainwater fittings or ornamental or architectural attachments.
Building height	If specified: (a) in metres, the vertical distance between the ground level and the highest point of the building roof (apex) or parapet at any point but not including load-bearing antenna, aerial, chimney, flagpole or the like; (b) in storeys, the number of storeys above ground level; or (c) in both metres and storeys, both (a) and (b) apply.
Contributing character building	A building within the Character residential zone that is not listed in the appendix of the Character residential planning scheme policy SC6.2.
Defined flood event	For this planning scheme, this is the 1% annual exceedance probability (AEP) flood and is mapped as the combined extent of the high and medium flood hazard areas identified on overlay map OM-06.1 and OM-06.2.
Defined flood level	The flood level relative to the Australian Height Datum (AHD) of the 1% AEP flood. **Editor's note—**This will vary between locations.
Defined storm tide event	For this planning scheme, this is the 1% annual exceedance probability (AEP) storm tide event with an allowance of 0.8m sea level rise and an increase in maximum cyclone intensity of 10% relative to present day conditions.
Defined storm tide event level	For this planning scheme, this is RL4.5m Australian Height Datum (AHD), within 100m of the coastline or RL3.9m AHD in other areas.
Demand unit	Demand units provide a standard of unit measurement to express demand on a trunk infrastructure network.

Column 1 Activity group	Column 2 Uses
Development footprint	The location and extent of all development proposed on a site. This includes all buildings and structures, open space, all associated facilities, landscaping, on-site stormwater drainage, on-site wastewater treatment, all areas of disturbance, on-site parking, access and manoeuvring areas.
Domestic outbuilding	A Class 10a building, as defined in the Building Code of Australia, that is ancillary to a residential use on the same premises and is limited to non-habitable buildings for the purpose of a shed, garage and carport.
Dwelling	A building or part of a building used or capable of being used as a self-contained residence that must include the following: (a) food preparation facilities; (b) a bath or shower; (c) a toilet and wash basin; (d) clothes washing facilities. This term includes outbuildings, structures and works normally associated with a dwelling.
Full time eqivalent	FTE – 'Full time equivalent', a measure of the total level of staff resources used. The FTE of a full-time staff member is equal to 1.0. The calculation of FTE for part-time staff is based on the proportion of time worked compared to that worked by full-time staff performing similar duties.
Gross floor area	The total floor area of all storeys of a building (measured from the outside of the external walls or the centre of a common wall), other than areas used for the following: (a) building services, plant and equipment; (b) access between levels; (c) ground floor public lobby; (d) a mall; (e) the parking, loading and manoeuvring of motor vehicles; (f) unenclosed private balconies whether roofed or not.
Ground level	The level of the natural ground or, where the level of the natural ground has been changed, the level as lawfully changed.
Household	An individual or a group of two or more related or unrelated people who reside in the dwelling, with the common intention to live together on a long-term basis and who make common provision for food or other essentials for living.
Major road	A road that operates as a major collector, sub arterial or arterial road or highway.
Minor building work	Building work that increases the gross floor area of a building by no more than the lesser of the following: (a) 50m² (b) an area equal to 5% of the gross floor area of the building.

Column 1 Activity group	Column 2 Uses
Minor electricity infrastructure	All aspects of development for an electricity supply network as defined under the *Electricity Act 1994*, (or for private electricity works that form an extension of, or provide service connections to properties from the network), if the network operates at standard voltages up to and including 66kV. This includes: (a) augmentations/upgrades to existing powerlines where the voltage of the infrastructure does not increase; (b) augmentations to existing substations (including communication facilities for controlling works as defined under the *Electricity Act 1994*) where the voltage of the infrastructure does not increase, and where they are located on an existing substation lot.
Net developable area	The area of land available for development. It does not include land that cannot be developed due to constraints such as acid sulphate soils, conservation land, flood affected land or steep slope. **Note—**for the purpose of a Local government infrastructure plan, net developable area is usually measured in hectares, net developable hectares (net dev ha).
Net residential density	The total number of dwellings divided by the combined area of residential lots, local parks , internal local roads and half the width of local roads bordering the site.
Netserv Plan	A distributor-retailer's plan about its water and wastewater networks and provision of water service and wastewater service pursuant to section 99BJ of the *South East Queensland (Distributor retailer Restructure) Water Act 2009*.
Non-contributing property	A property within the Character residential zone that is listed in Appendix 1 of the Character residential planning scheme policy SC6.2.
Non-residential workers	Workers who reside in areas for extended periods when employed on projects directly associated with resource extraction, major industry, major infrastructure or rural uses, but have a permanent place of residence in another area. This includes workers engaged in fly-in/fly-out or drive-in/drive-out arrangements.
Outermost projection	The outermost projection of any part of a building or structure including, in the case of a roof, the outside face of the fascia, or the roof structure where there is no fascia, or attached sunhoods or the like, but does not include retractable blinds, fixed screens, rainwater fittings, or ornamental attachments.
Planning assumption	Assumptions about the type, scale, location and timing of future growth.
Plot ratio	The ratio of gross floor area to the area of the site.
Projection area(s)	Area or areas within a local government area for which a local government carries out demand growth projections.
Rear lot	A lot that does not have frontage or access to a road other than by means of an access way that forms part of the lot, or by means of an easement over adjoining land.
Secondary dwelling	A dwelling used in conjunction with, and subordinate to, a dwelling house on the same lot. A secondary dwelling may be constructed under a dwelling house, be attached to a dwelling house or be free standing.

Column 1 Activity group	Column 2 Uses
Service catchment	An area serviced by an infrastructure network. An infrastructure network is made up of one or more service catchments. Service catchments are determined by the network type and how it has been designed to operate and provide service to the urban areas. **Note—**for example: • stormwater network service catchments can be delineated to align with watershed boundaries • open space network service catchment can be determined using local government accessibility standards • water network service catchment can be established as the area serviced by a particular reservoir.
Setback	For a building or structure, the shortest distance measured horizontally from the outermost projection of a building or structure to the vertical projection of the boundary of the lot.
Site	Any land on which development is carried out or is proposed to be carried out whether such land comprises the whole or part of one lot or more than one lot if each of such lots is contiguous.
Site cover	The proportion of the site covered by a building(s), structure(s) attached to the building(s) and carport(s), calculated to the outermost projections of the building(s) and is expressed as a percentage. The term does not include: (a) any structure or part thereof included in a landscaped open space area such as a gazebo or shade structure; (b) basement car parking areas located wholly below ground level; (c) eaves and sun shading devices.
Storey	A space that is situated between one floor level and the floor level next above, or if there is no floor above, the ceiling or roof above, but not a space that contains only: (a) a lift shaft, stairway or meter room; (b) a bathroom, shower room laundry, water closet, or other sanitary compartment; (c) a combination of the above. A mezzanine is a storey. A roofed structure on or part of a rooftop that does not solely accommodate building plant and equipment is a storey. A basement is not a storey.
Temporary use	A use that is impermanent and may be irregular or infrequent that does not require the construction of a permanent building or the installation of permanent infrastructure or services. **Note—**provisions for temporary use timeframes for defined uses may be provided in section 1.7 Local government administrative matters.

Column 1 Activity group	Column 2 Uses
Total use area	Total use area – the sum of all areas (exclusive of walls, columns and balconies whether roofed or not) of all storeys of a building which are used or intended for use for a particular purpose, plus any other areas of the site which is also used or intended for use for the same purpose, except for: (a) areas (inclusive of walls and columns) of any lift wells, lift motor rooms, air conditioning and (b) associated mechanical or electrical plant and equipment rooms; (c) areas of any staircases; (d) areas of any public lobby; (e) areas of any public toilets; (f) areas of any staff toilets, washrooms, recreation areas and associated facilities; and (g) areas used for the access, parking and associated manoeuvring of motor vehicles.
Ultimate development	The realistic extent of development anticipated to be achieved when a site (or projection area or infrastructure service catchment) is fully developed.
Urban purposes	For the purpose of Local government infrastructure plans, urban purposes includes residential (other than rural residential), retail, commercial, industrial, community and government related purposes.

Schedule 2 Mapping

SC2.1 Map index

The table(s) below list any strategic framework, zoning, local plan and overlay maps applicable to the planning scheme area.

Editor's note—Mapping for the LGIP is contained within Schedule 3 of the planning scheme.

Table SC2.1.1—Map index

Map number	Map title	Gazettal date
Strategic framework maps		
SFM-001	Townsville City Council Planning Scheme Strategic Framework Map - Shaping Townsville	19 June 2020
SFM-002	Townsville City Council Planning Scheme Strategic Framework Map - Shaping Townsville and Strong and connected community	17 October 2014
SFM-003	Townsville City Council Planning Scheme Strategic Framework Map - Environmentally sustainable future	17 October 2014
SFM-004	Townsville City Council Planning Scheme Strategic Framework Map - Sustaining economic growth	19 June 2020
Zone maps		
	Townsville City Council Planning Scheme Zoning Index	17 October 2014
	Precinct and Sub Precinct Legend	17 October 2014
ZM-001	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-002	Townsville City Council Planning Scheme Zoning Map	28 April 2017
ZM-003	Townsville City Council Planning Scheme Zoning Map	05 August 2022
ZM-004	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-005	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-006	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-007	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-008	Townsville City Council Planning Scheme Zoning Map	17 October 2014
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ZM-020	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-021	Townsville City Council Planning Scheme Zoning Map	17 October 2014

ZM-022	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-023	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-024	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-025	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-026	Townsville City Council Planning Scheme Zoning Map	05 August 2022
ZM-027	Townsville City Council Planning Scheme Zoning Map	9 December 2016
ZM-028	Townsville City Council Planning Scheme Zoning Map	05 August 2022
ZM-029	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-030	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-031	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-032	Townsville City Council Planning Scheme Zoning Map	9 December 2016
ZM-033	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-034	Townsville City Council Planning Scheme Zoning Map	9 December 2016
ZM-035	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-036	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-037	Townsville City Council Planning Scheme Zoning Map	05 August 2022
ZM-038	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-039	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-040	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-041	Townsville City Council Planning Scheme Zoning Map	27 April 2018
ZM-042	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-043	Townsville City Council Planning Scheme Zoning Map	29 January 2016
ZM-044	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-045	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-046	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-047	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-048	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-049	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-050	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-051	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-052	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-053	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-054	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-055	Townsville City Council Planning Scheme Zoning Map	19 June 2020
ZM-056	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-057	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-058	Townsville City Council Planning Scheme Zoning Map	19 June 2020
ZM-059	Townsville City Council Planning Scheme Zoning Map	17 October 2014
ZM-060	Townsville City Council Planning Scheme Zoning Map	17 October 2014
	Townsville City Council Planning Scheme Precinct Map Index	17 October 2014
	Precinct and Sub-precinct Legend	17 October 2014

PM-001	Townsville City Council Planning Scheme Precinct Map	17 October 2014
PM-002	Townsville City Council Planning Scheme Precinct Map	17 October 2014
PM-003	Townsville City Council Planning Scheme Precinct Map	27 April 2018
PM-004	Townsville City Council Planning Scheme Precinct Map	17 October 2014
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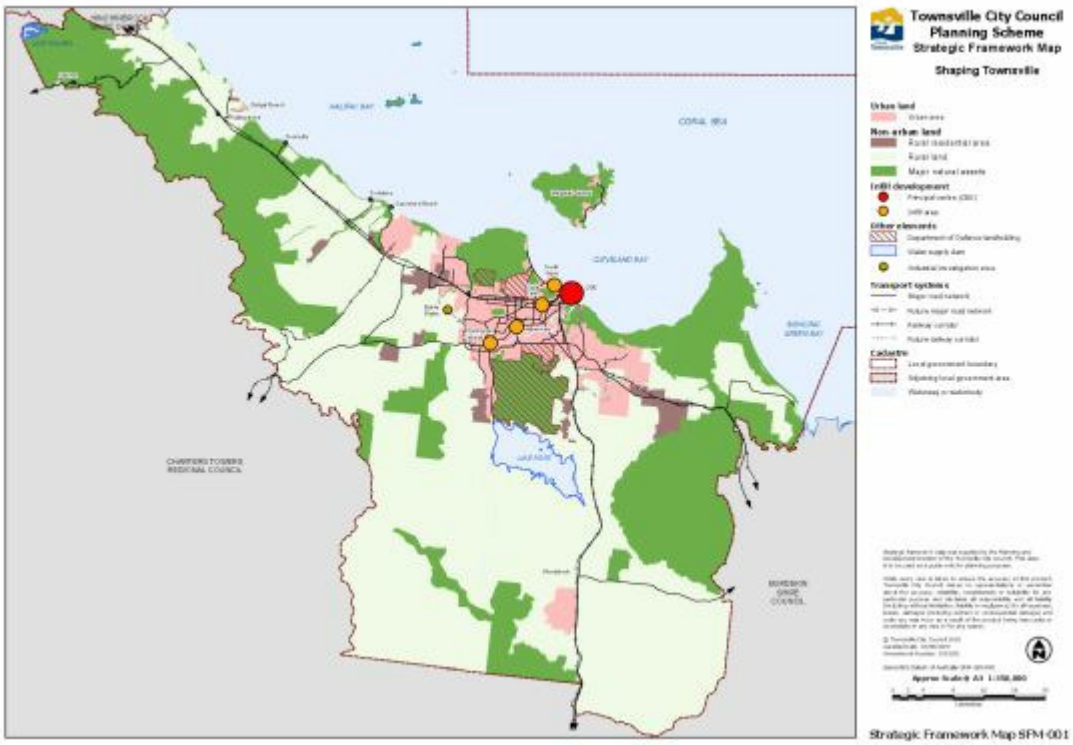
PM-023	Townsville City Council Planning Scheme Precinct Map	19 June 2020
PM-024	Townsville City Council Planning Scheme Precinct Map	17 October 2014
PM-025	Townsville City Council Planning Scheme Precinct Map	17 October 2014
PM-026	Townsville City Council Planning Scheme Precinct Map	17 October 2014
PM-027	Townsville City Council Planning Scheme Precinct Map	17 October 2014
PM-028	Townsville City Council Planning Scheme Precinct Map	27 April 2018
Local plan maps		
There are no local plan maps in this planning scheme.		17 October 2014
Overlay maps		
OM-01.1	Townsville City Council Planning Scheme Development Constraints Airport Environs Overlay Map - Operational airspace	28 August 2015
OM-01.2	Townsville City Council Planning Scheme Development Constraints Airport Environs Overlay Map - Wildlife hazard buffer zones and public safety areas	9 December 2016
OM-01.3	Townsville City Council Planning Scheme Development Constraints Airport Environs Overlay Map - Aviation facilities	28 August 2015
OM-01.4	Townsville City Council Planning Scheme Development Constraints Airport Environs Overlay Map - Australian noise exposure forecast (ANEF) contours (2036)	3 March 2017

OM-01.5	Townsville City Council Planning Scheme Development Constraints Airport Environs Overlay Map - Lighting area buffer zones	9 December 2016
OM-02	Townsville City Council Planning Scheme Development Constraints Overlay Map - Bushfire hazard	29 January 2016
OM-03.1	Townsville City Council Planning Scheme Environment Coastal Environment Overlay Map - Coastal hazard areas – storm tide inundation areas	27 April 2018
OM-03.2	Townsville City Council Planning Scheme Environment Coastal Environment Overlay Map - Coastal hazard areas – storm tide inundation areas	27 April 2018
OM-03.3	Townsville City Council Planning Scheme Environment Coastal Environment Overlay Map - Coastal hazard areas – erosion prone area	27 April 2018
OM-04.1	Townsville City Council Planning Scheme Heritage Overlay Map - Cultural heritage	27 April 2018
OM-04.2	Townsville City Council Planning Scheme Heritage Overlay Map - Cultural heritage	27 April 2018
OM-04.3	Townsville City Council Planning Scheme Heritage Overlay Map - Cultural heritage	27 April 2018
OM-04.4	Townsville City Council Planning Scheme Heritage Overlay Map - Cultural heritage	19 June 2020
OM-05	Townsville City Council Planning Scheme Natural Resources Overlay Map - Extractive resources	17 October 2014
OM-06.1	Townsville City Council Planning Scheme Development Constraints Overlay Map - Flood hazard	19 June 2020
OM-06.2	Townsville City Council Planning Scheme Development Constraints Overlay Map - Flood hazard	27 April 2018
OM-07.1	Townsville City Council Planning Scheme Development Constraints Overlay Map - Landslide hazard	17 October 2014
OM-07.2	Townsville City Council Planning Scheme Development Constraints Overlay Map - Landslide hazard	28 August 2015
OM-08	Townsville City Council Planning Scheme Environment Natural Assets Overlay Map - Environmental importance	19 June 2020
OM-09	Townsville City Council Planning Scheme Natural Resources Overlay Map - Water resource catchments	28 August 2015
OM-10.1	Townsville City Council Planning Scheme Infrastructure Overlay Map - Noise corridors - Roads	28 April 2017
OM-10.2	Townsville City Council Planning Scheme Infrastructure Overlay Map - Noise corridors - Railway	29 January 2016
Other plans maps		
OPM-01	Oonoonba Urban Development Area Development Scheme Map - Map 2: Oonoonba UDA structure and zoning plan	17 October 2014
OPM-02	Map No. PDA 7 - Townsville City Waterfront Priority Development Area	17 October 2014

SC2.2 Strategic framework maps



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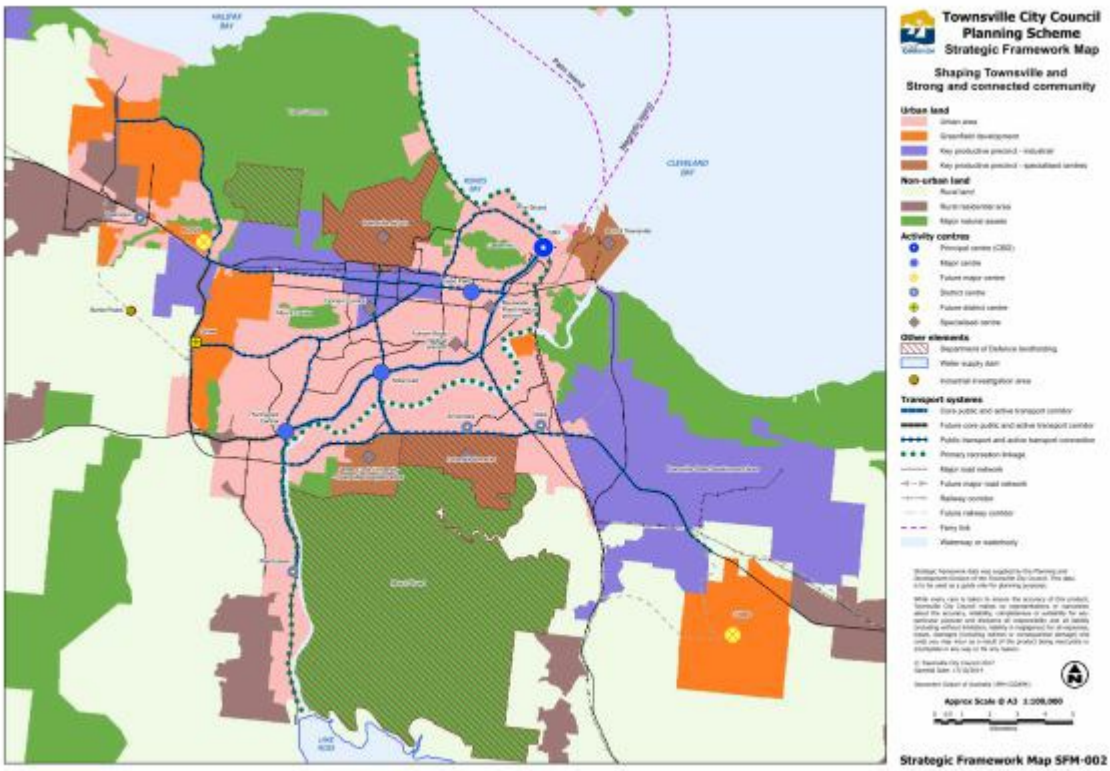
Shaping Townsville Strategic Framework Map SFM-001



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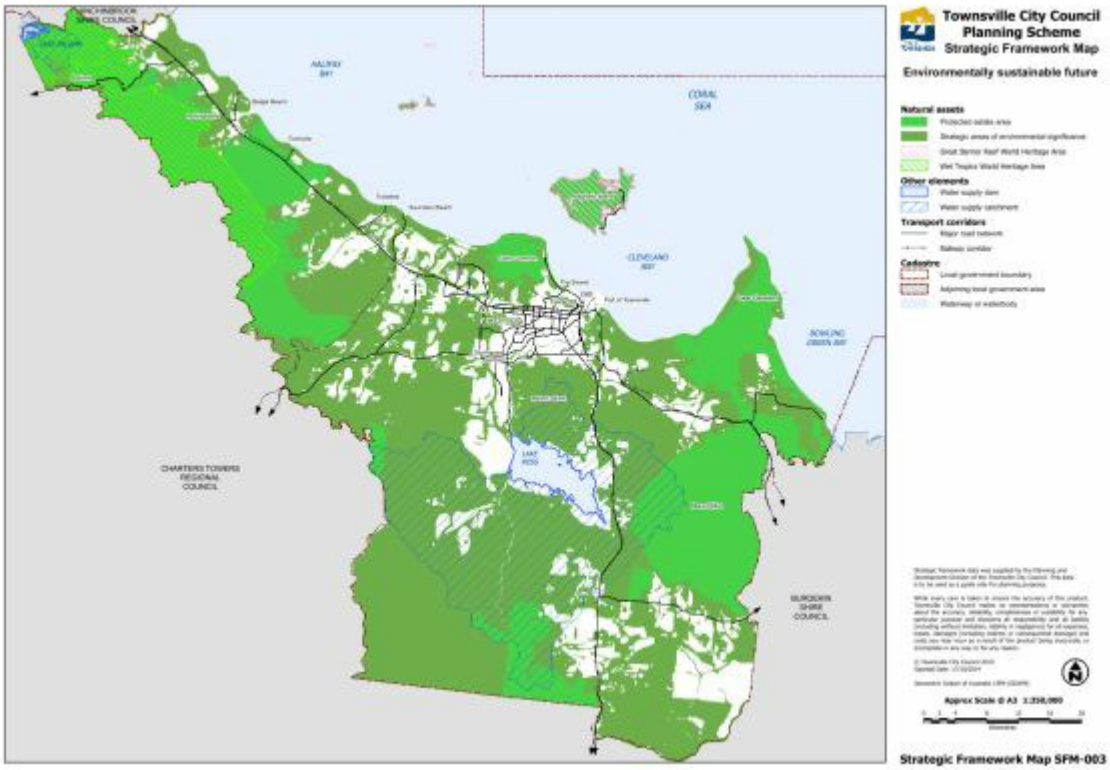
Shaping Townsville and Strong and Connected Community Strategic Framework Map SFM - 002



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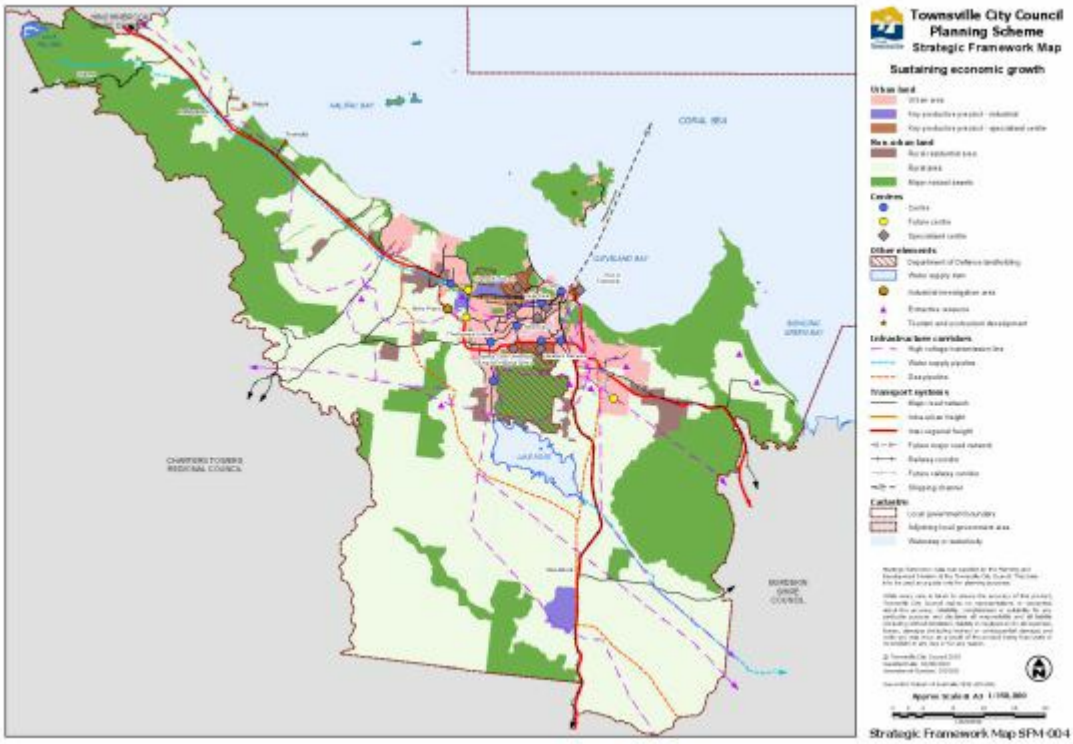
Environmentally sustainable future Strategic Framework Map SFM - 003



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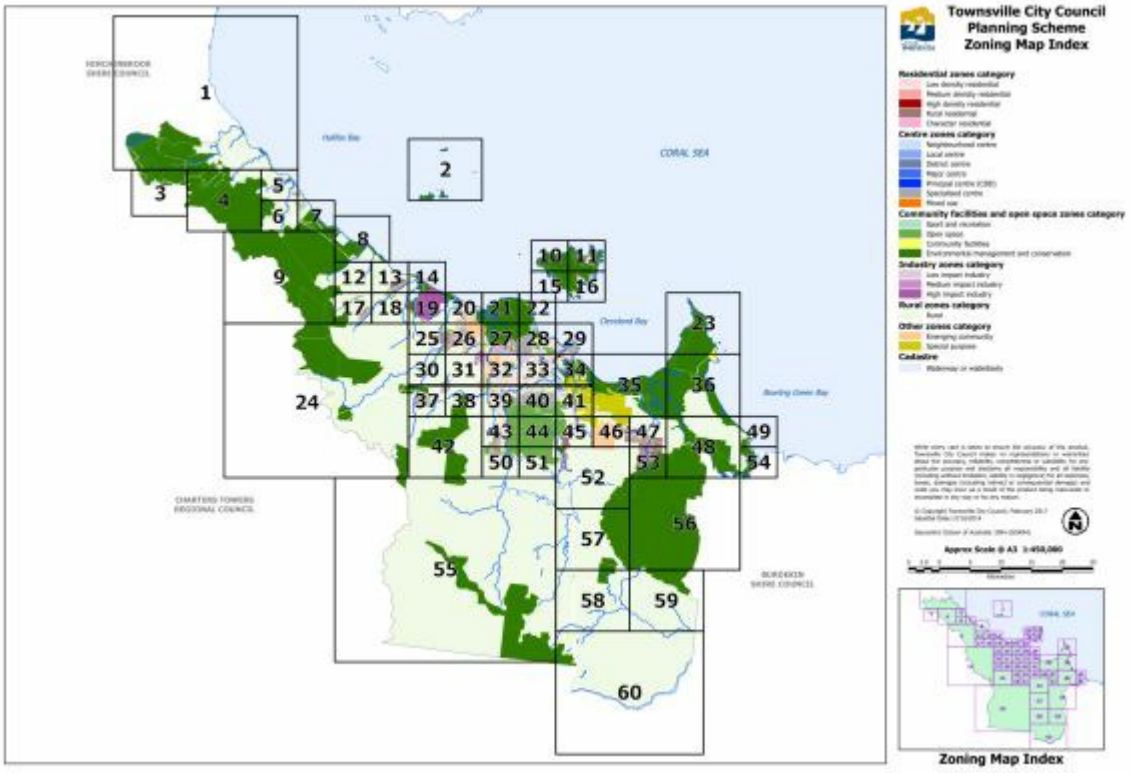
Sustaining economic growth Strategic Framework Map SFM-004

SC2.3 Zone maps



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Townsville City Council planning scheme zoning map index

PRECINCT AND SUB-PRECINCT LEGEND				
Precinct Code	**Precinct**	**Sub-Precinct Code**	**Sub-Precinct**	**Zone Category**
A	Townsville Airport			Specialised centre
AC	Arcadia Central			Mixed use
ADC	Annandale district centre			District centre
AMC	Aitkenvale major centre	**ACC**	Aitkenvale centre core	Major centre
AMC	Aitkenvale major centre	**ACF**	Aitkenvale centre frame	Major centre
AMD	Aitkenvale medium density			Medium density residential
AV	Aitkenvale village			Medium density residential
B	Breakwater			Mixed use
BBGC	Balgal Beach golf course			Sport and recreation
BRM	Bayswater Road medical			Specialised centre
C	Cungulla			Rural
CA	Civic and administration			Principal centre
CD	Cluden			Sport and recreation
CBDG	CBD gateway			Mixed use
CS	Churchill Street			Character residential
CTR	Charters Towers Road business			Mixed use

D	Domain Central			Specialised centre
DDC	Deeragun district centre			District centre
DHHC	1960s Defence Housing and1960s Housing Commission			Character residential
FRM	Fulham Road medical			Specialised centre
FS	French Street			Character residential
FSE	Flinders Street East			Principal centre
FSR	Flinders Street retail			Principal centre
FSW	Flinders Street West			High density residential
G	Grazing			Rural
GQ	Grand Queenslanders			Character residential
H	Horticulture			Rural
HPMC	Hyde Park major centre			Major centre
HPMD	Hyde Park medium density			Medium density residential
IAG	Interwar to 1950s Asymmetrical Gables			Character residential
IDC	Idalia district centre			District centre
IGQB	Interwar Gables and Queensland Bungalows			Character residential
J	Jensen			Rural
JCUTH	James Cook University Townsville Hospital			Specialised centre
KR	Kings Road			Mixed use
KRM D	Kings Road medium density			Medium density residential
KSQ	King Street quarter			Mixed use
KT	Kirwan Traders			Mixed use
LB	Lavarack Barracks			Specialised centre
LH	Lansdown high impact industry			High impact industry
LM	Lansdown motor sport facility			Sport and recreation
MF	Mixed farming			Rural
M FP	Mixed 1950s			Character residential
MIMD	Magnetic Island medium density			Medium density residential
MIV	Magnetic Island villages	**HB**	Horseshoe Bay	Mixed use
MIV	Magnetic Island villages	**N B**	Nelly Bay	Mixed use
MIV	Magnetic Island villages	**PB**	Picnic Bay	Mixed use
MS	Marlow Street			Low density residential
NBG	Nelly Bay gateway			Mixed use
NBI	Nelly Bay low impact industry			Low impact industry
NBT	Nelly Bay tourist			Medium density residential
NW	North Ward local centre			Local centre

NWG	North Ward gateway			Medium density residential
N WMD	North Ward medium density			Medium density residential
N WV	North Ward villages			Medium density residential
PB	Picnic Bay			Medium density residential
PBCF	Picnic Bay community facilities			Community facilities
PS	Palmer Street			High density residential
PSP	Park Street			Character residential
PT	Port of Townsville			Specialised centre
PWE	1950s Post War Expansion			Character residential
Q	Queenslanders			Character residential
R	Riverway			Open space
RDC	Rasmussen district centre			District centre
RE	Railway Estate			High density residential
RMII	Roseneath medium impact industry			Medium impact industry
RP	Rossiter Park			Medium density residential
RRRC	Ross River Road corridor			Low density residential
RSLC	Rising Sun local centre			Local centre
S	The Strand			Medium density residential
ST	Stables			Low density residential
STP	South Townsville			Character residential
STRD	South Townsville railyards and Dean Park			Mixed use
TCMC	Thuringowa Central major centre	**TCS**	Thuringowa centre support	Major centre
TCMC	Thuringowa Central major centre	**TD**	Thuringowa Drive	Major centre
TCMC	Thuringowa Central major centre	**TTCH**	Thuringowa town centre heart	Major centre
TCMC	Thuringowa Central major centre	**W**	Willows	Major centre
TE	Thuringowa East			Medium density residential
TS	Thuringowa South			Medium density residential
WC	Workers Cottages			Character residential
WLS	Wills Street			Medium Density Residential
WS	Wotton Street			Mixed use

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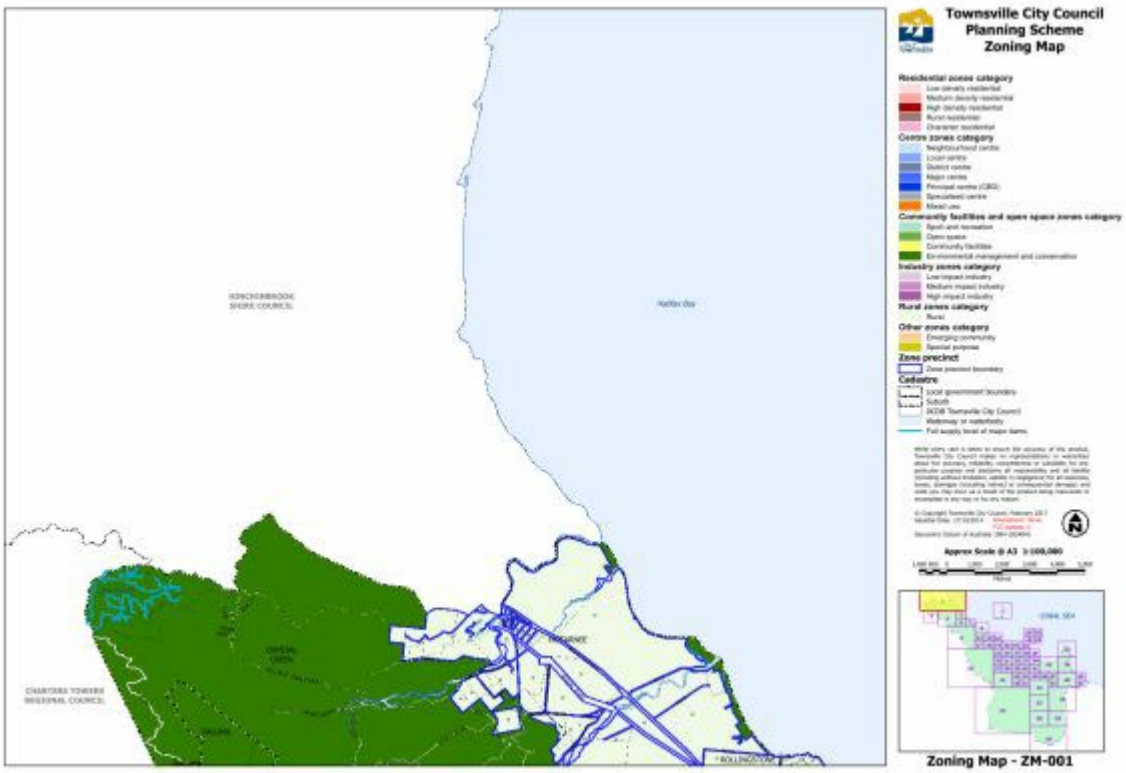

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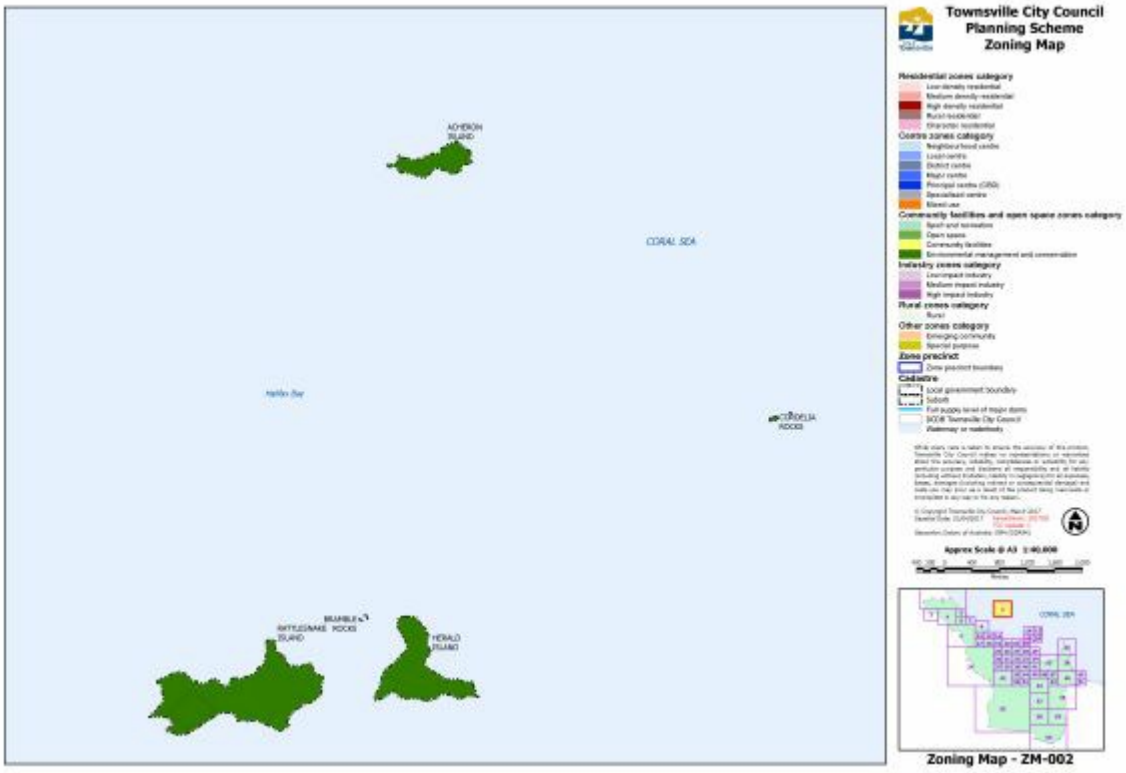
Zoning Map ZM-001



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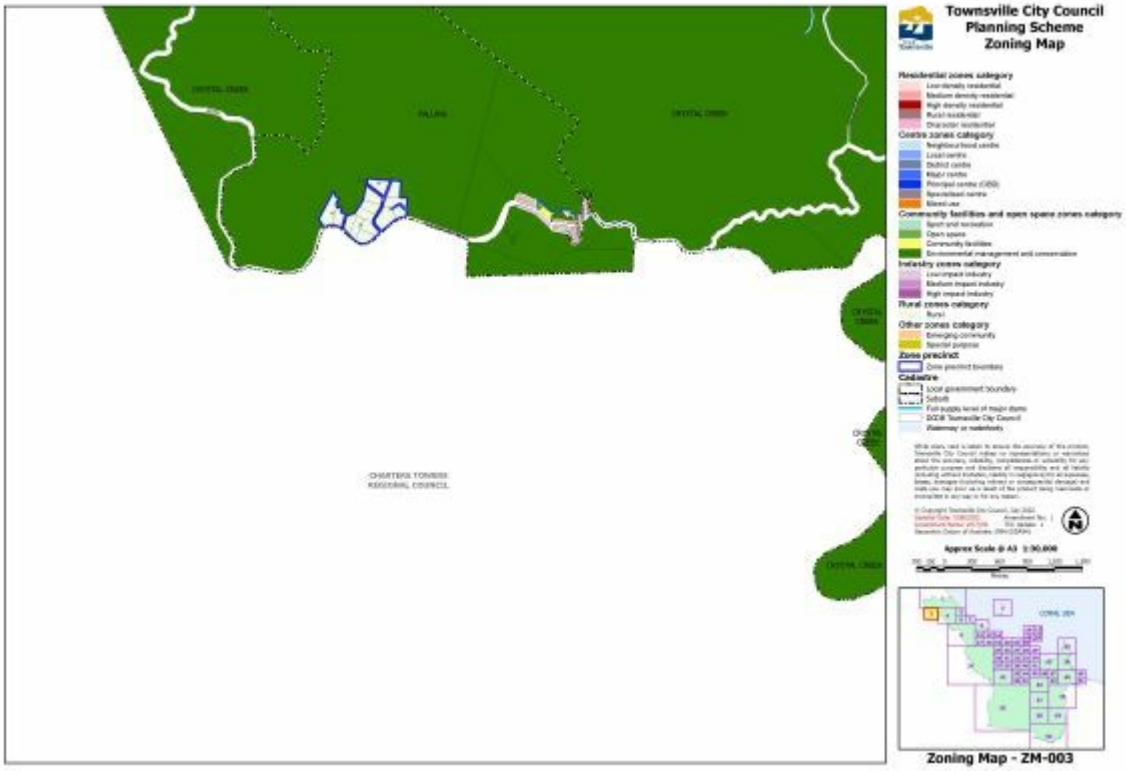
Zoning Map ZM-002



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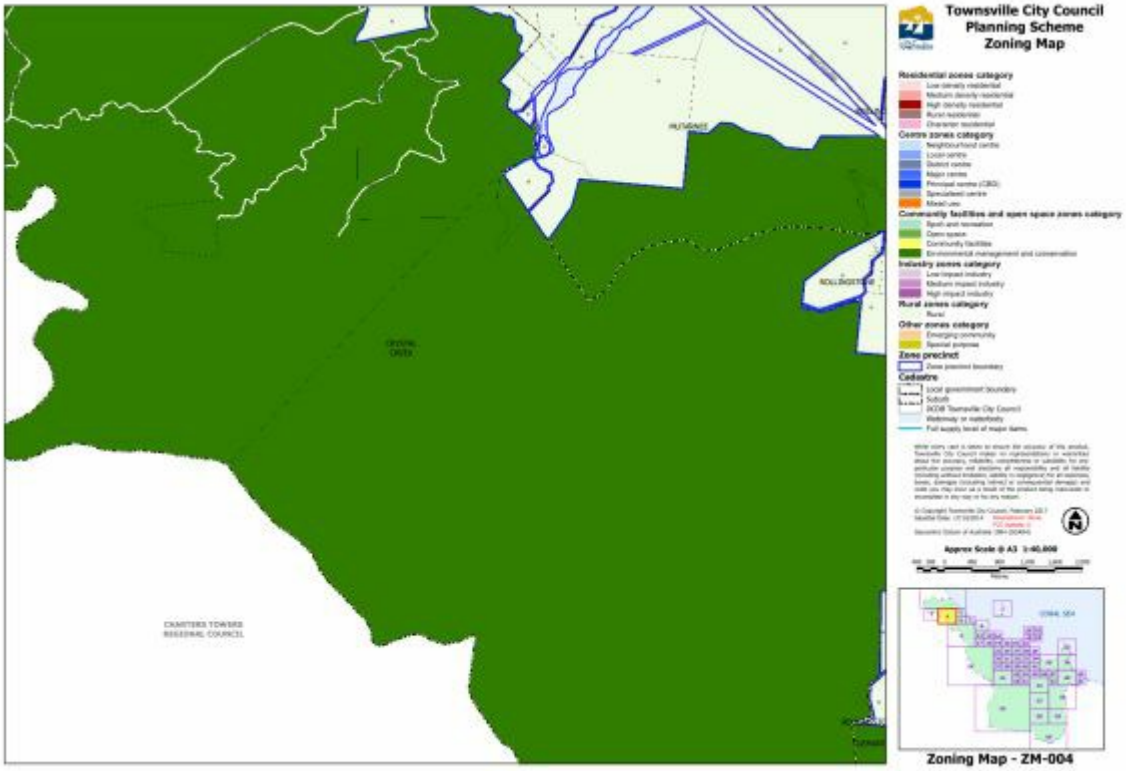
Zoning Map ZM-003



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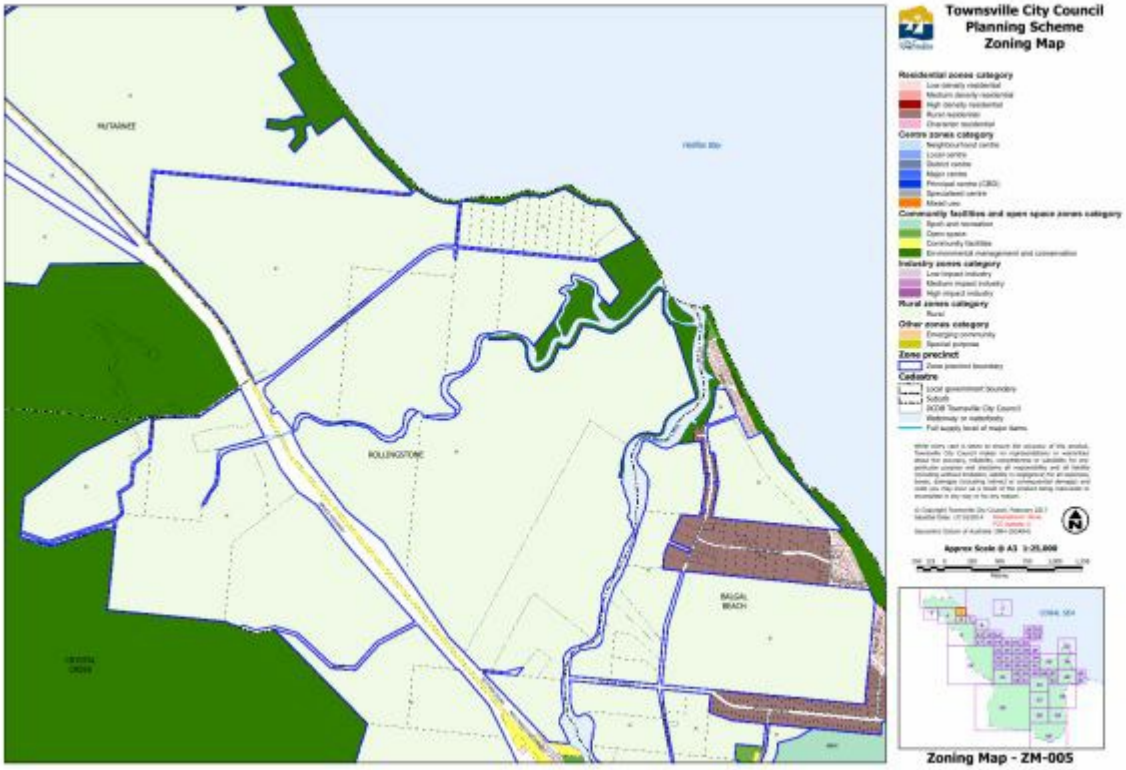
Zoning Map ZM-004



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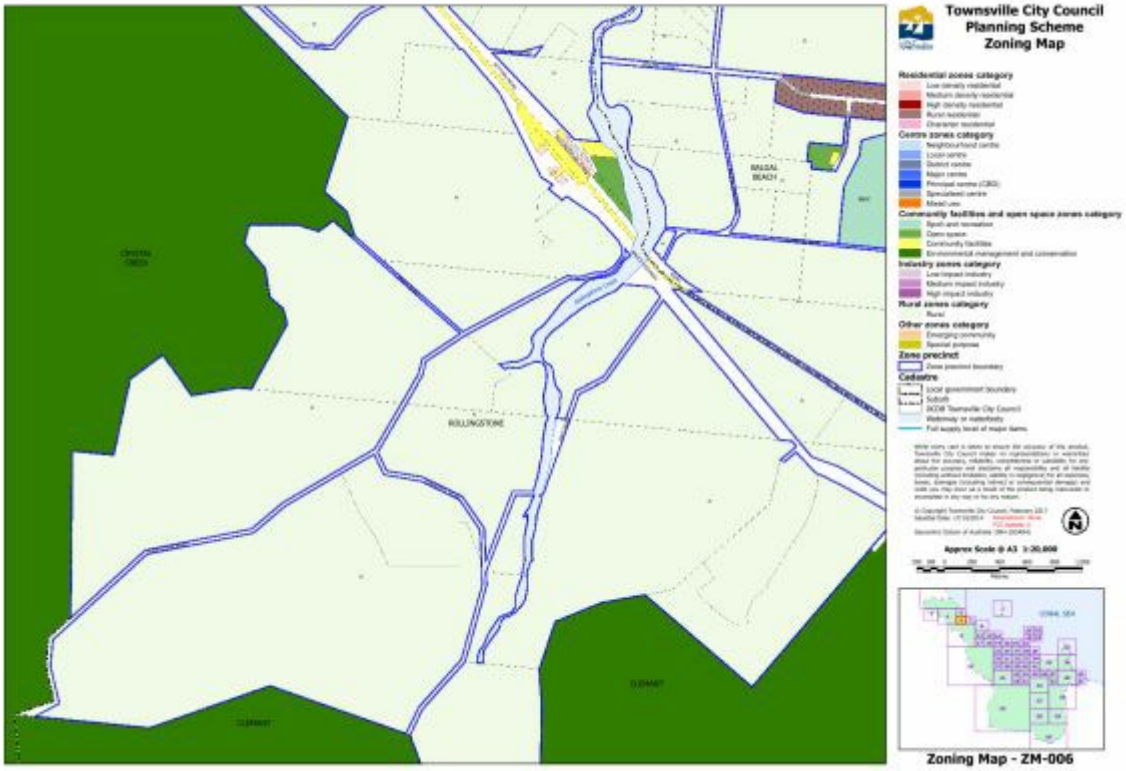
Zoning Map ZM-005



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Zoning Map ZM-006

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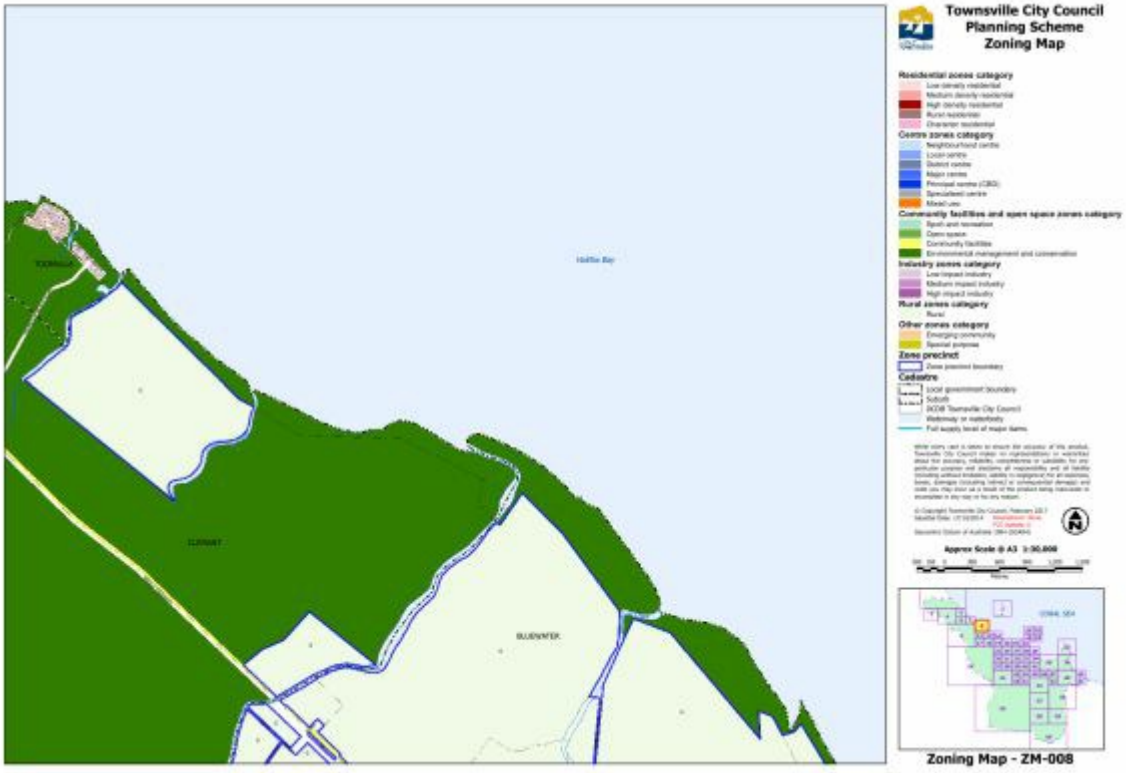
Zoning Map ZM-007



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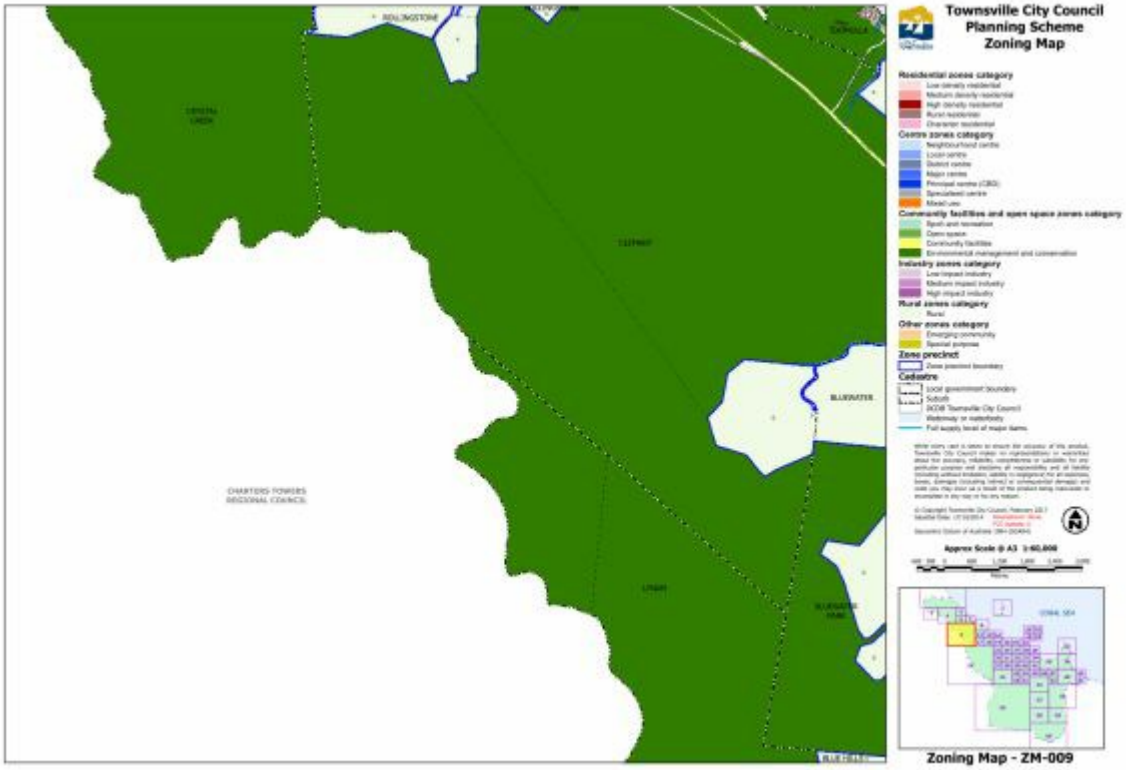
Zoning Map ZM-008



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Zoning Map ZM-009

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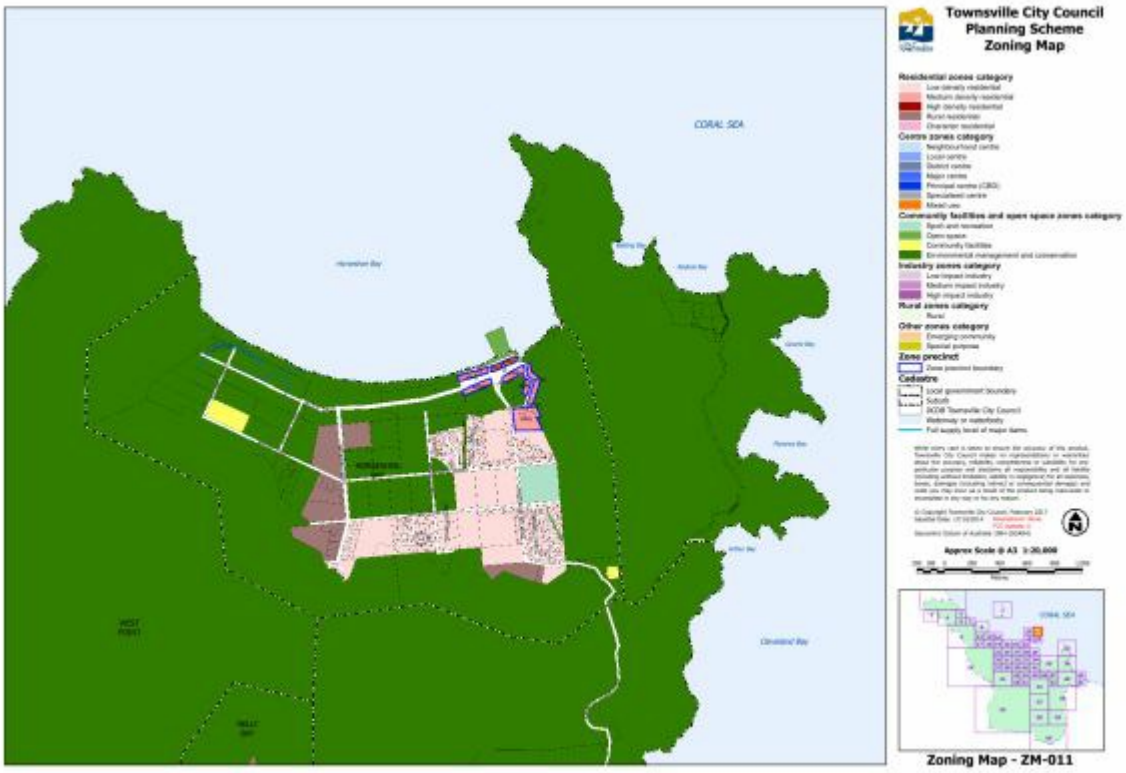
Zoning Map ZM-010



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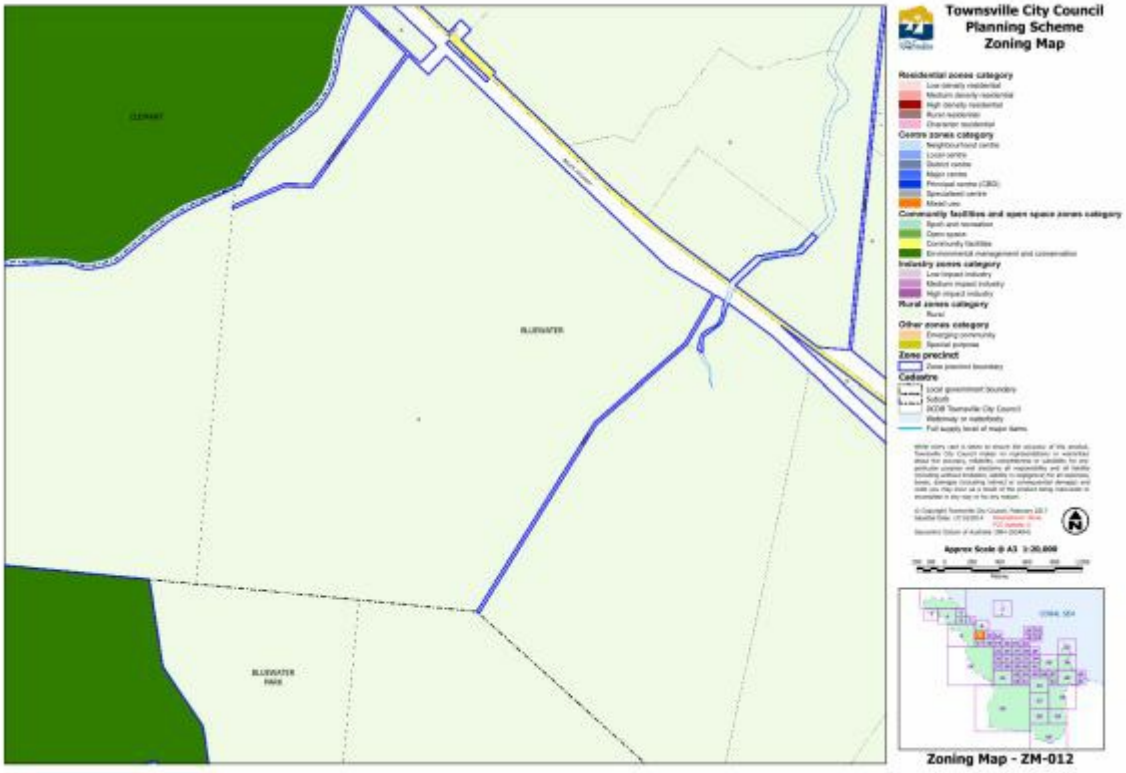
Zoning Map ZM-011



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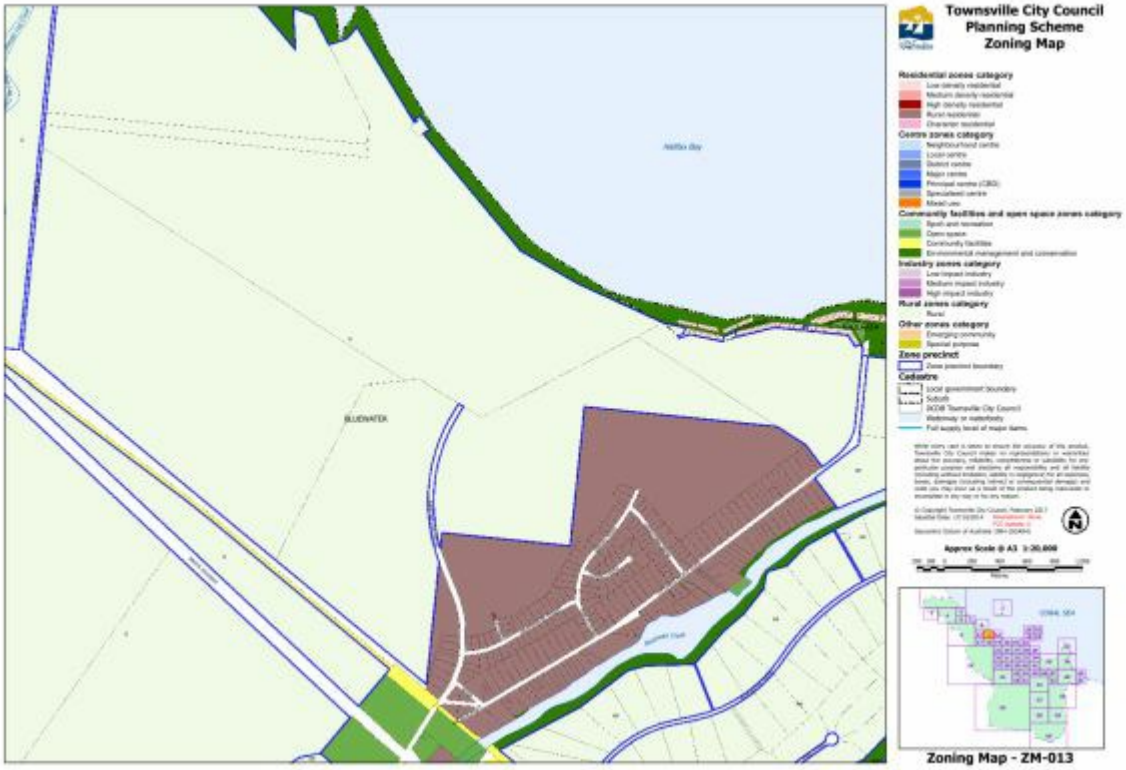
Zoning Map ZM-012



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Zoning Map ZM-013

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Zoning Map ZM-014

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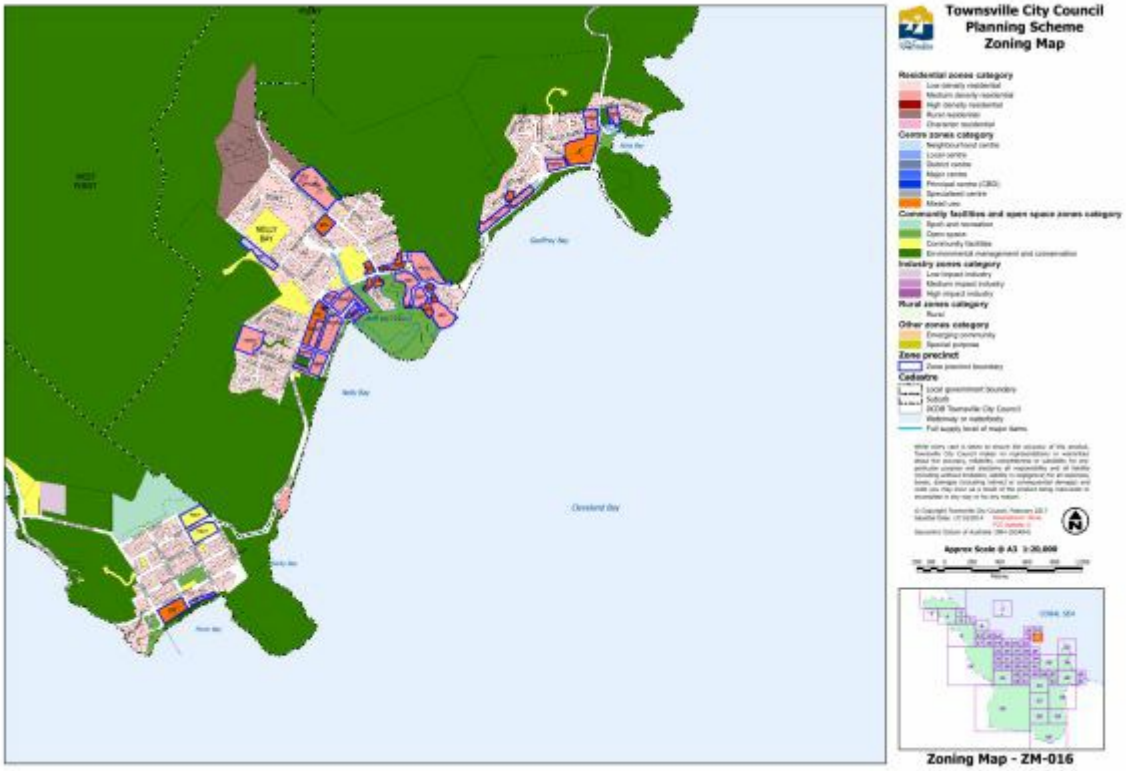
Zoning Map ZM-015



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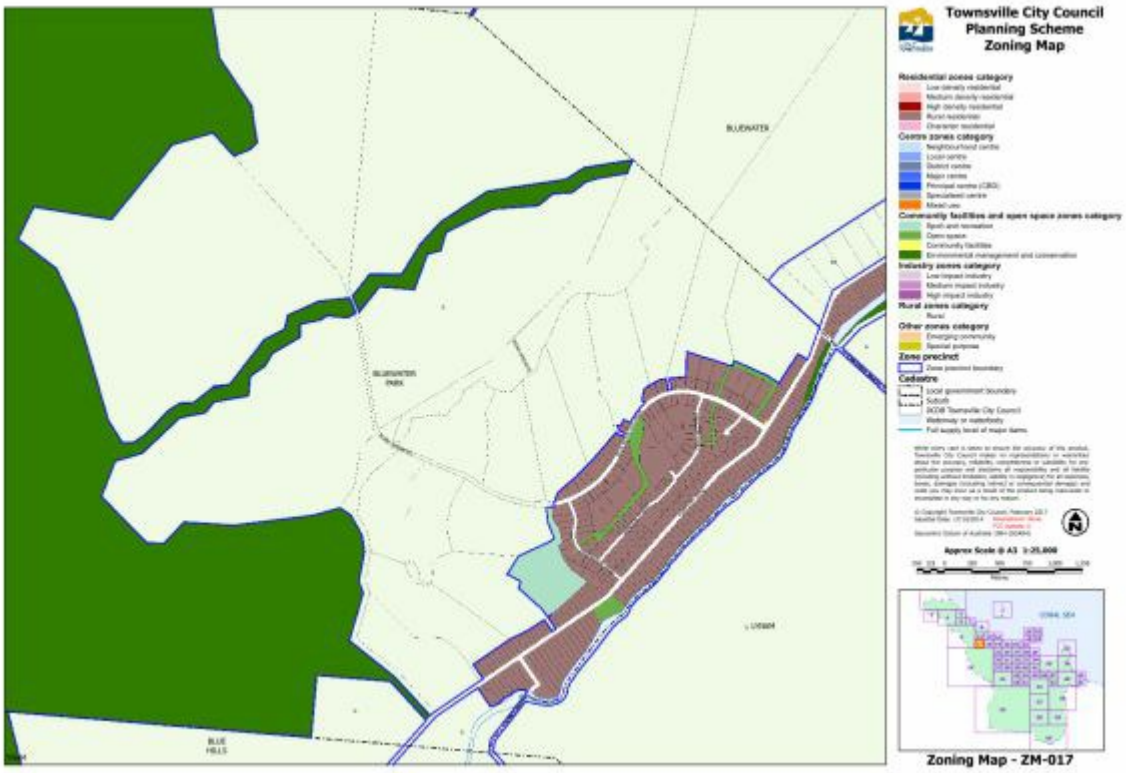
Zoning Map ZM-016



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Zoning Map ZM-017

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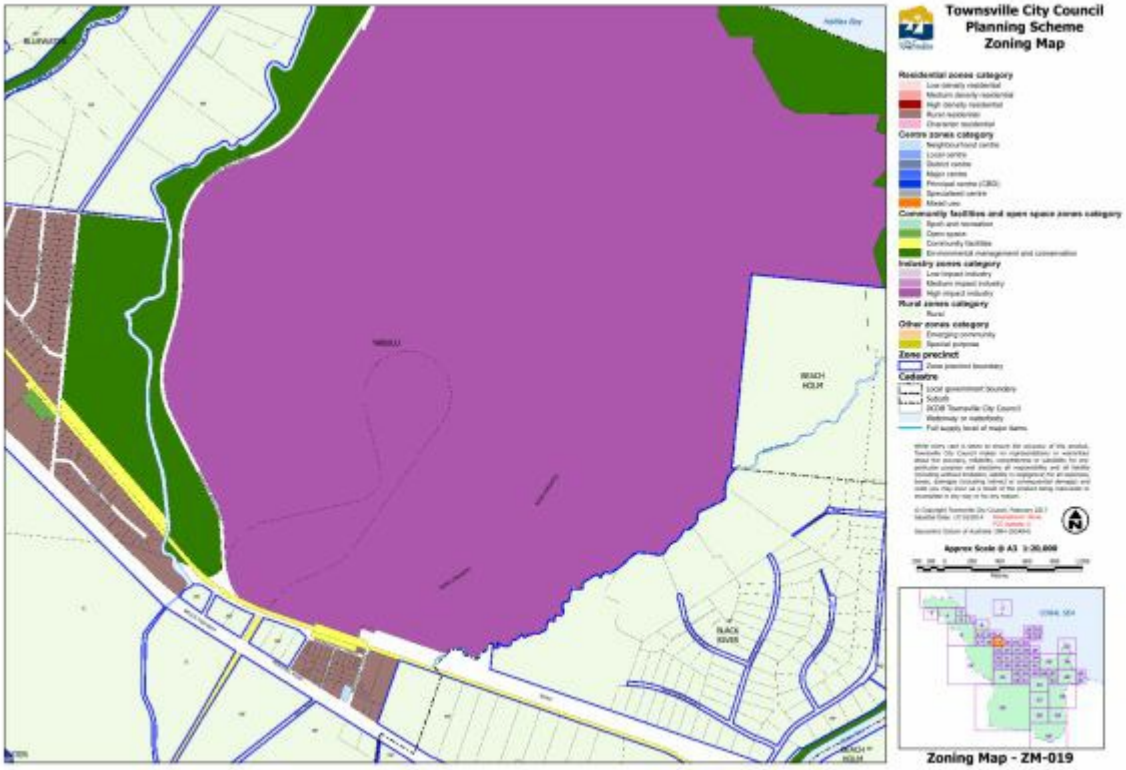
Zoning Map ZM-018



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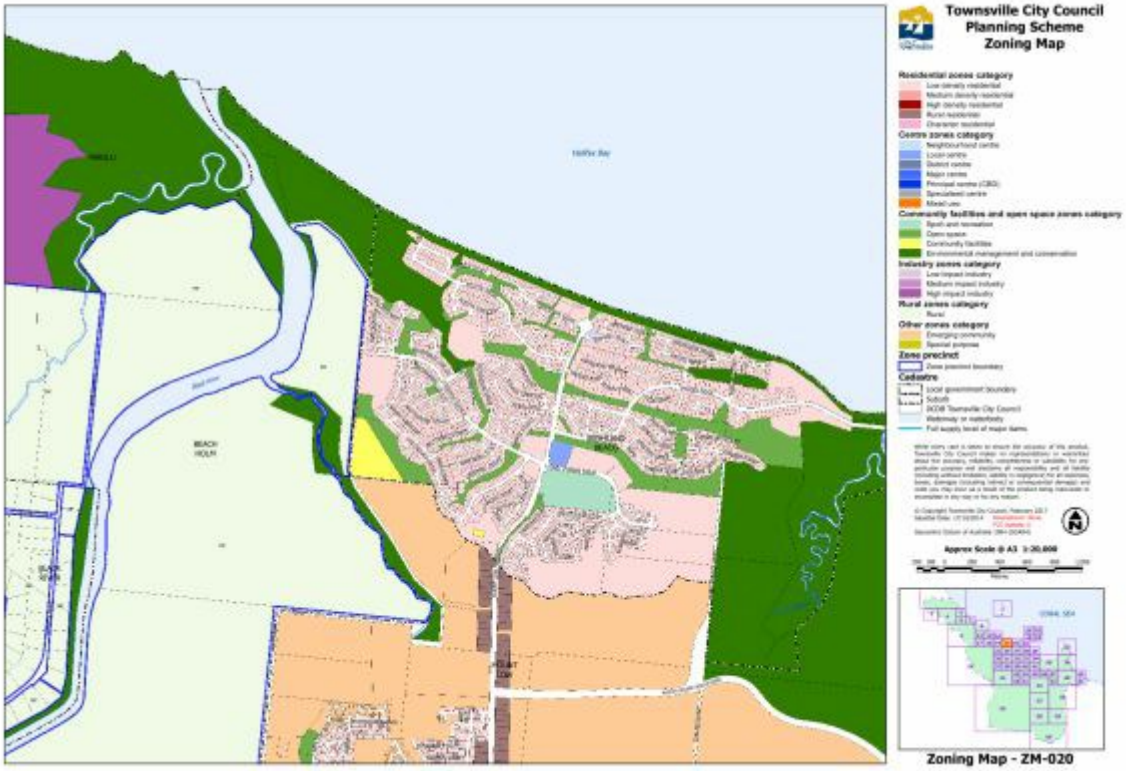

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Zoning Map ZM-020

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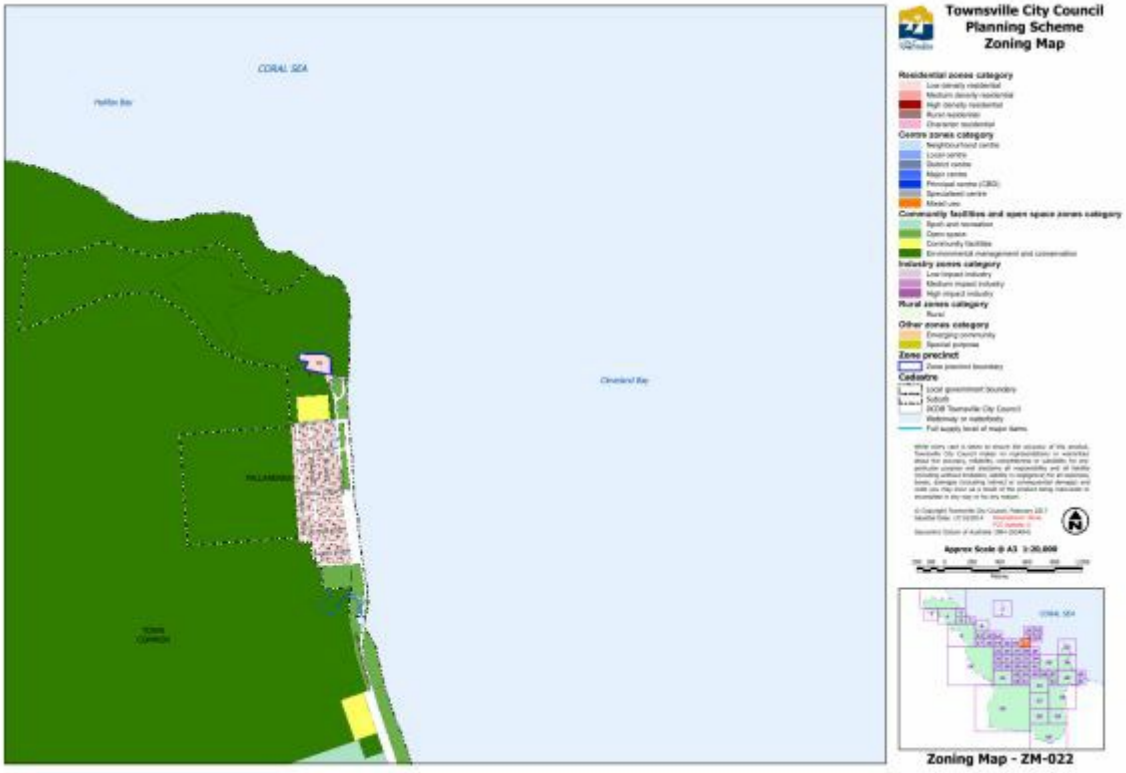
Zoning Map ZM-021



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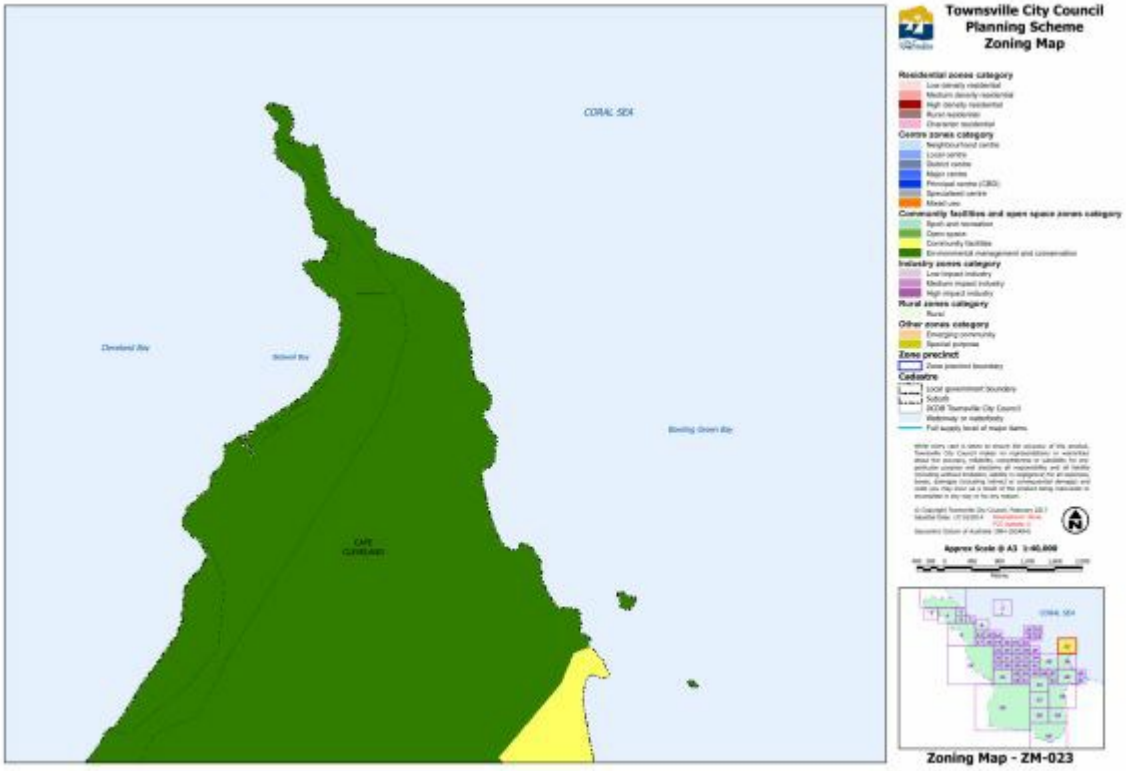

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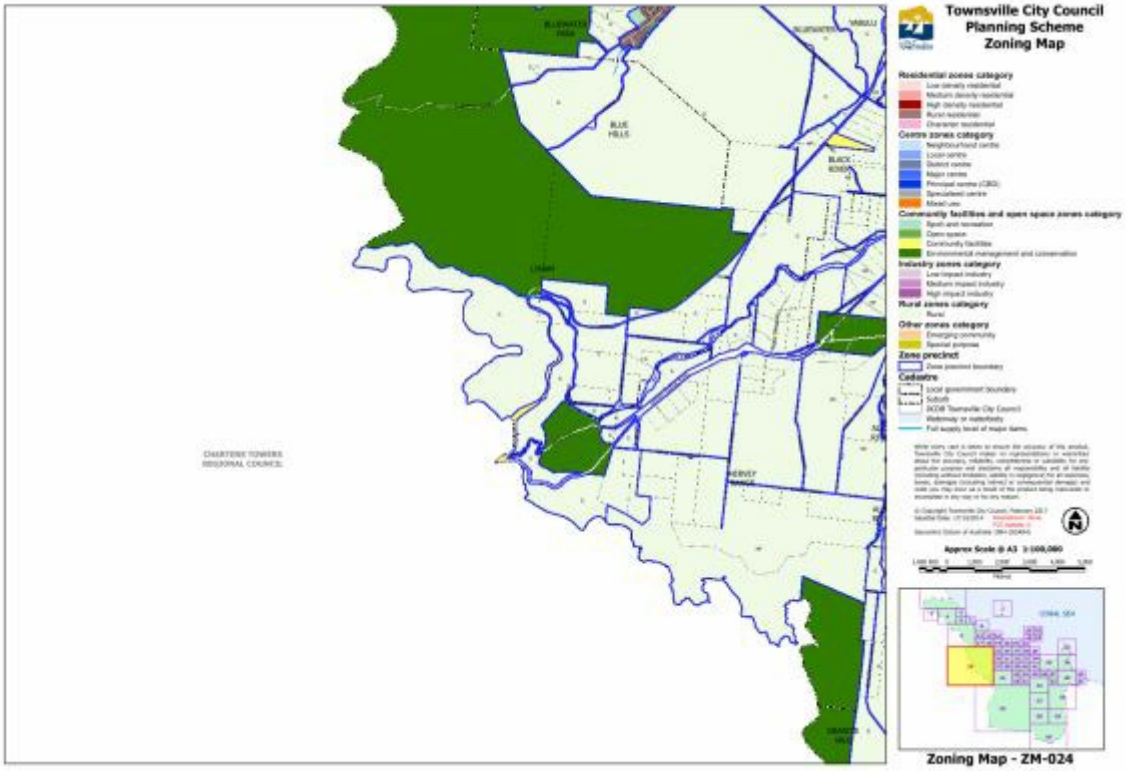

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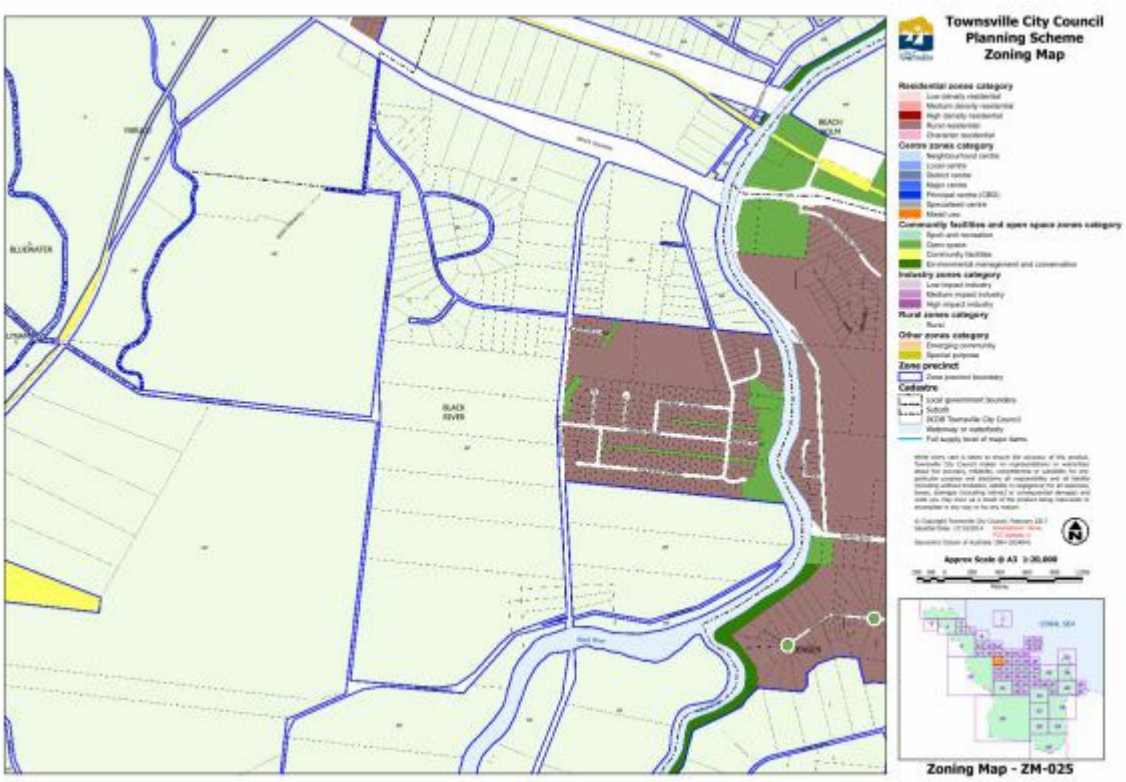

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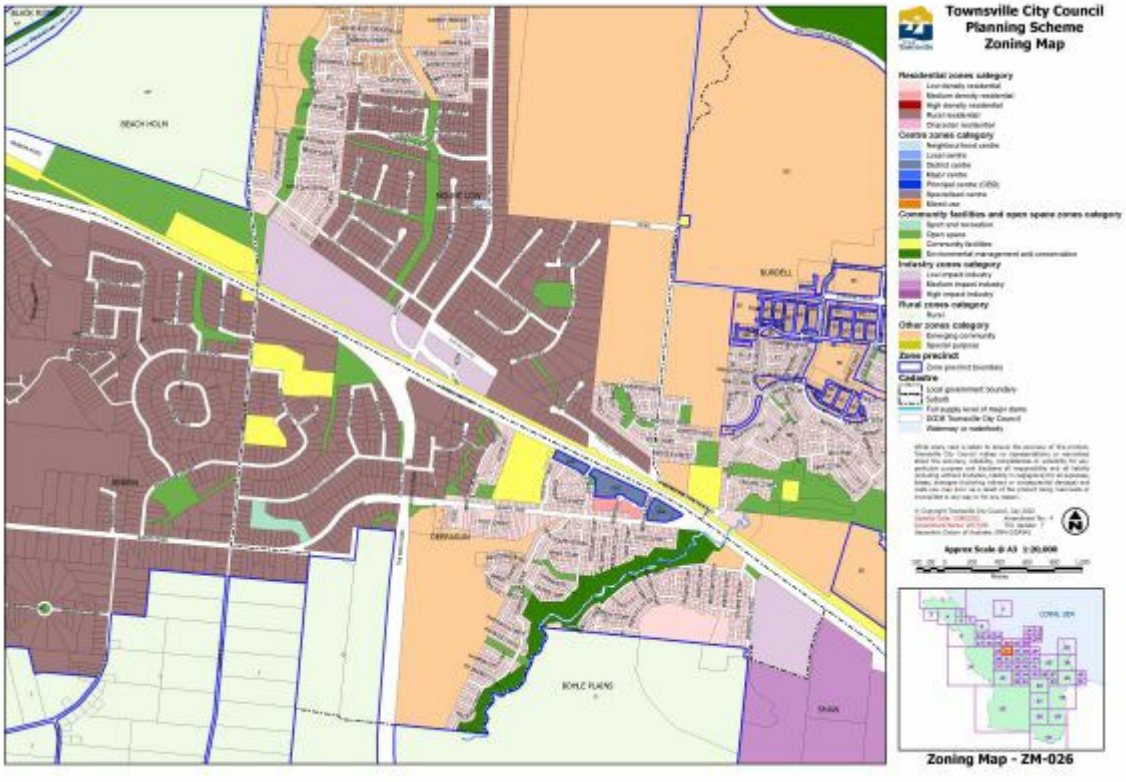

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Zoning Map ZM-026

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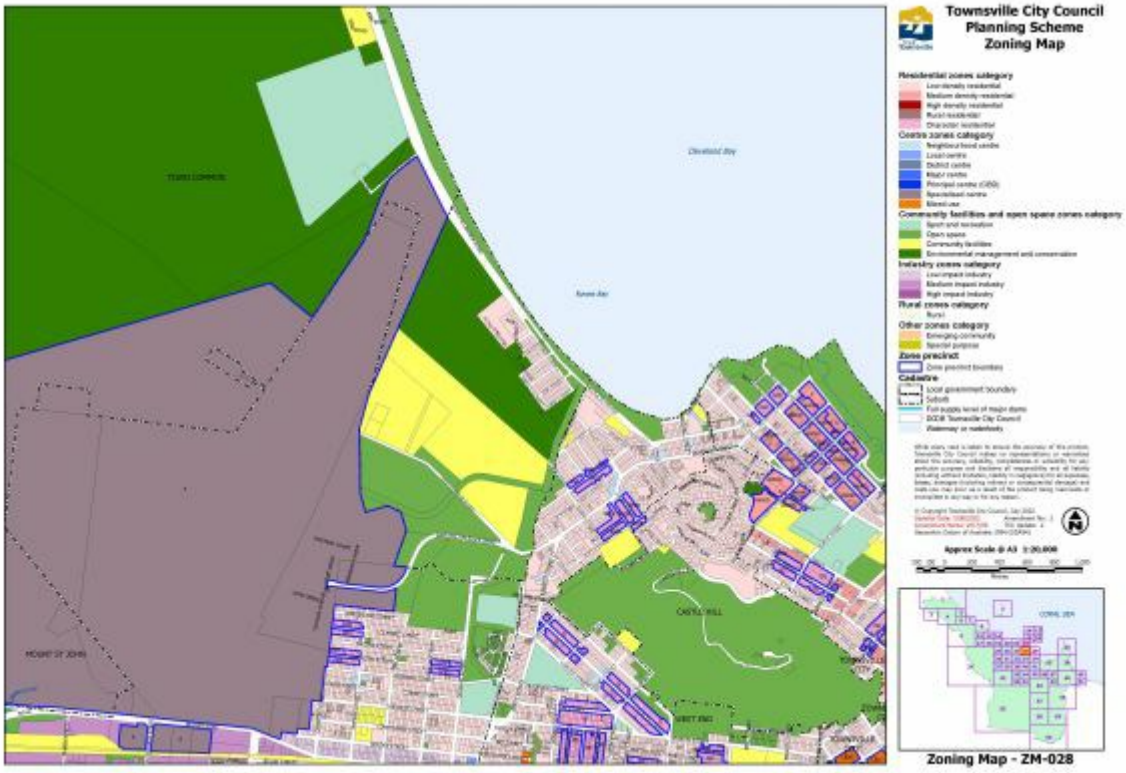

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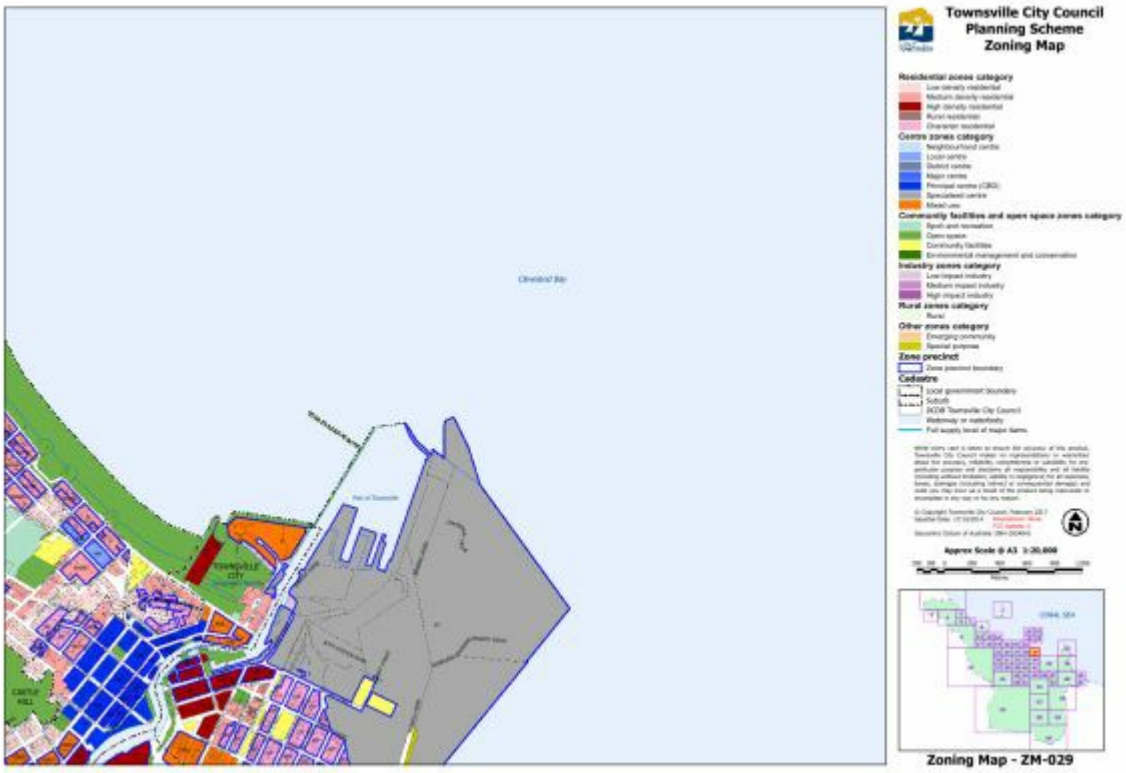

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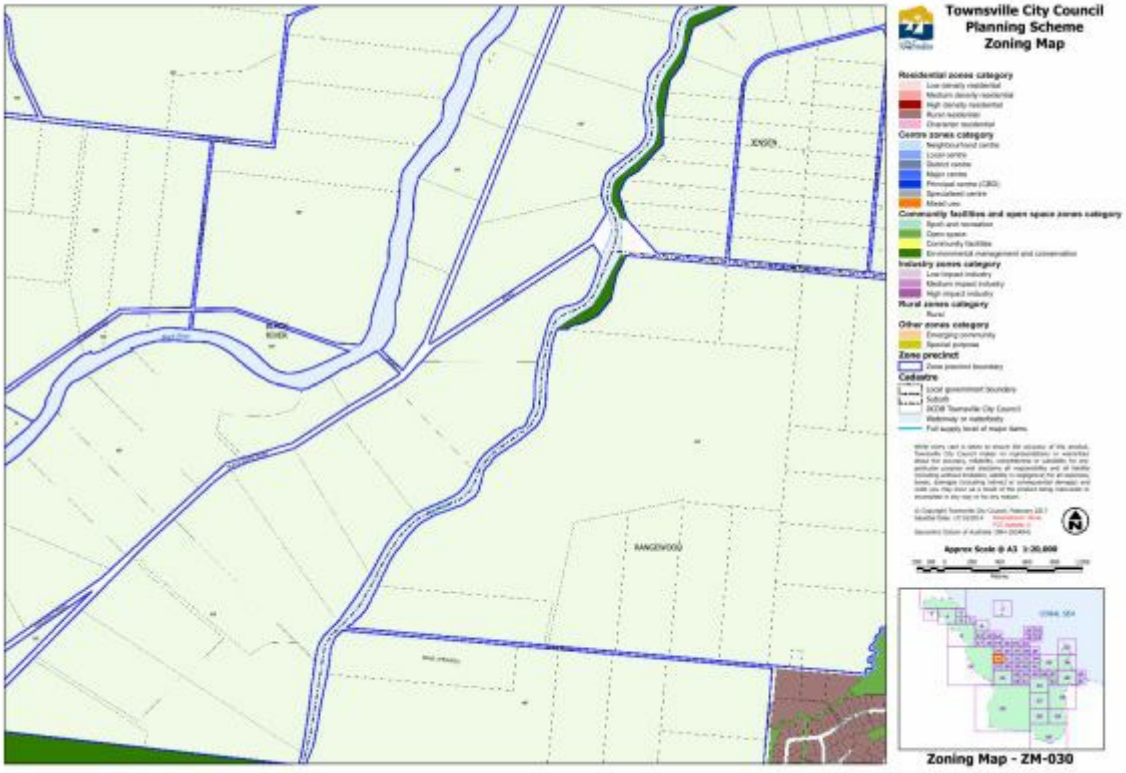

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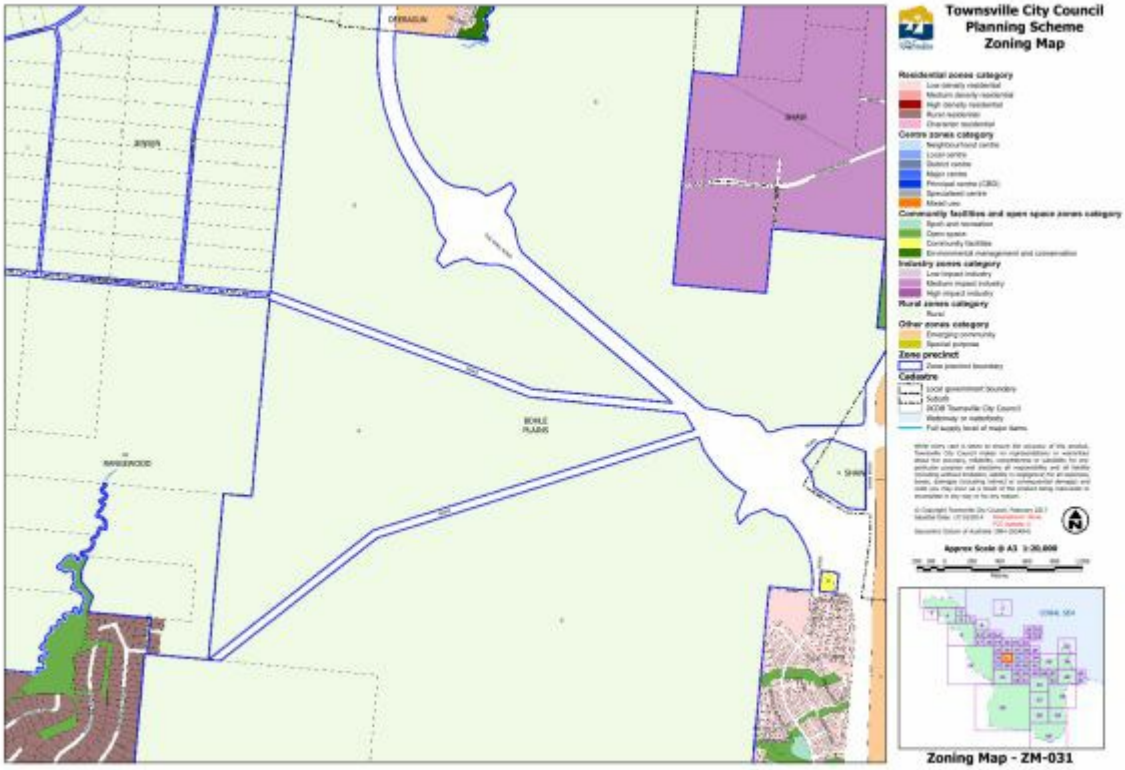

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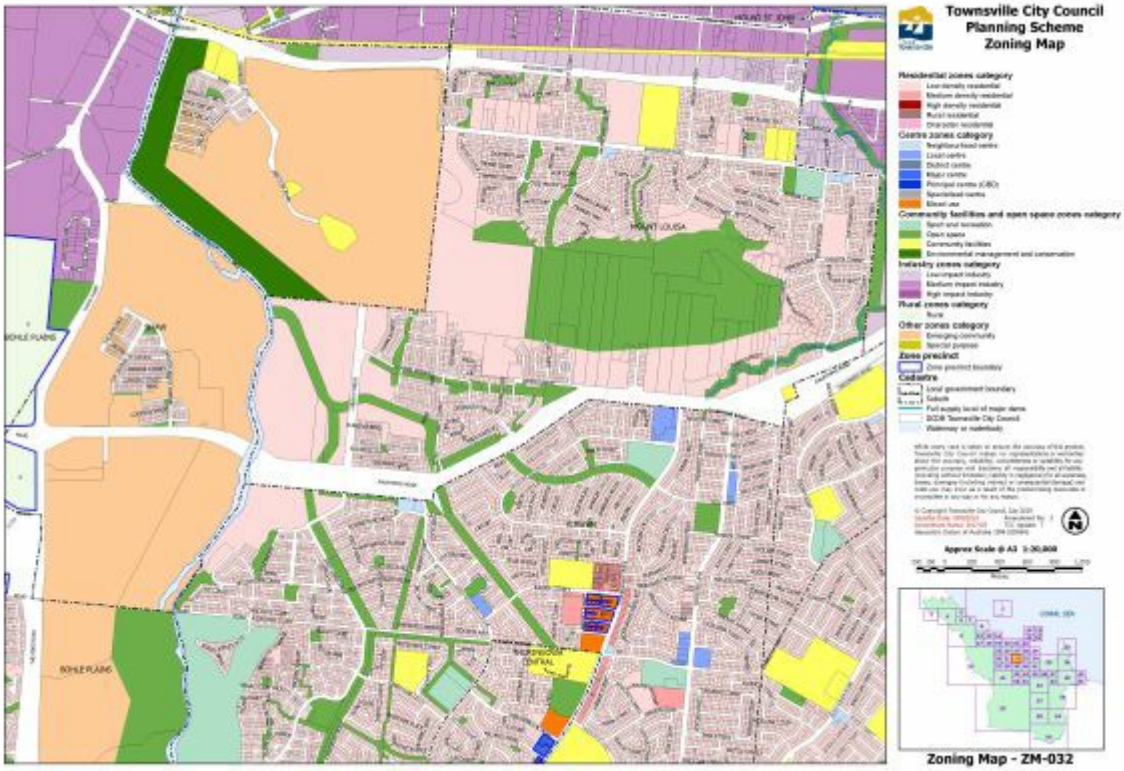

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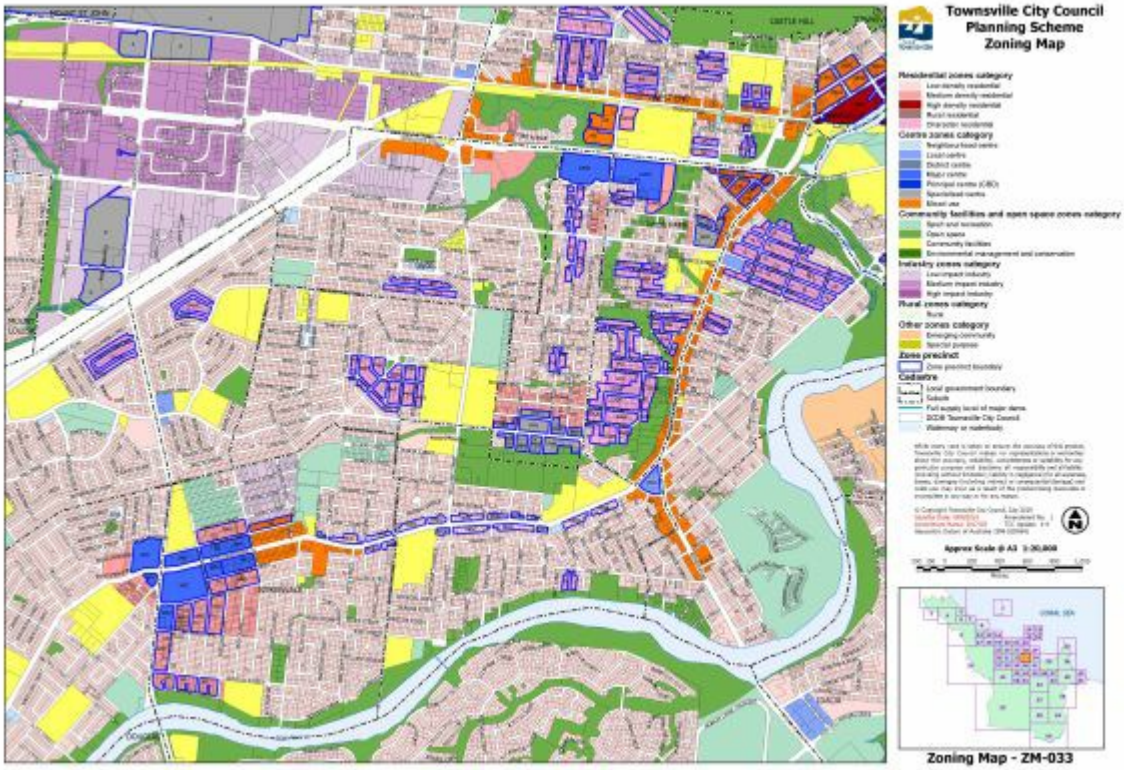

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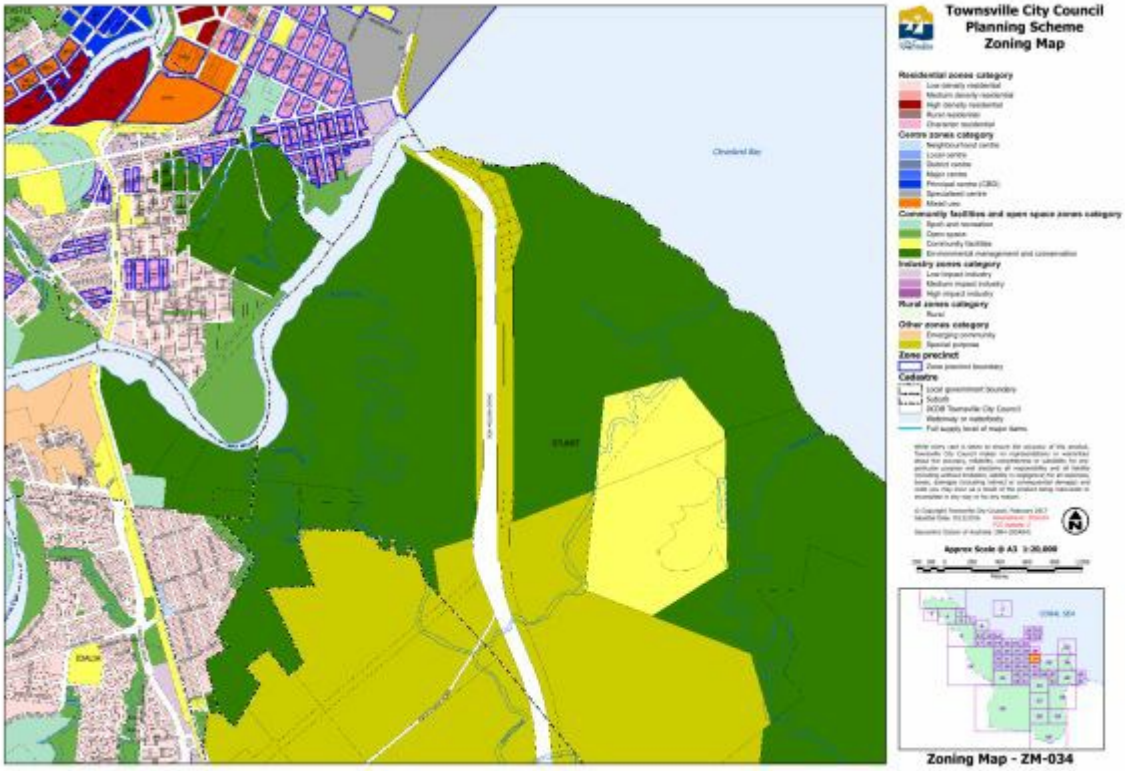

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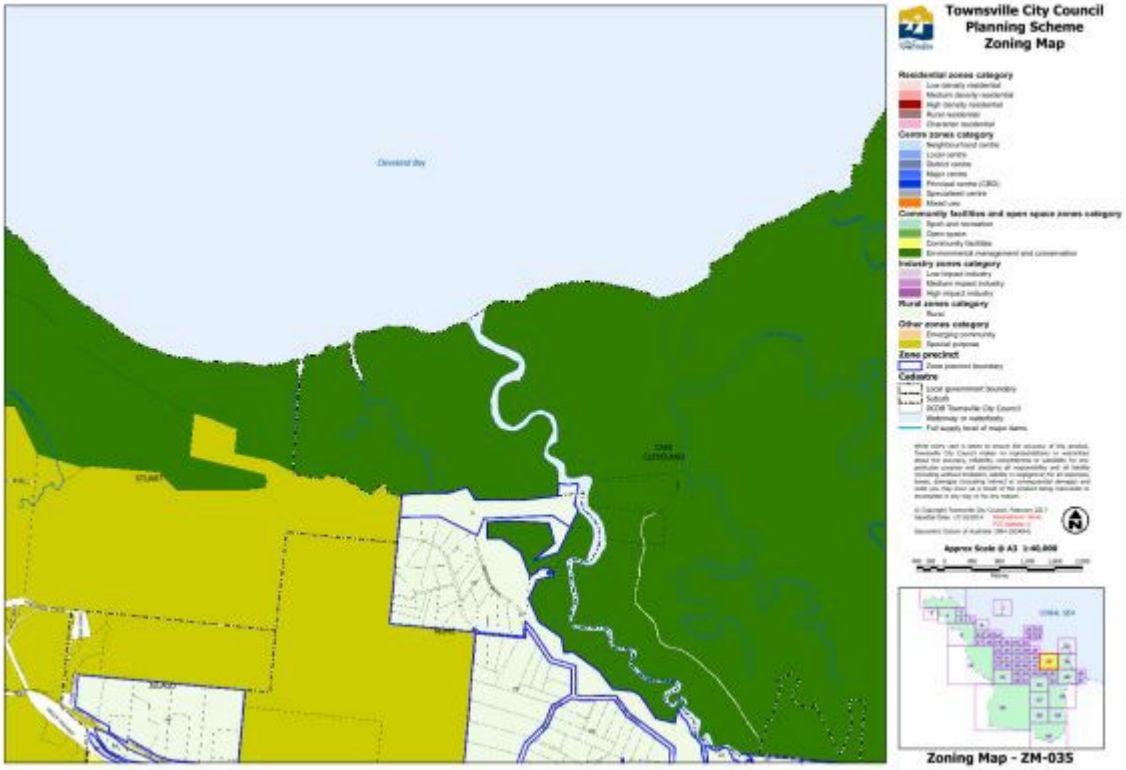

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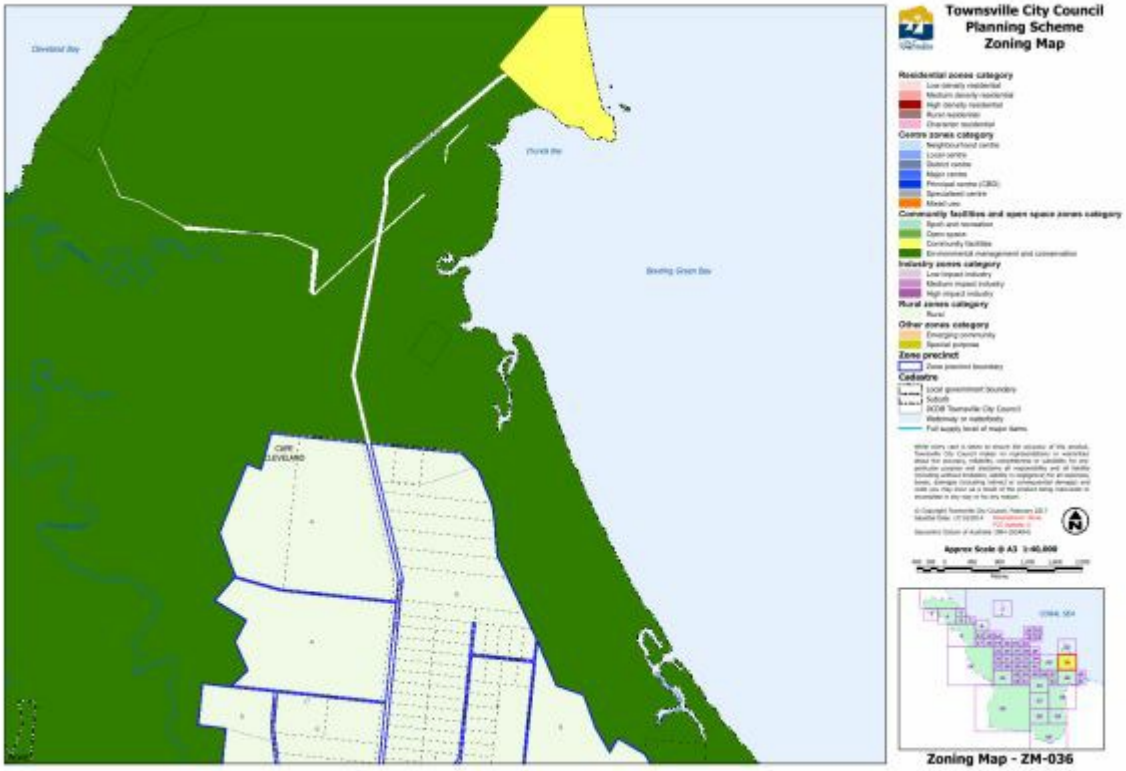

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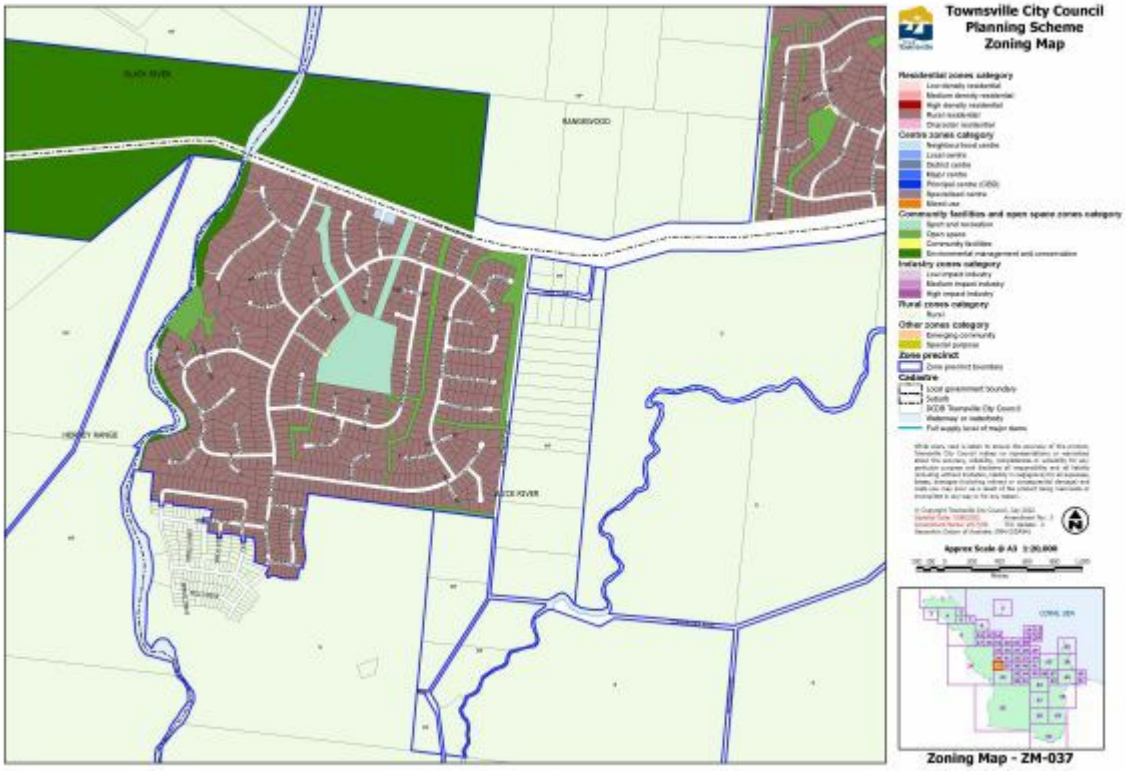

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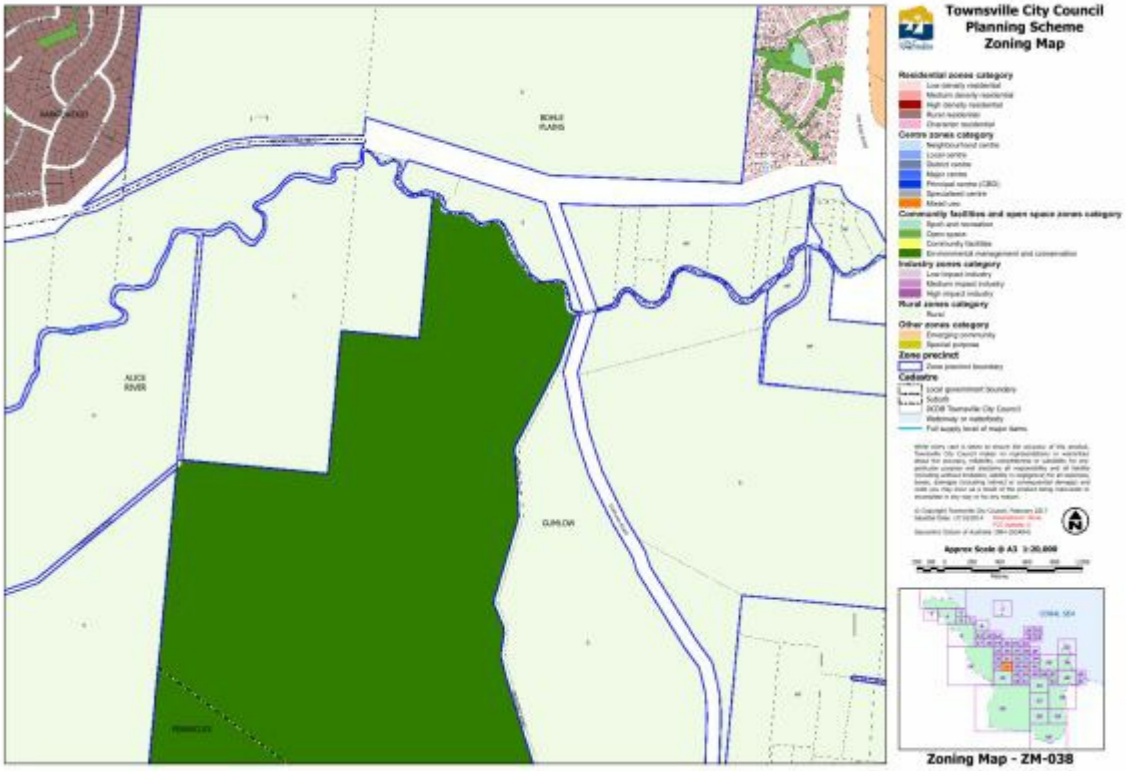

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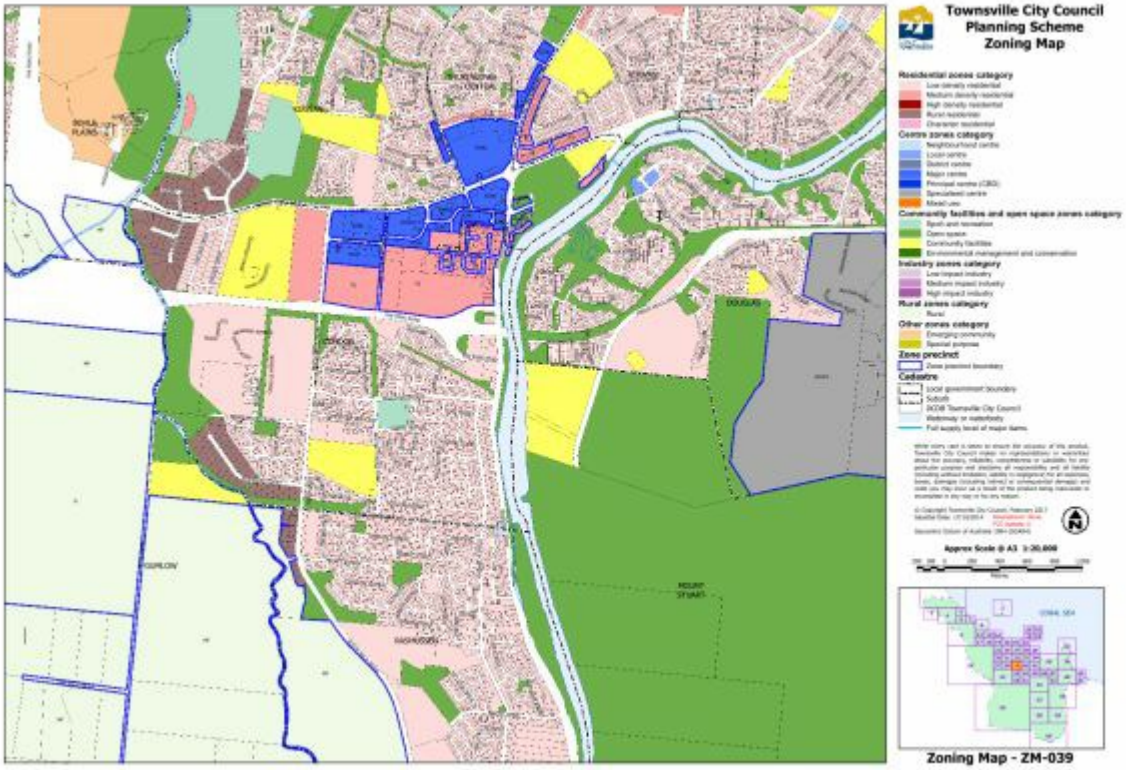

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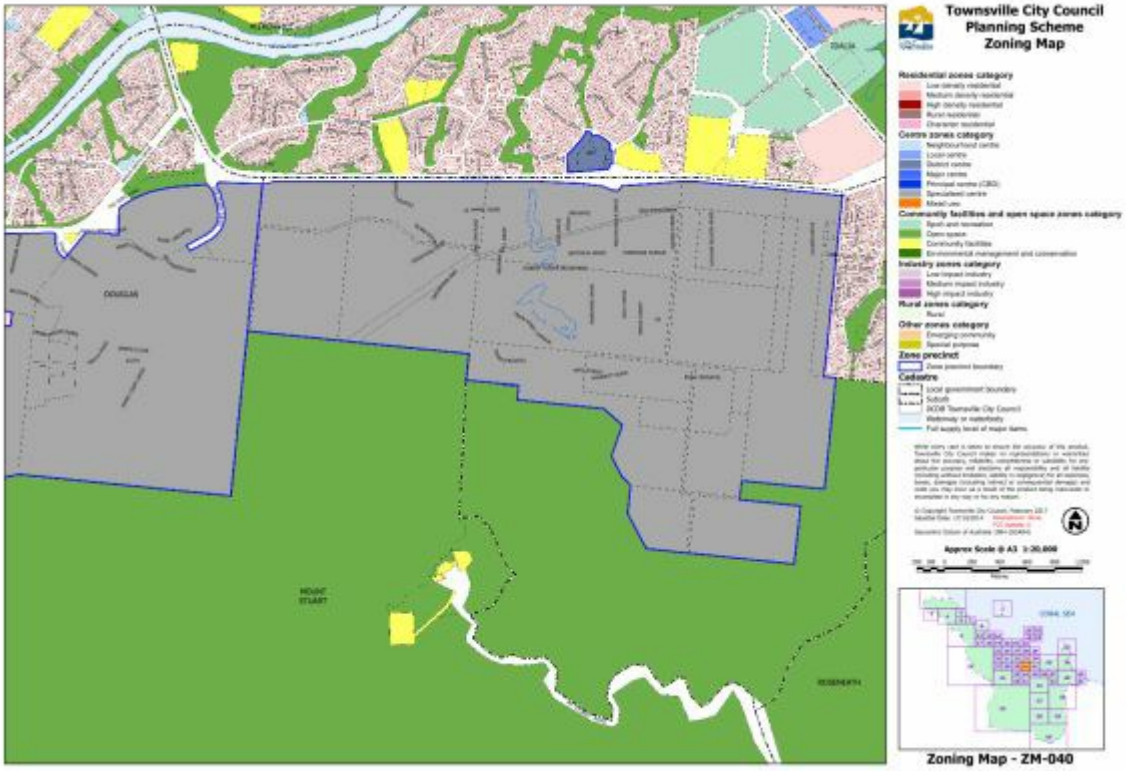

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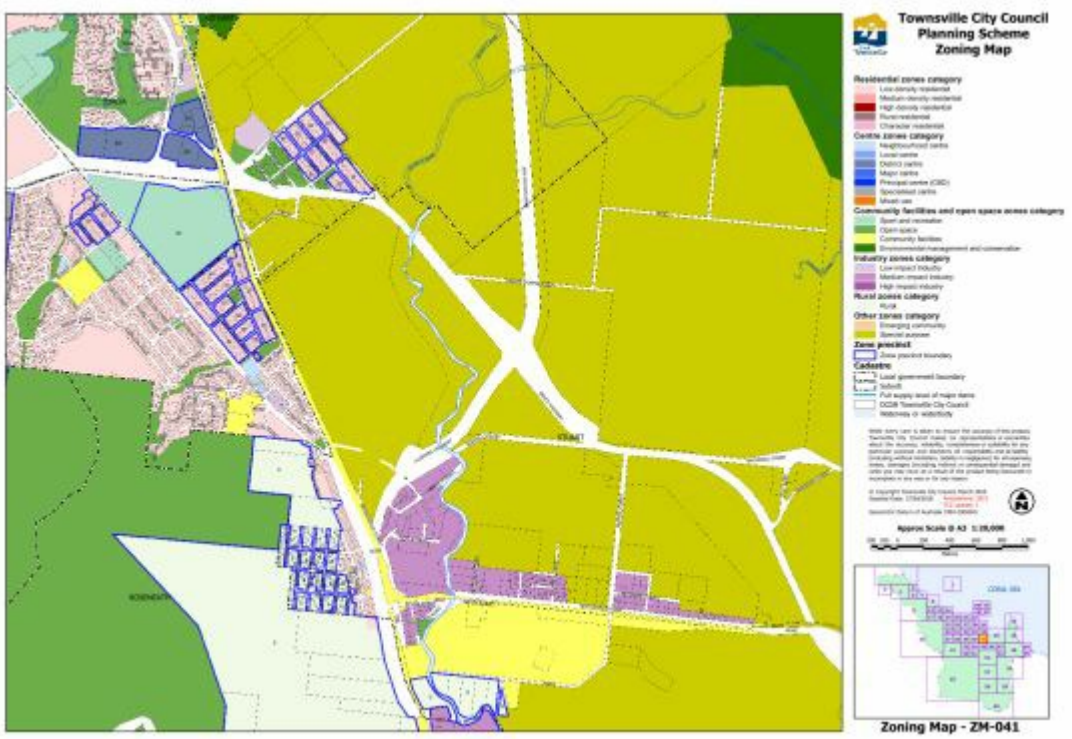

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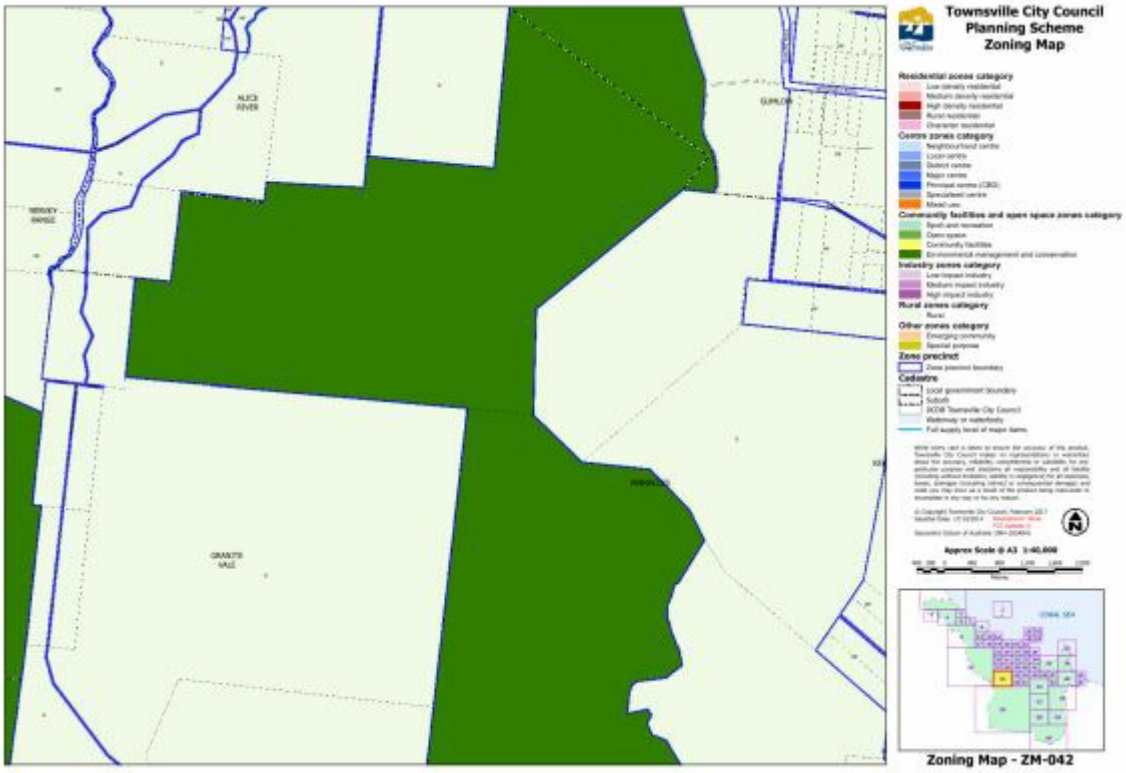

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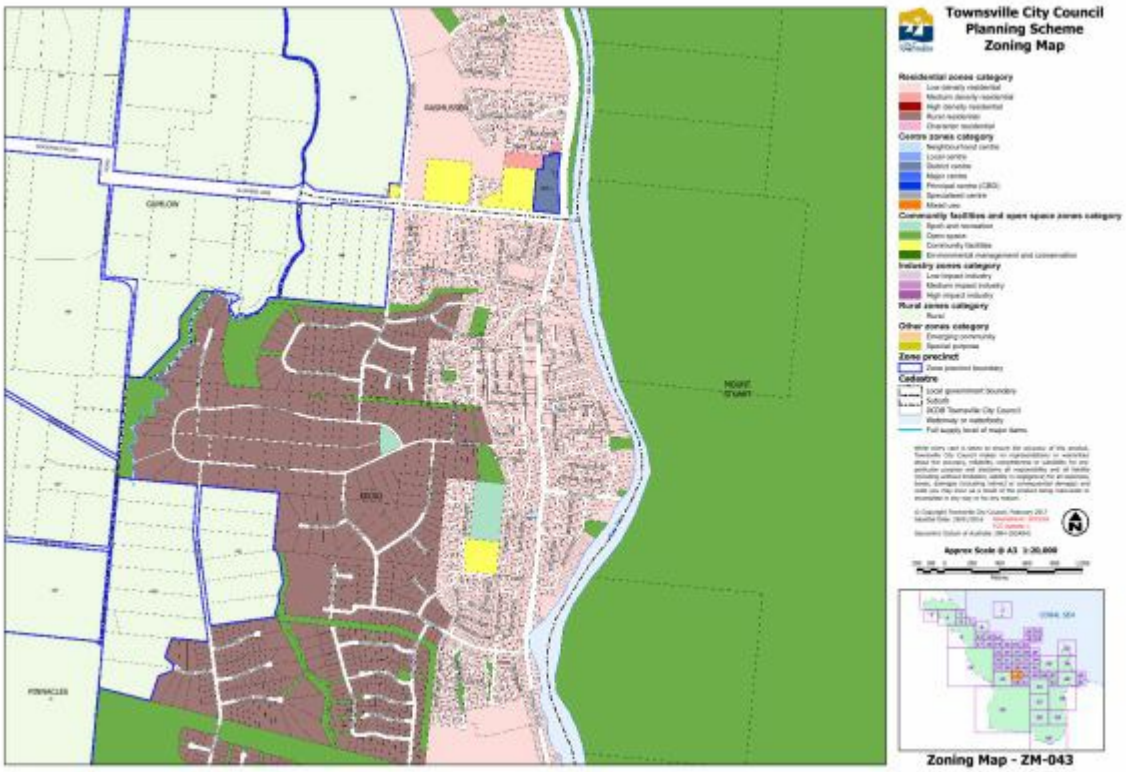

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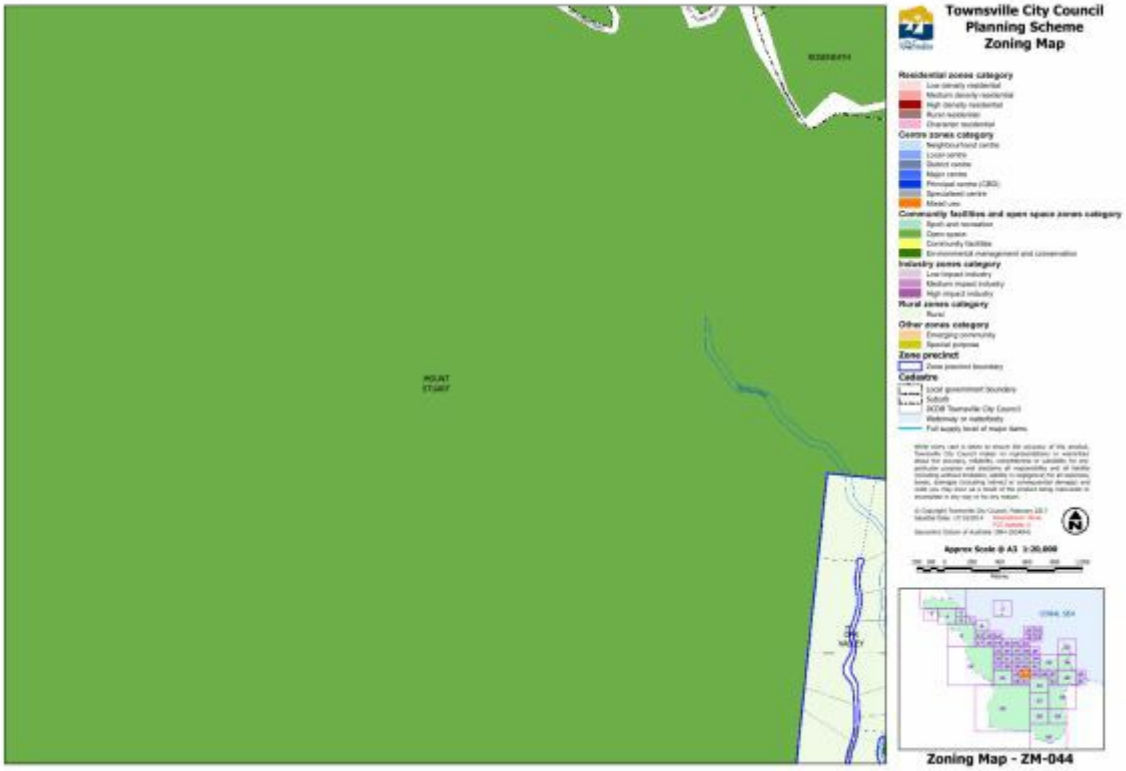

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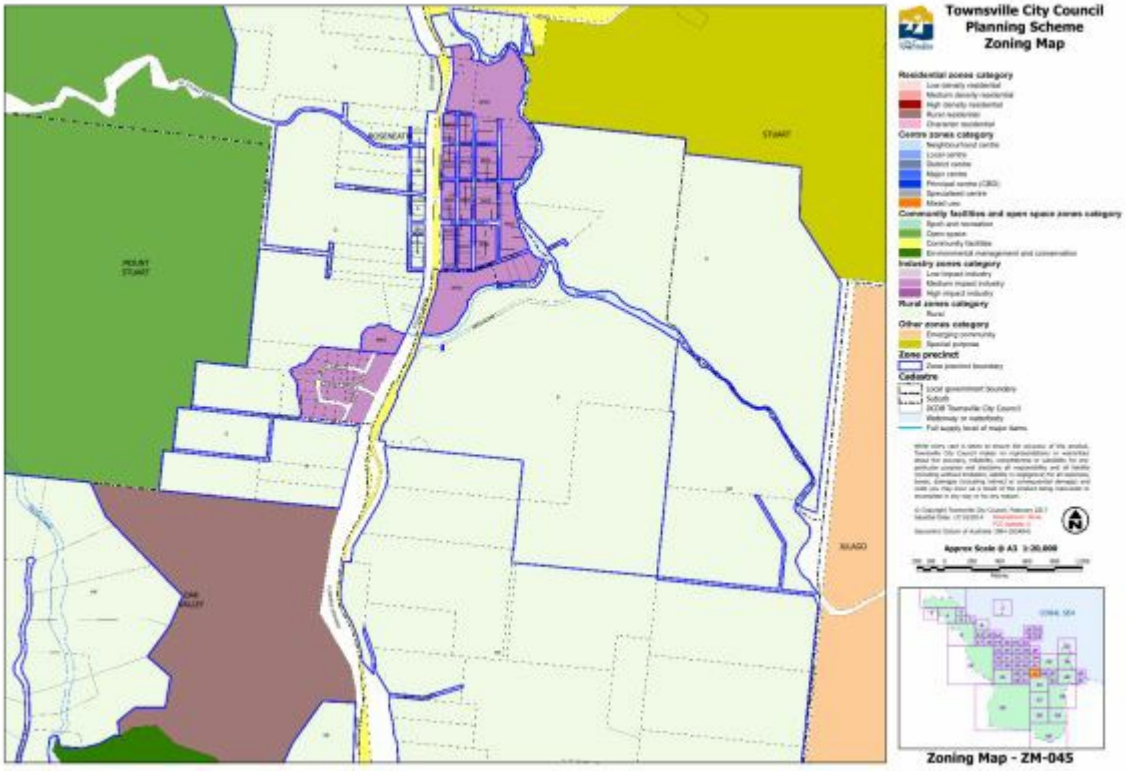

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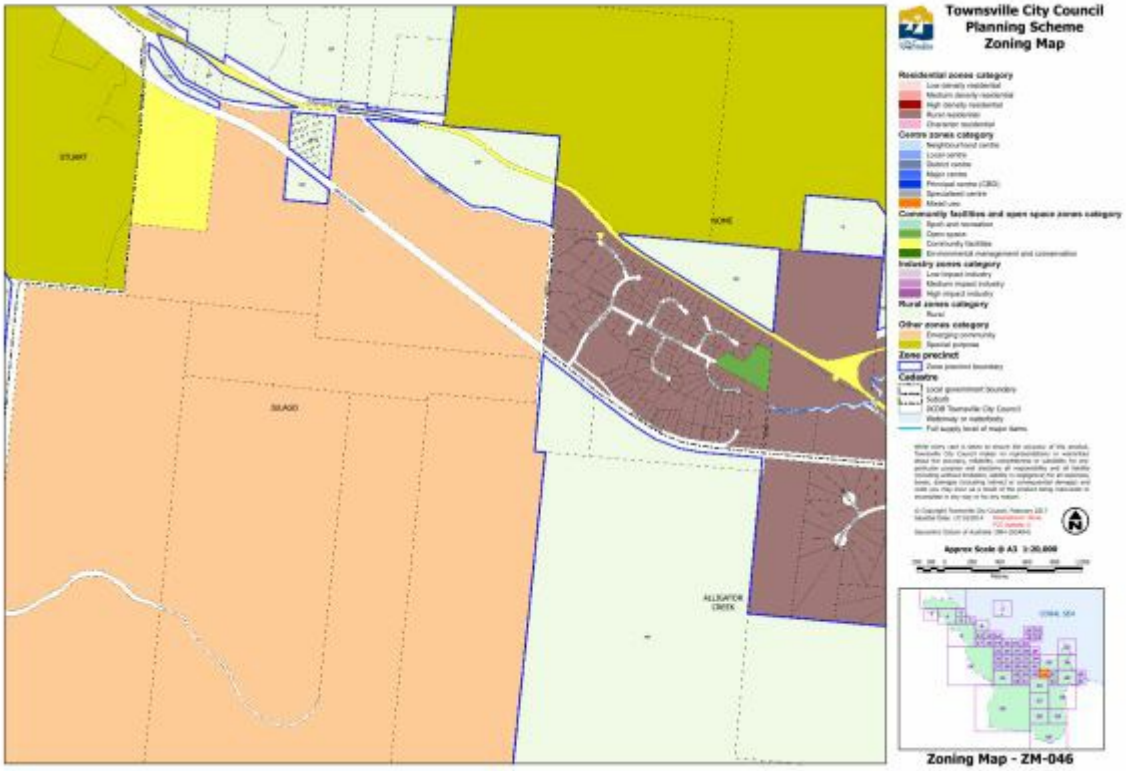

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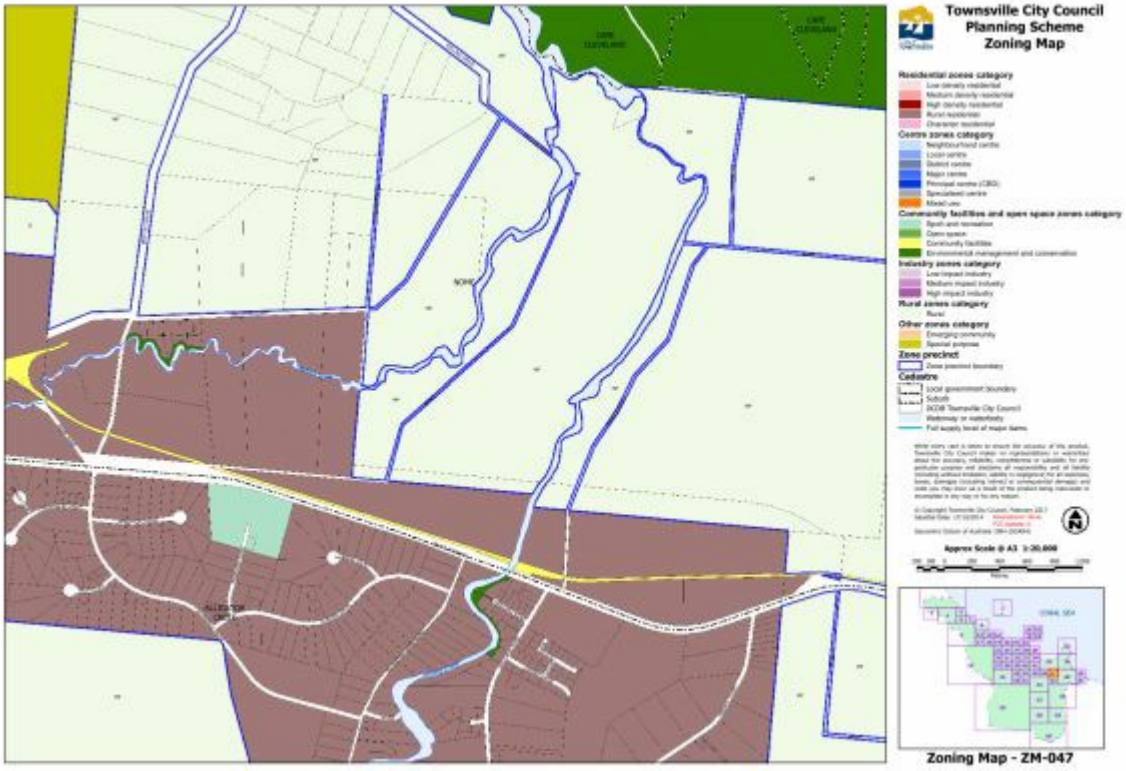

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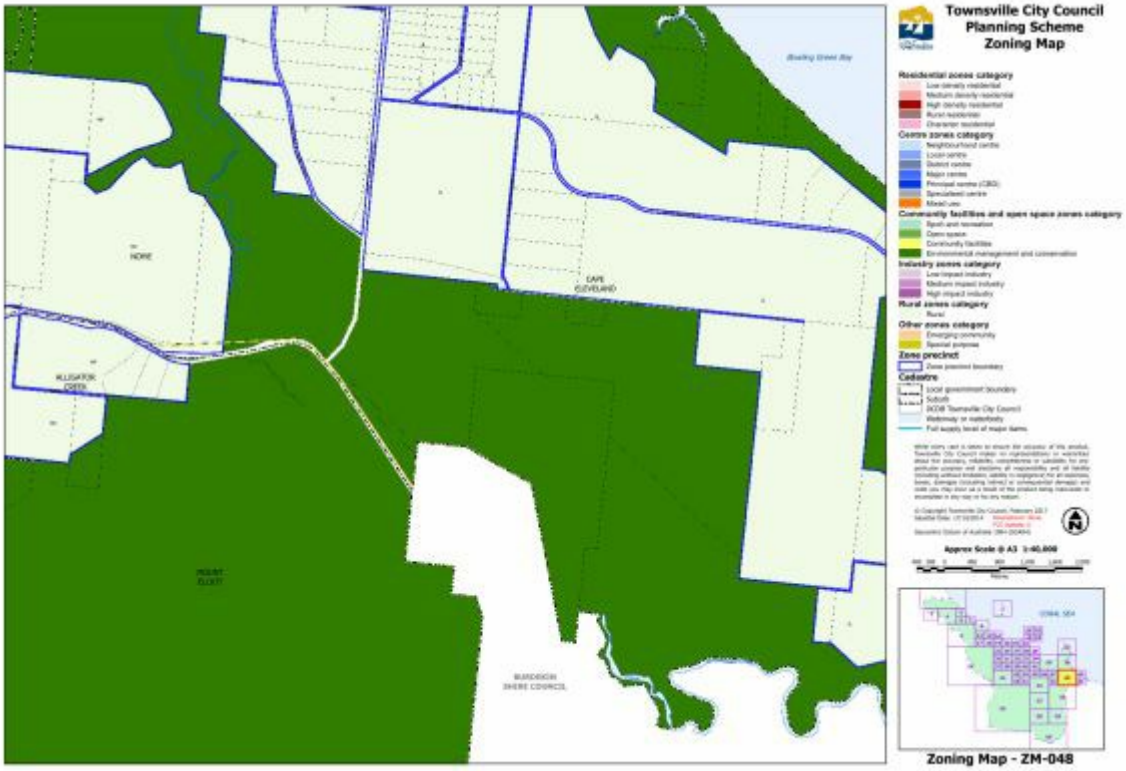

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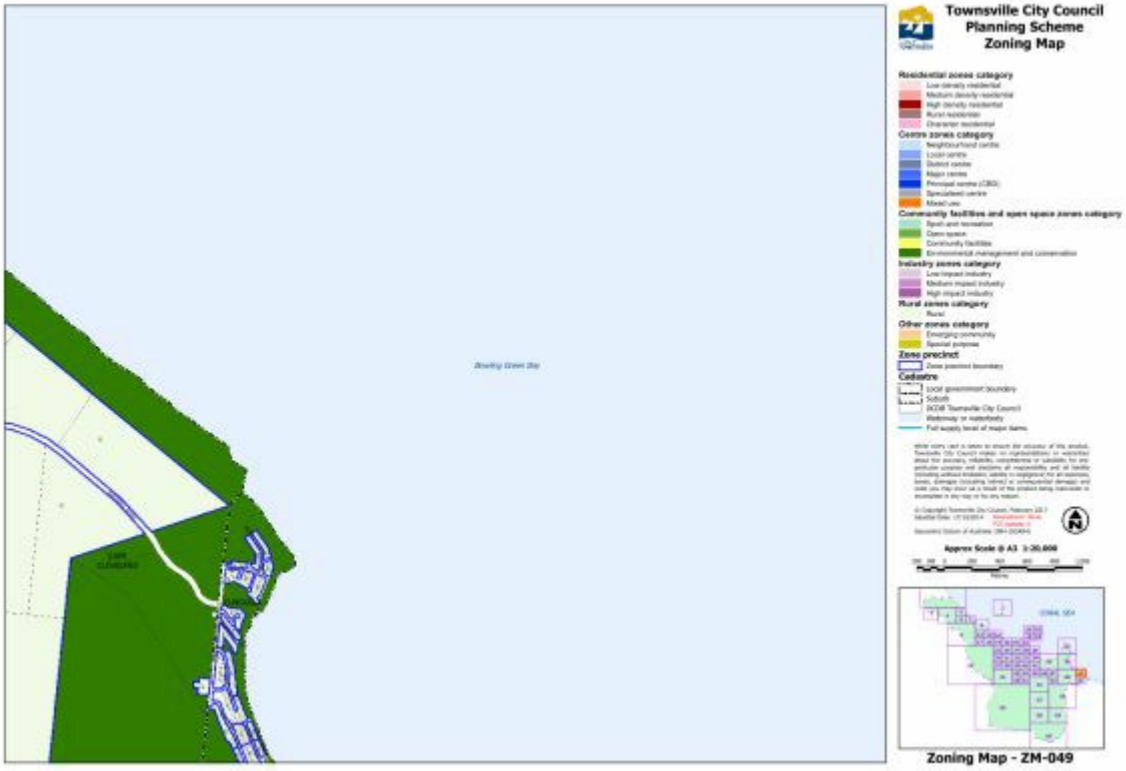

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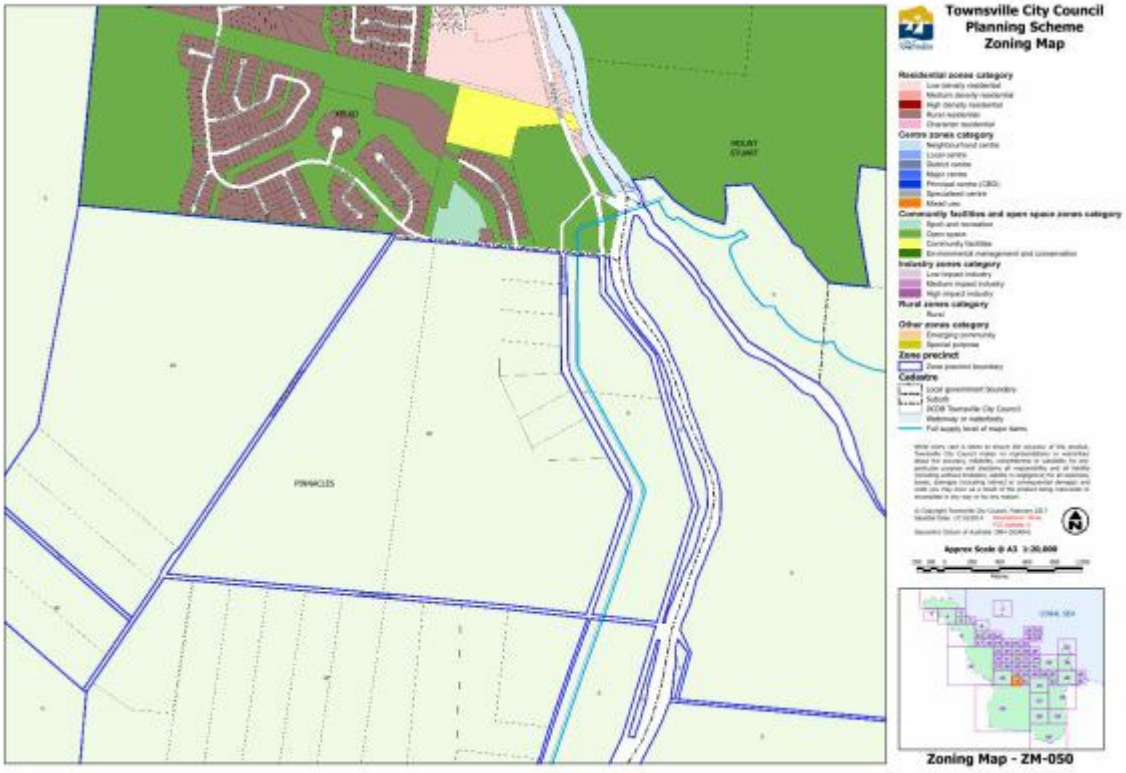

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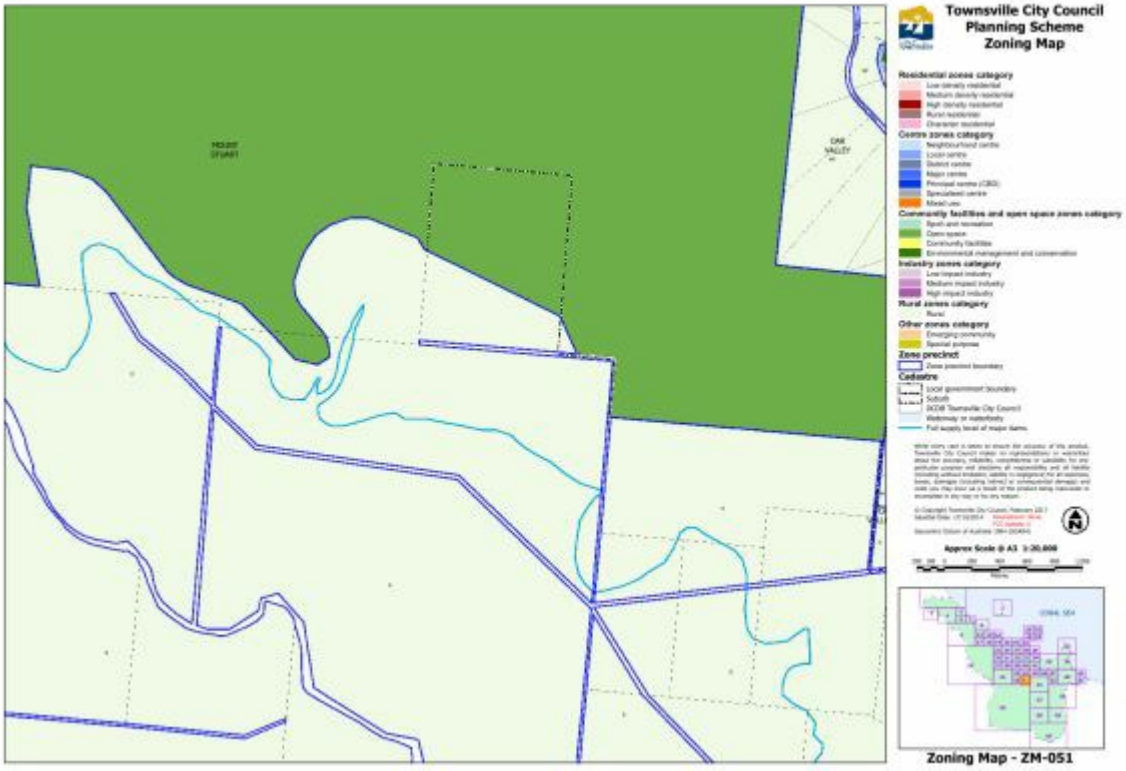

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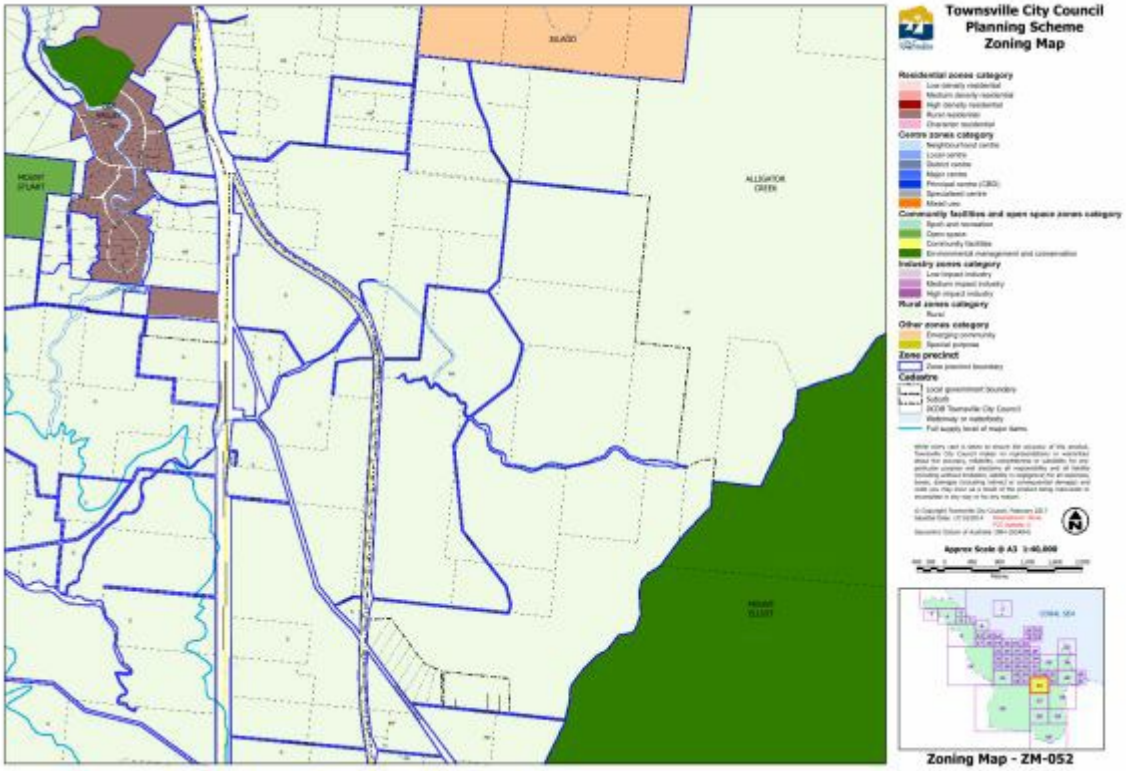

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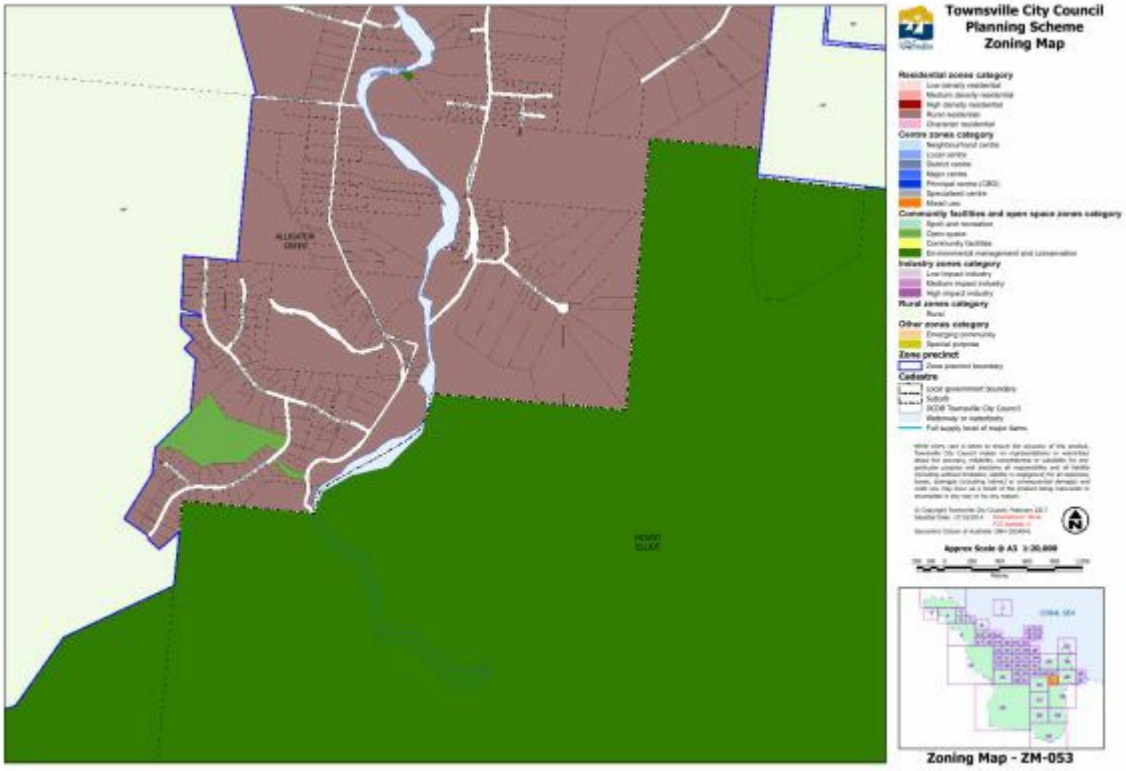

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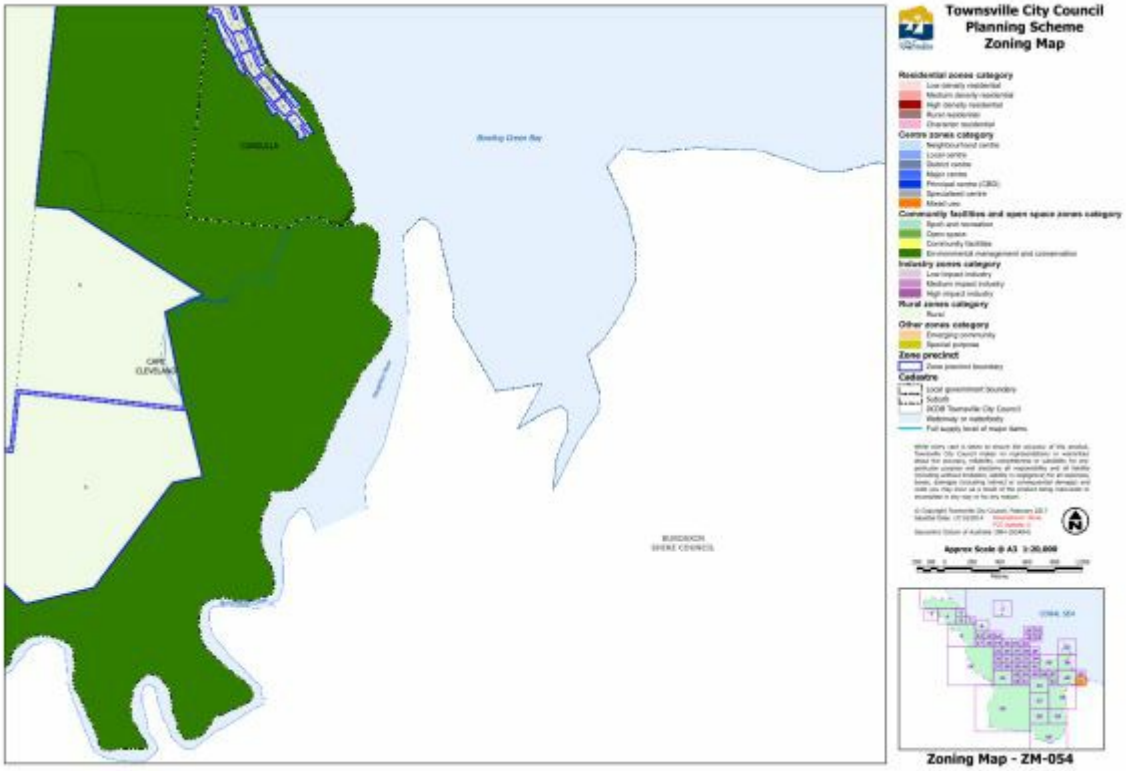

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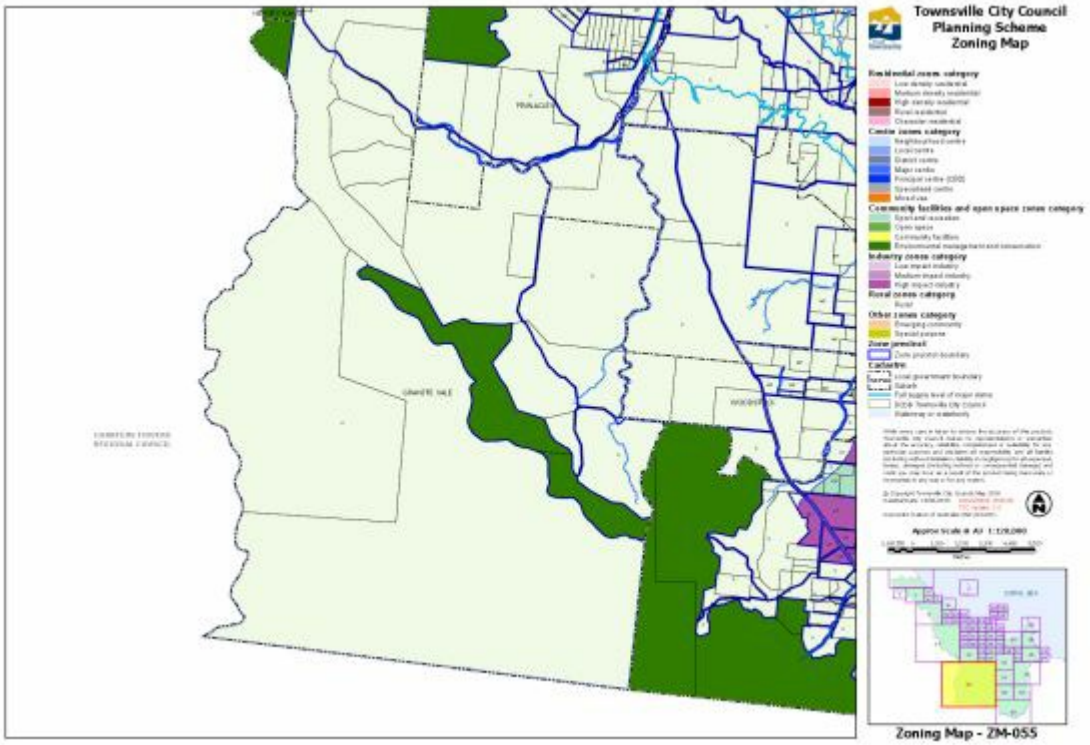

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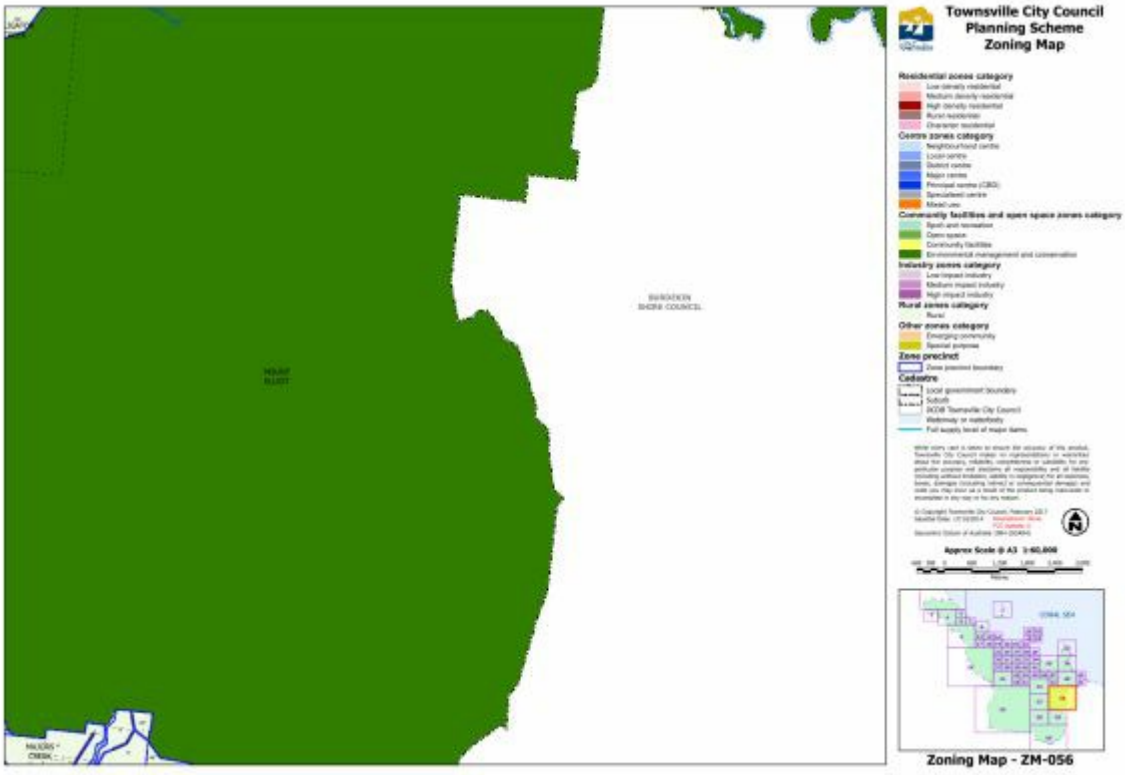

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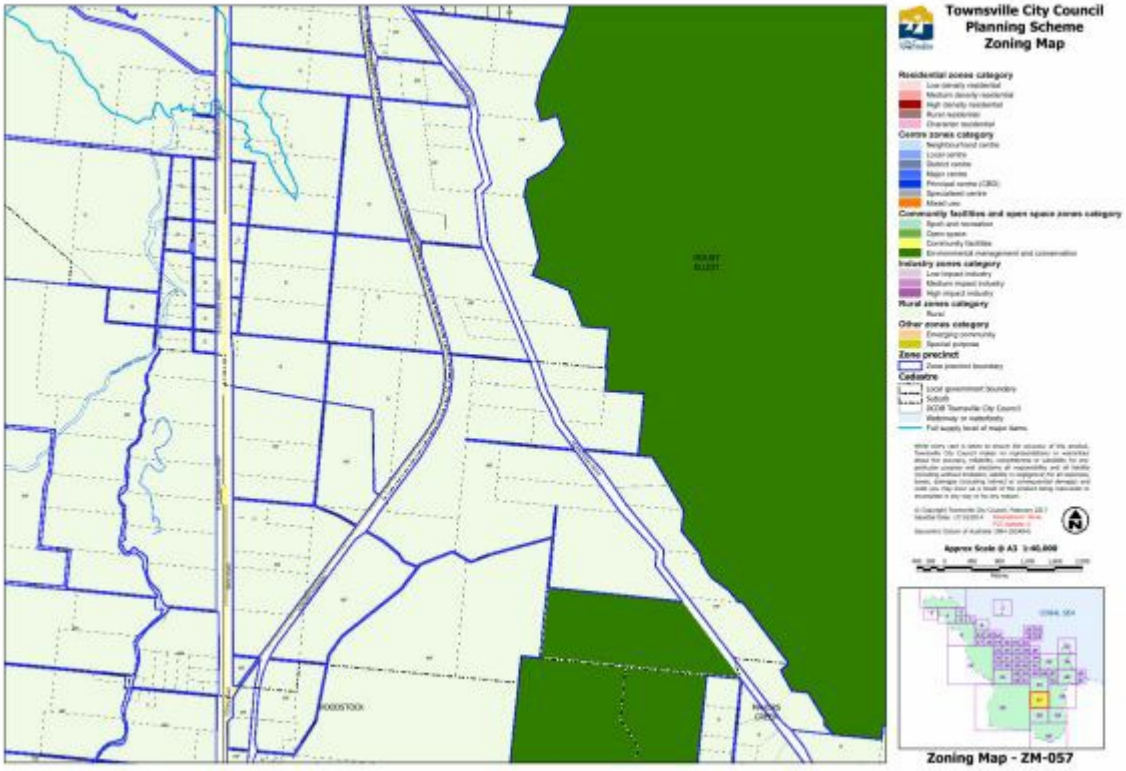

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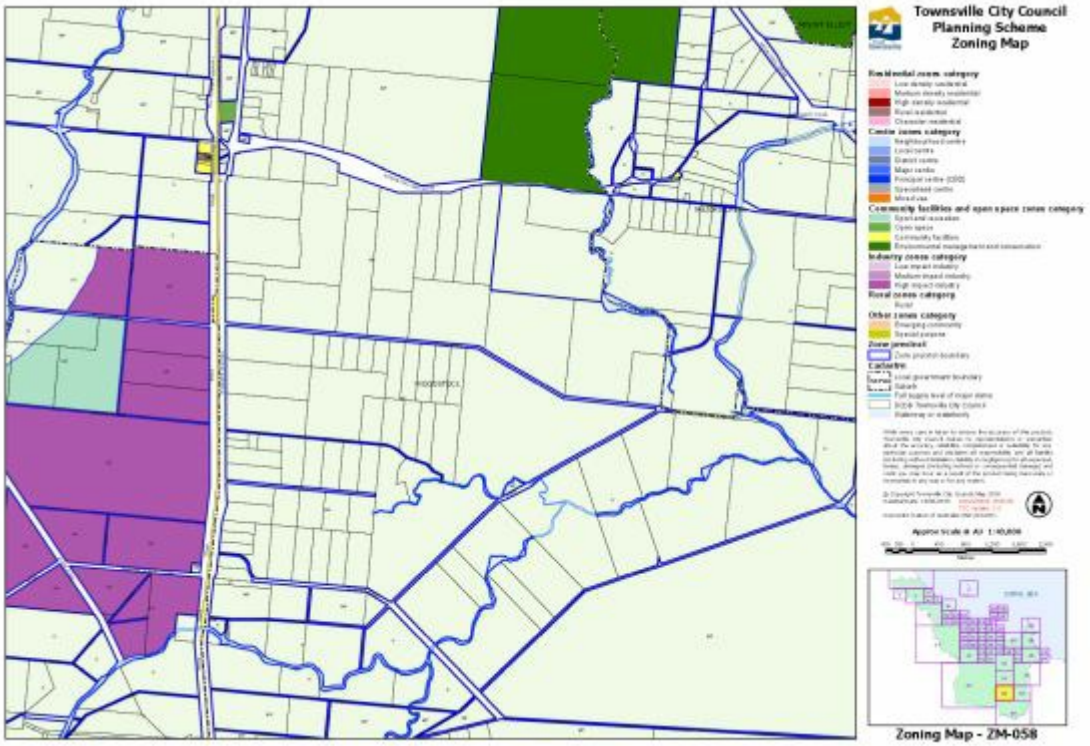

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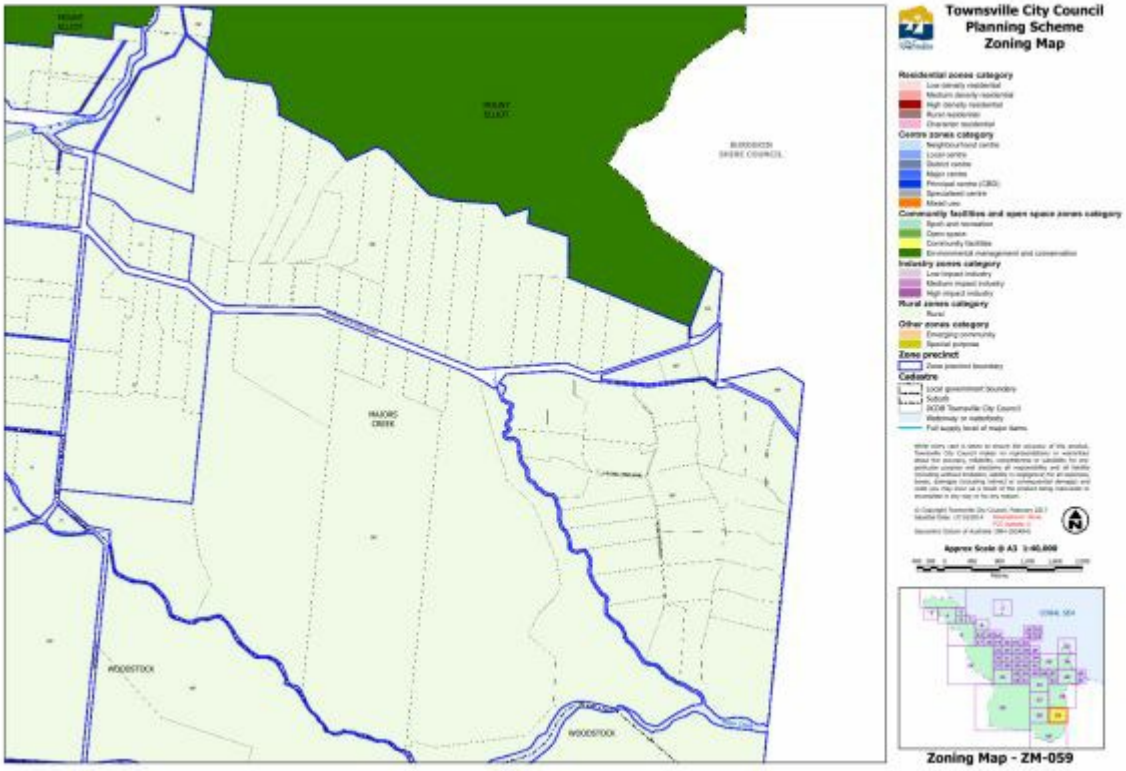

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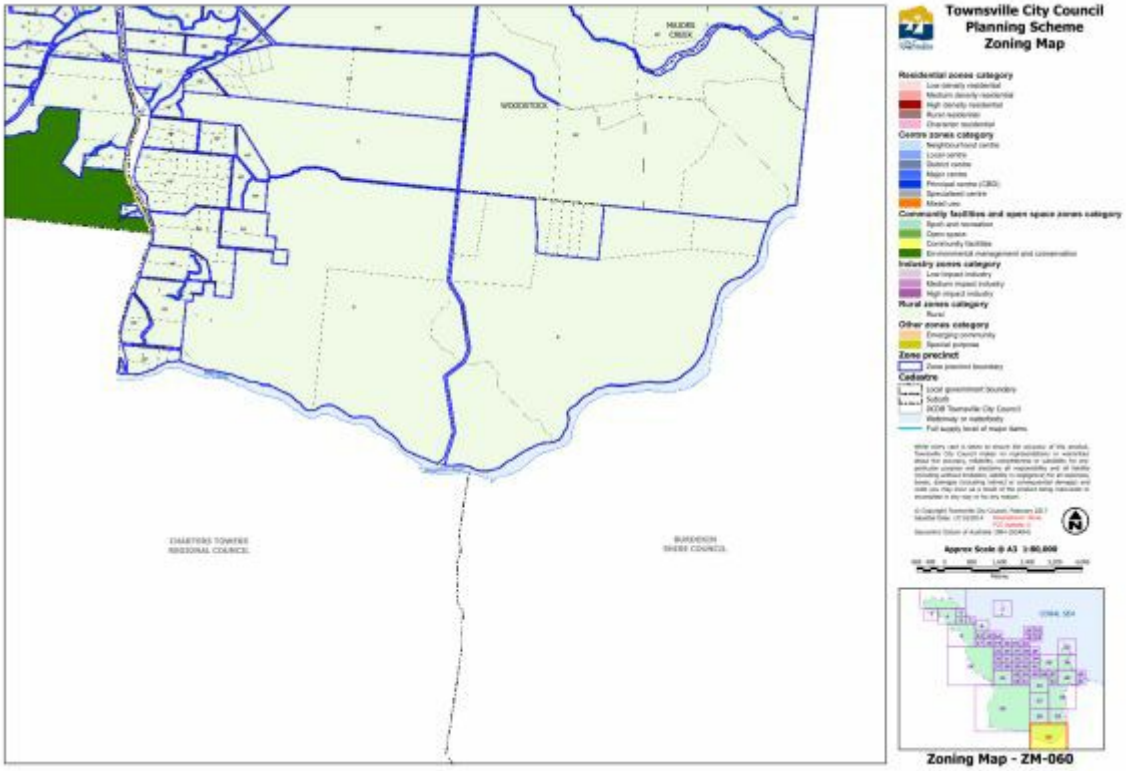

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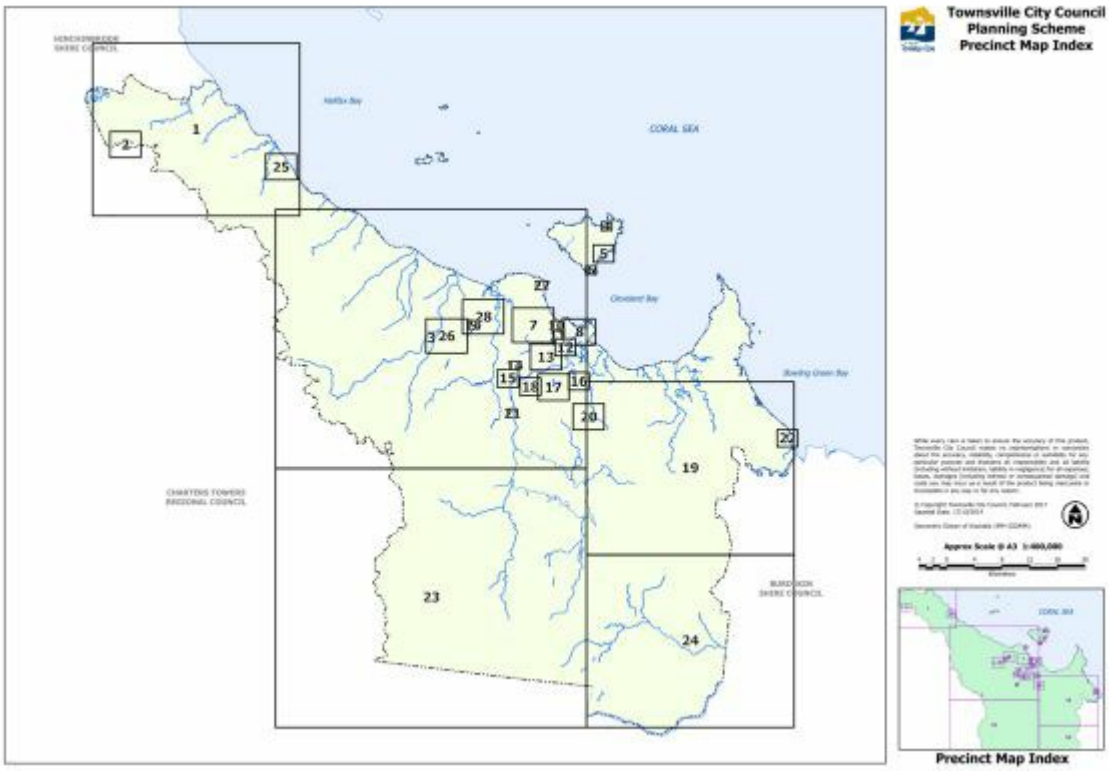
Zoning Map ZM-060



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Precinct Map Index

PRECINCT AND SUB-PRECINCT LEGEND				
Precinct Code	**Precinct**	**Sub-Precinct Code**	**Sub-Precinct**	**Zone Category**
A	Townsville Airport			Specialised centre
AC	Arcadia Central			Mixed use
ADC	Annandale district centre			District centre
AMC	Aitkenvale major centre	**ACC**	Aitkenvale centre core	Major centre
AMC	Aitkenvale major centre	**ACF**	Aitkenvale centre frame	Major centre
AMD	Aitkenvale medium density			Medium density residential
AV	Aitkenvale village			Medium density residential
B	Breakwater			Mixed use
BBGC	Balgal Beach golf course			Sport and recreation
BRM	Bayswater Road medical			Specialised centre
C	Cungulla			Rural
CA	Civic and administration			Principal centre
CD	Cluden			Sport and recreation
CBDG	CBD gateway			Mixed use
CS	Churchill Street			Character residential
CTR	Charters Towers Road business			Mixed use
D	Domain Central			Specialised centre

DDC	Deeragun district centre			District centre
DHHC	1960s Defence Housing and1960s Housing Commission			Character residential
FRM	Fulham Road medical			Specialised centre
FS	French Street			Character residential
FSE	Flinders Street East			Principal centre
FSR	Flinders Street retail			Principal centre
FSW	Flinders Street West			High density residential
G	Grazing			Rural
GQ	Grand Queenslanders			Character residential
H	Horticulture			Rural
HPMC	Hyde Park major centre			Major centre
HPMD	Hyde Park medium density			Medium density residential
IAG	Interwar to 1950s Asymmetrical Gables			Character residential
IDC	Idalia district centre			District centre
IGQB	Interwar Gables and Queensland Bungalows			Character residential
J	Jensen			Rural
JCUTH	James Cook University Townsville Hospital			Specialised centre
KR	Kings Road			Mixed use
KRM D	Kings Road medium density			Medium density residential
KSQ	King Street quarter			Mixed use
KT	Kirwan Traders			Mixed use
LB	Lavarack Barracks			Specialised centre
LH	Lansdown high impact industry			High impact industry
LM	Lansdown motor sport facility			Sport and recreation
MF	Mixed farming			Rural
M FP	Mixed 1950s			Character residential
MIMD	Magnetic Island medium density			Medium density residential
MIV	Magnetic Island villages	**HB**	Horseshoe Bay	Mixed use
MIV	Magnetic Island villages	**N B**	Nelly Bay	Mixed use
MIV	Magnetic Island villages	**PB**	Picnic Bay	Mixed use
MS	Marlow Street			Low density residential
NBG	Nelly Bay gateway			Mixed use
NBI	Nelly Bay low impact industry			Low impact industry
NBT	Nelly Bay tourist			Medium density residential
NW	North Ward local centre			Local centre
NWG	North Ward gateway			Medium density residential

N WMD	North Ward medium density			Medium density residential
N WV	North Ward villages			Medium density residential
PB	Picnic Bay			Medium density residential
PBCF	Picnic Bay community facilities			Community facilities
PS	Palmer Street			High density residential
PSP	Park Street			Character residential
PT	Port of Townsville			Specialised centre
PWE	1950s Post War Expansion			Character residential
Q	Queenslanders			Character residential
R	Riverway			Open space
RDC	Rasmussen district centre			District centre
RE	Railway Estate			High density residential
RMII	Roseneath medium impact industry			Medium impact industry
RP	Rossiter Park			Medium density residential
RRRC	Ross River Road corridor			Low density residential
RSLC	Rising Sun local centre			Local centre
S	The Strand			Medium density residential
ST	Stables			Low density residential
STP	South Townsville			Character residential
STRD	South Townsville railyards and Dean Park			Mixed use
TCMC	Thuringowa Central major centre	**TCS**	Thuringowa centre support	Major centre
TCMC	Thuringowa Central major centre	**TD**	Thuringowa Drive	Major centre
TCMC	Thuringowa Central major centre	**TTCH**	Thuringowa town centre heart	Major centre
TCMC	Thuringowa Central major centre	**W**	Willows	Major centre
TE	Thuringowa East			Medium density residential
TS	Thuringowa South			Medium density residential
WC	Workers Cottages			Character residential
WLS	Wills Street			Medium Density Residential
WS	Wotton Street			Mixed use

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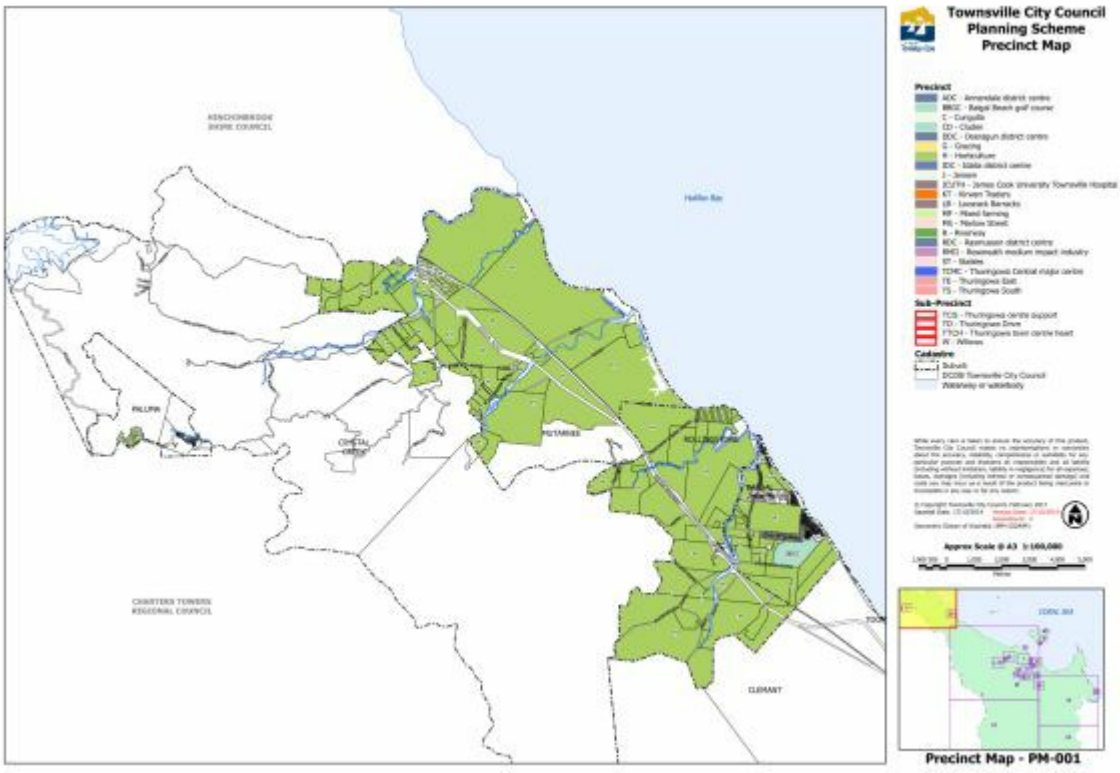

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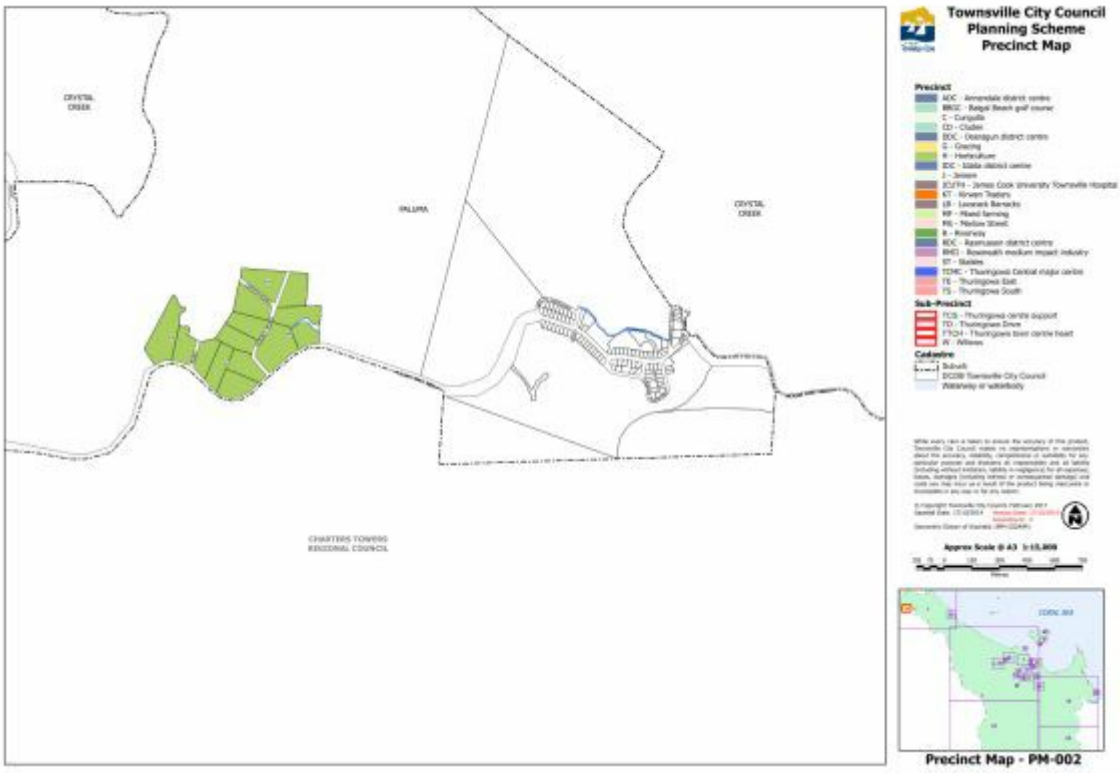
Precinct Map PM-001



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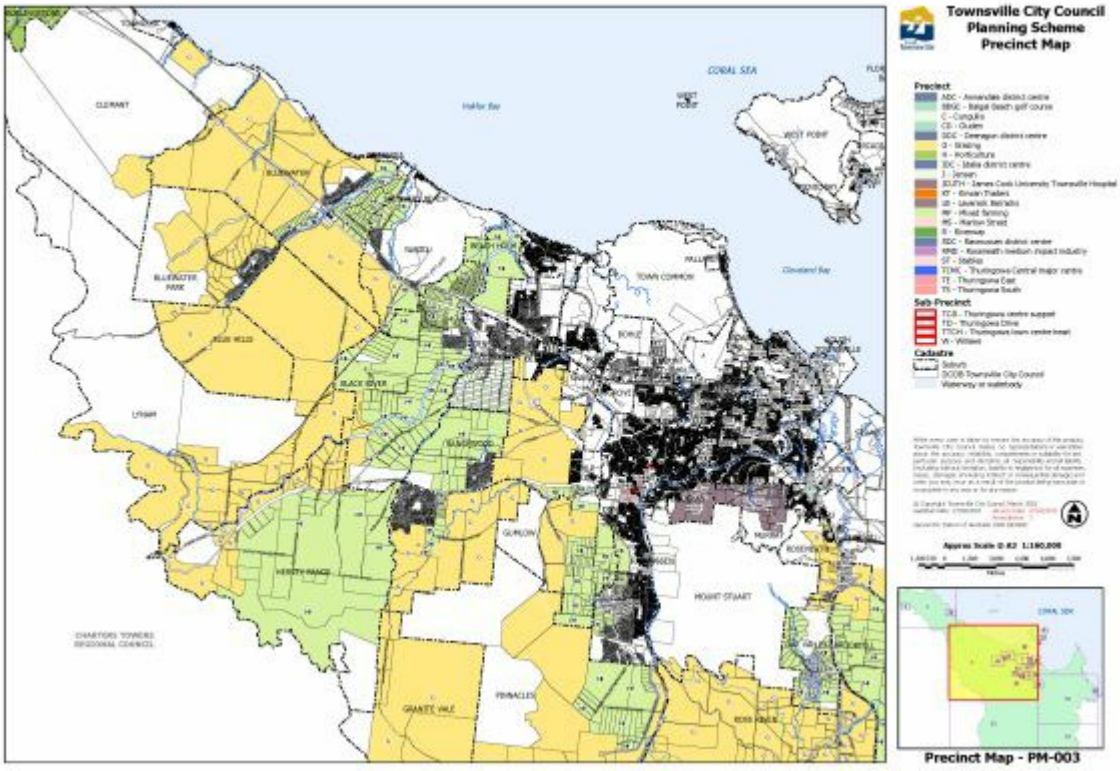
Precinct Map PM-002



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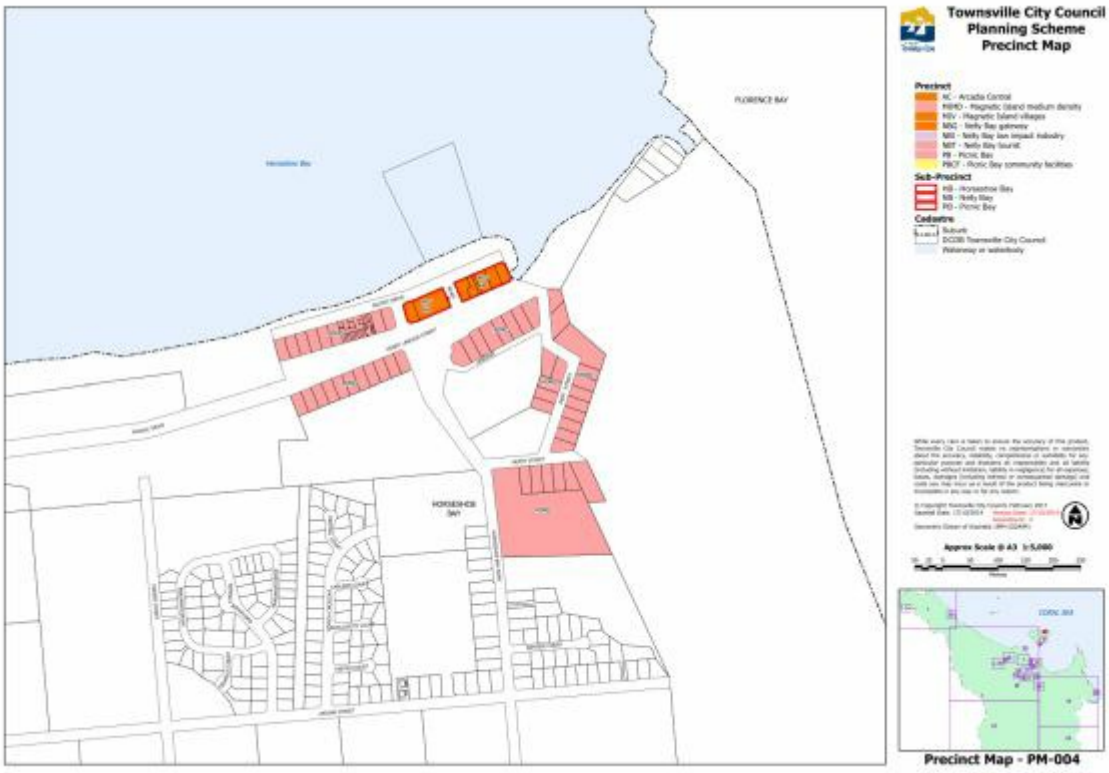
Precinct Map PM-003



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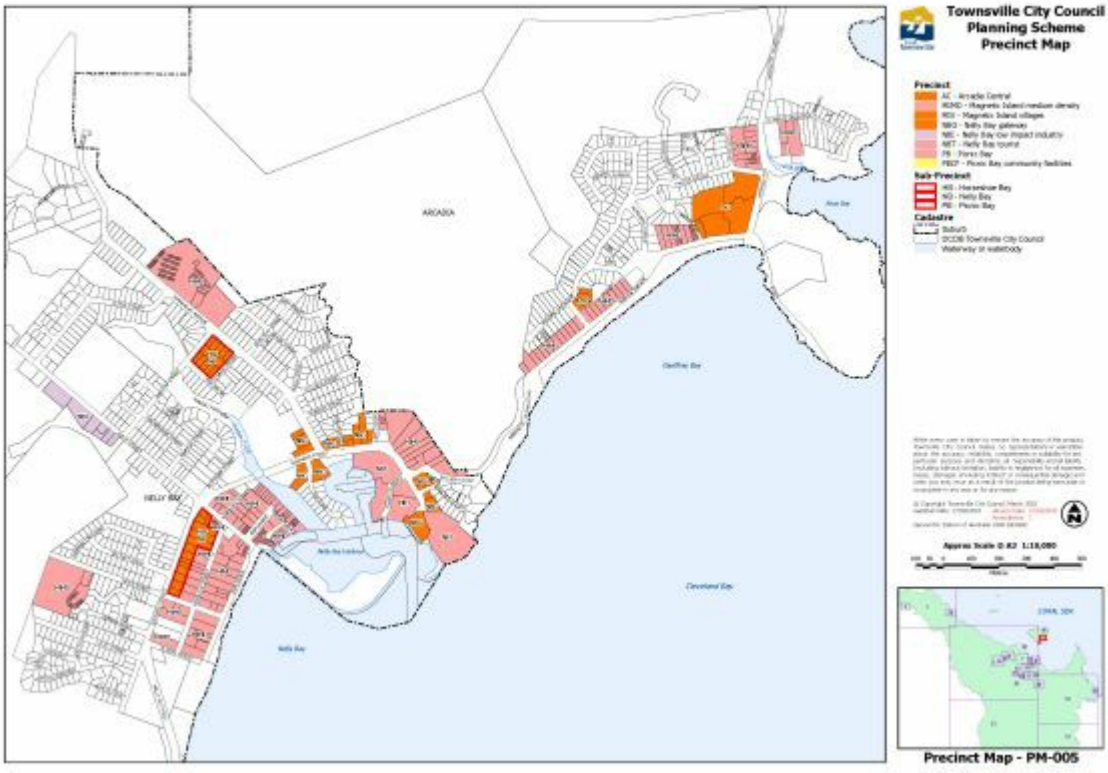
Precinct Map PM-004



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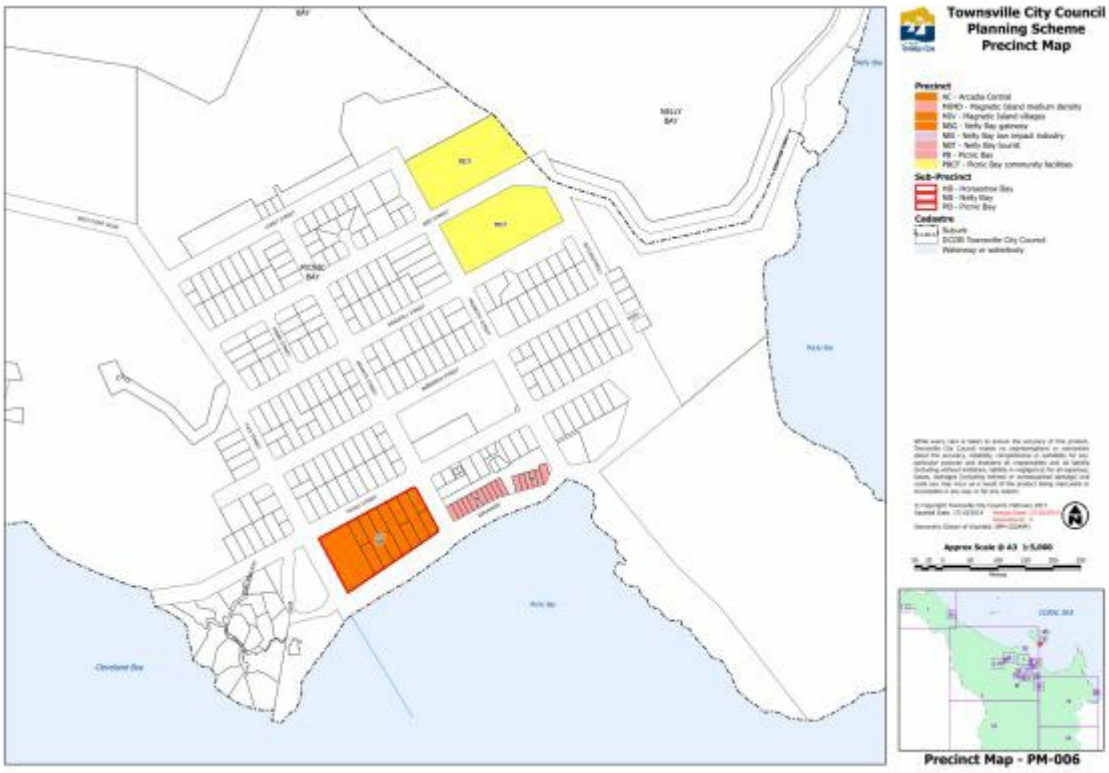
Precinct Map PM-005



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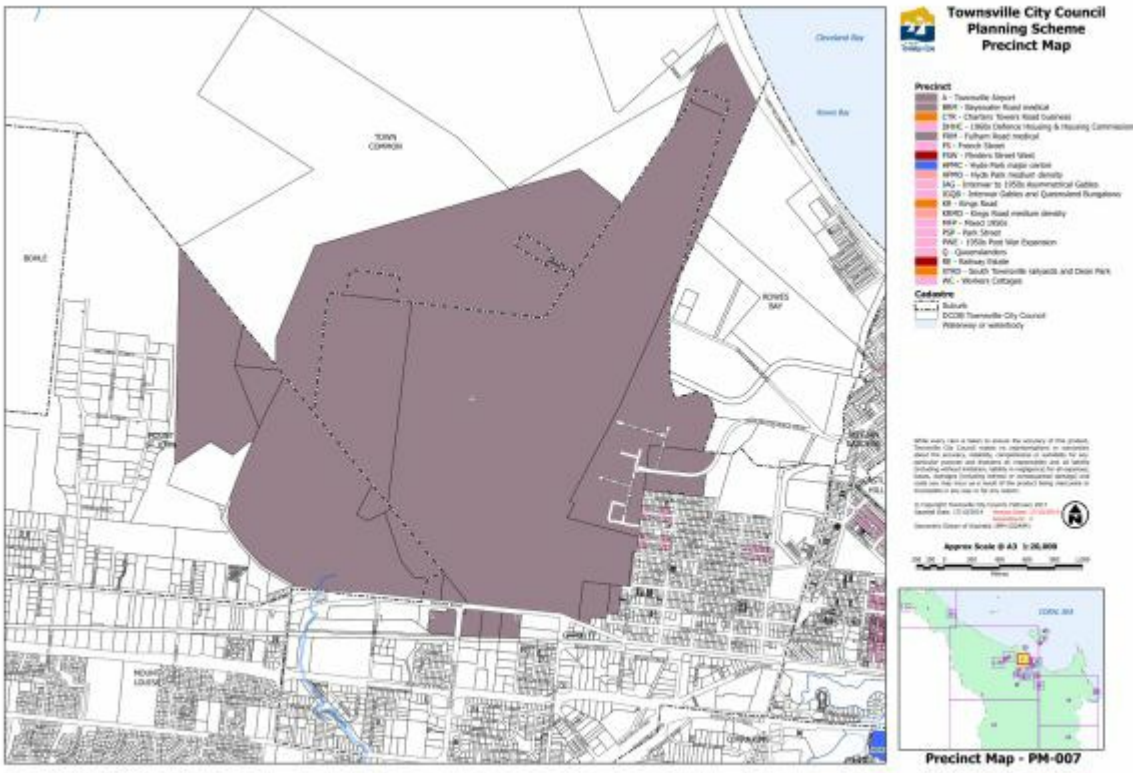
Precinct Map PM-006



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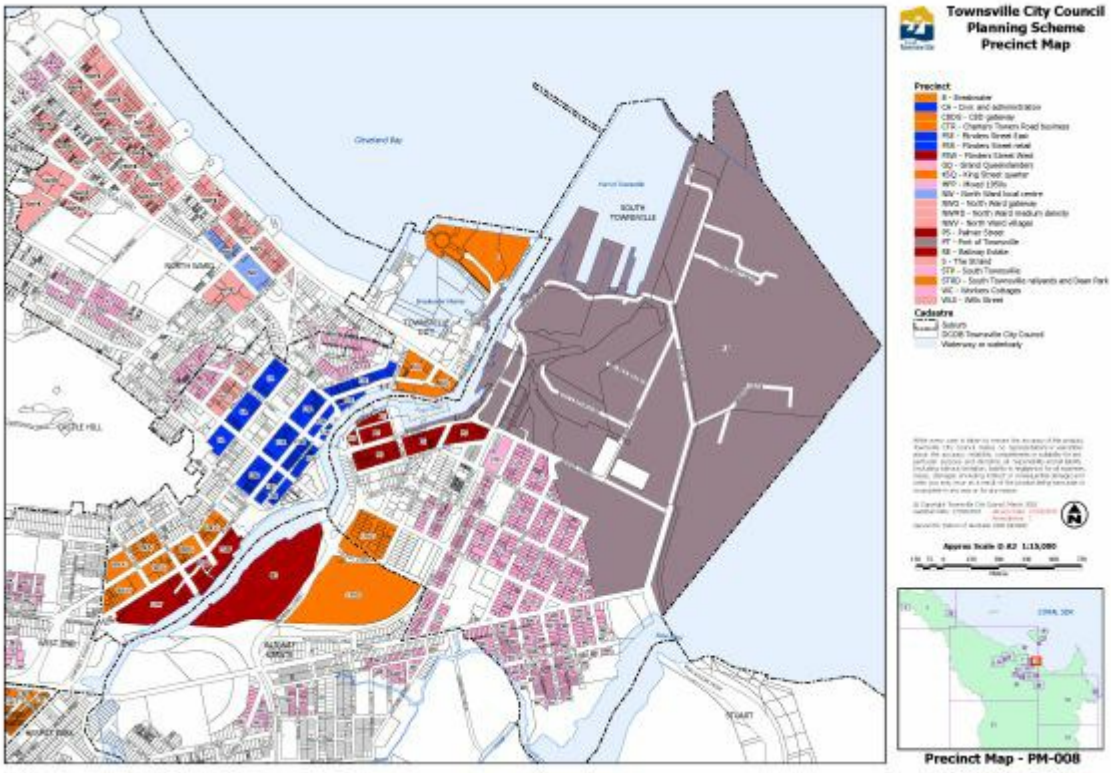
Precinct Map PM-007



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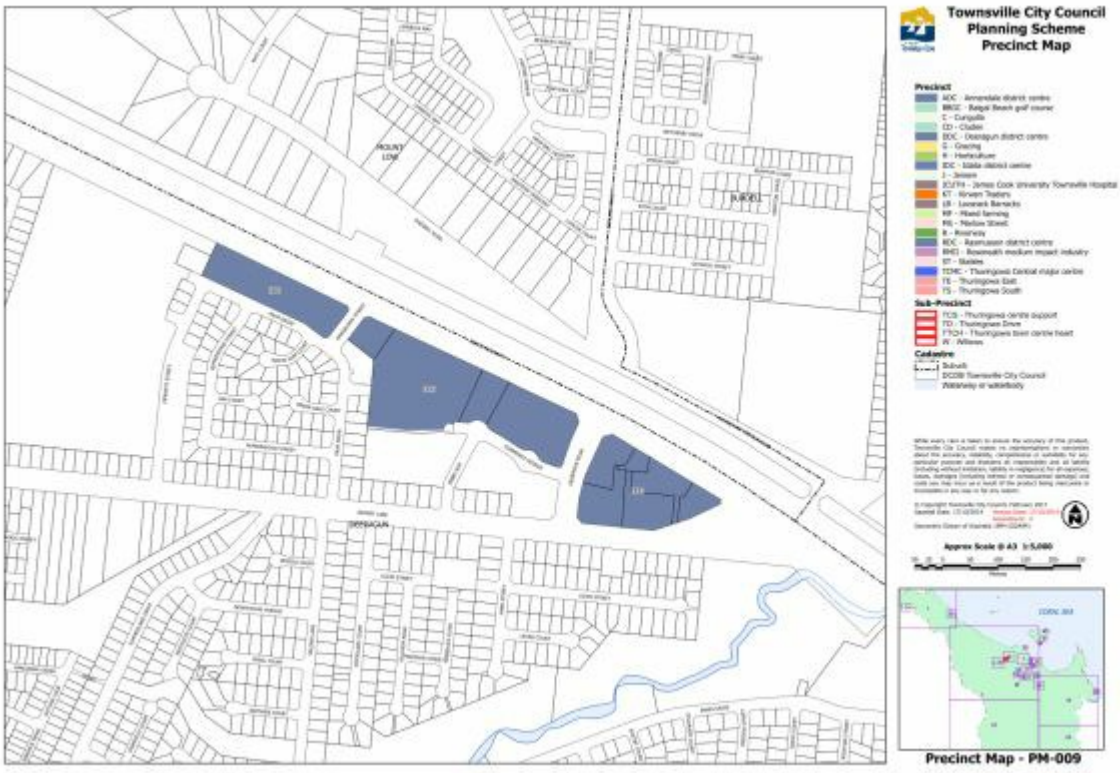

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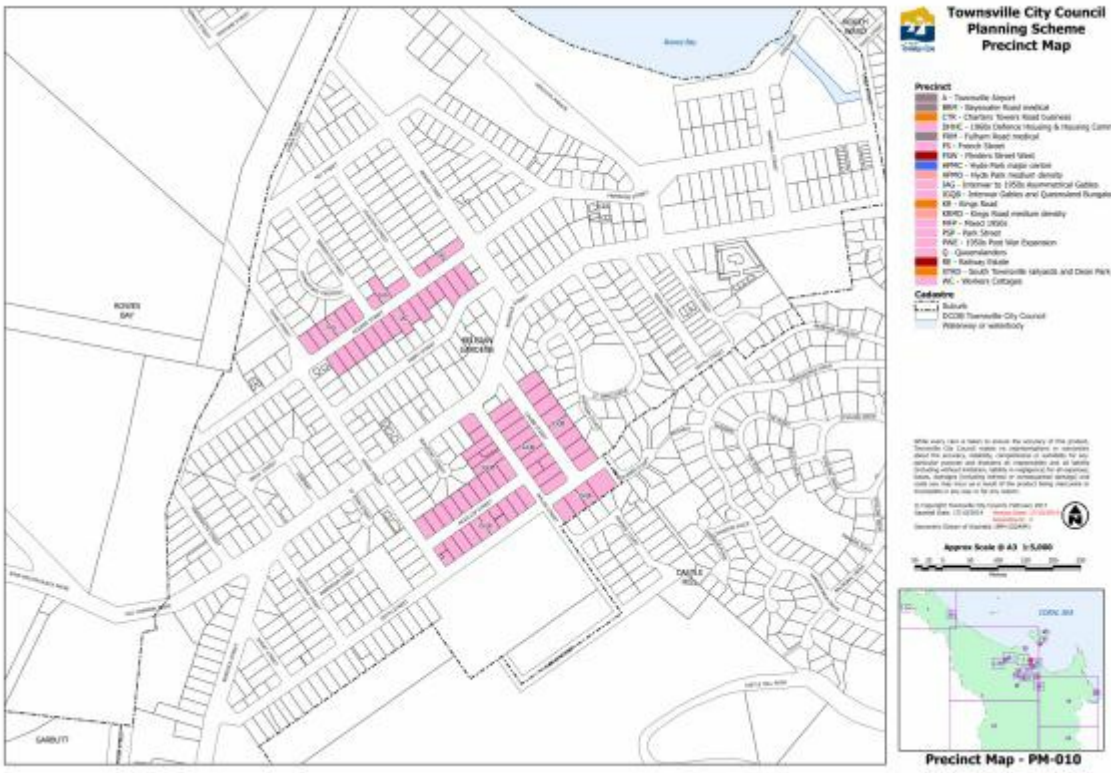

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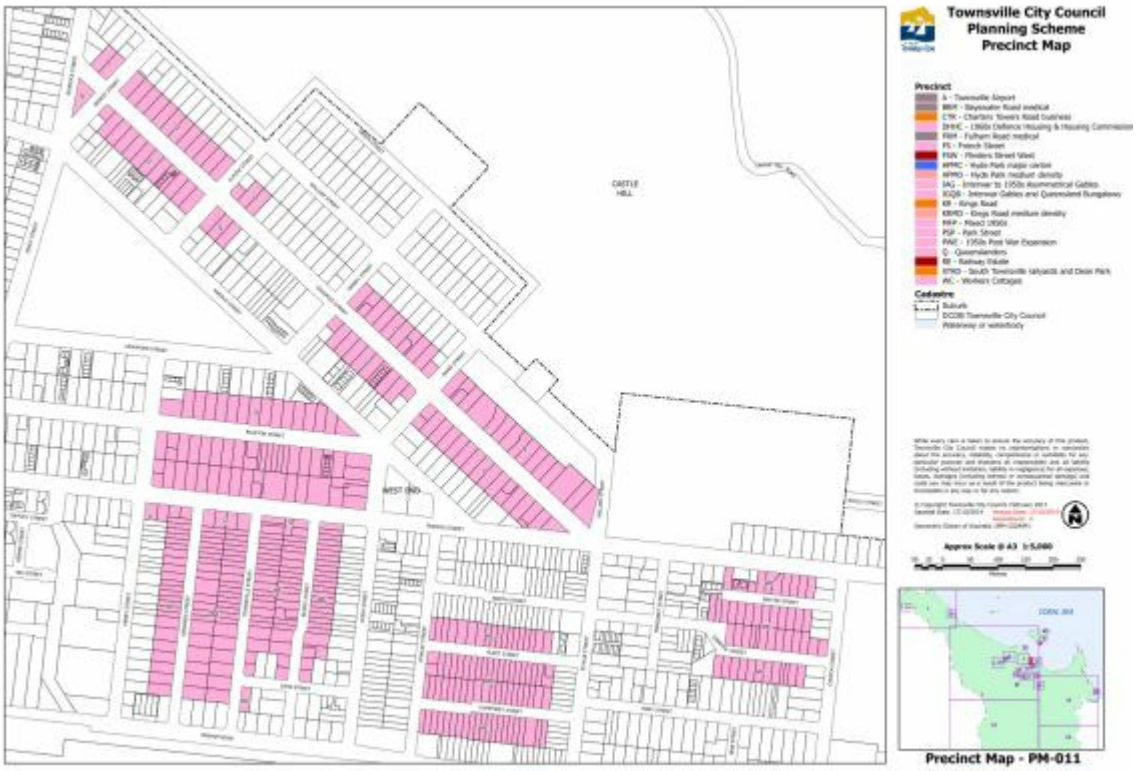

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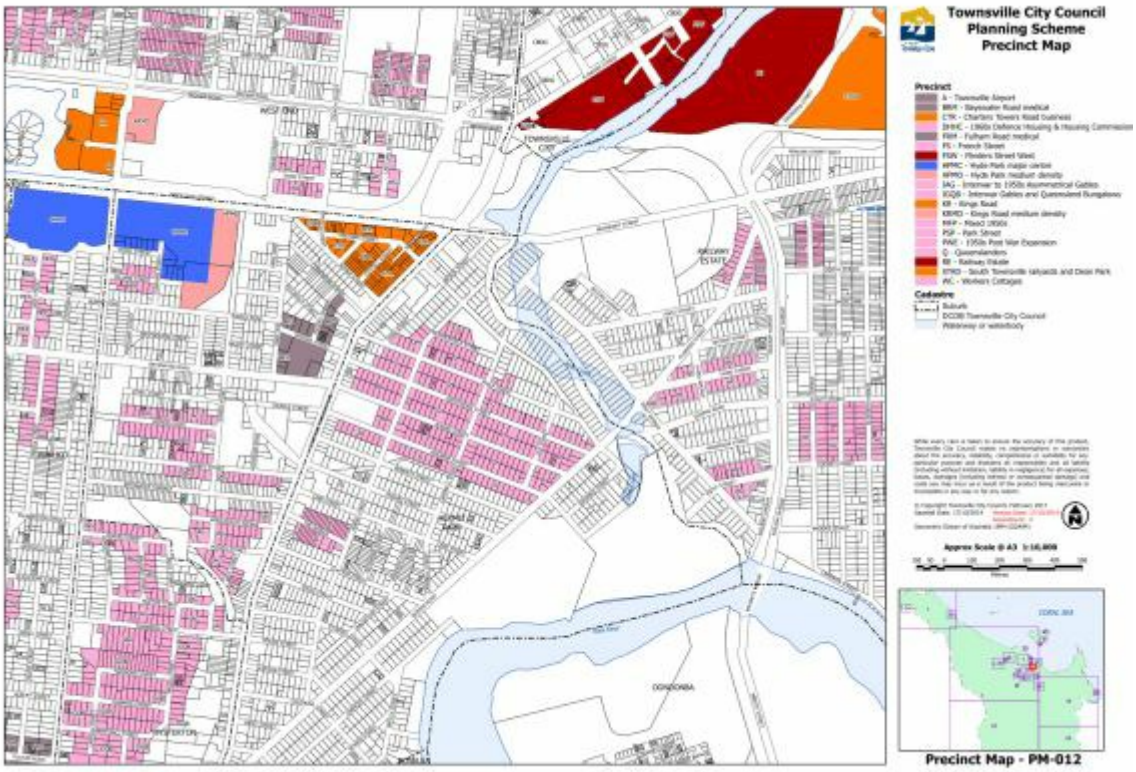
Precinct Map PM-011



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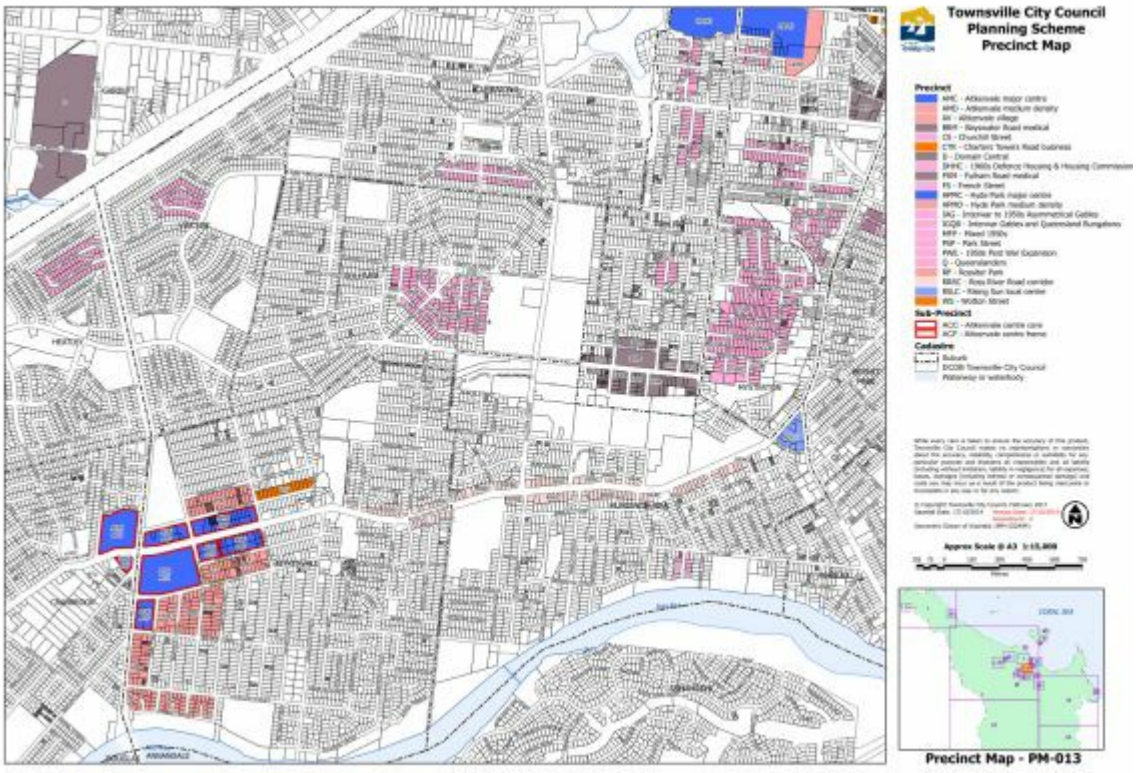
Precinct Map PM-012



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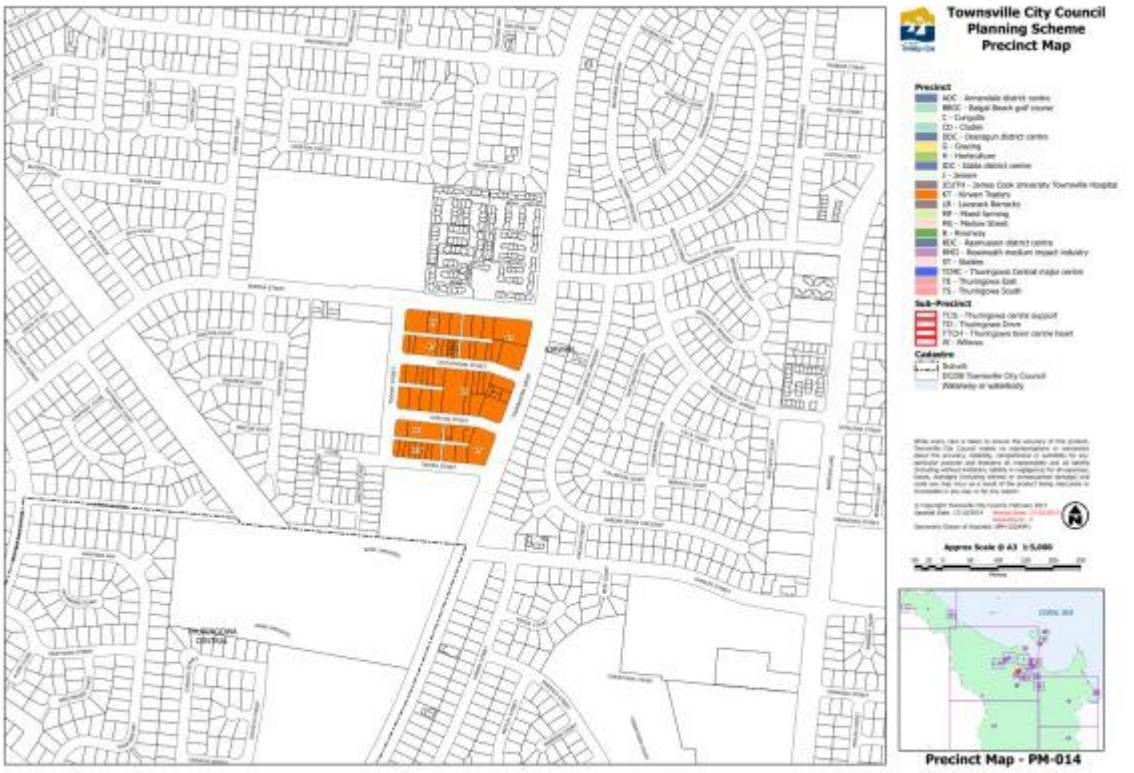

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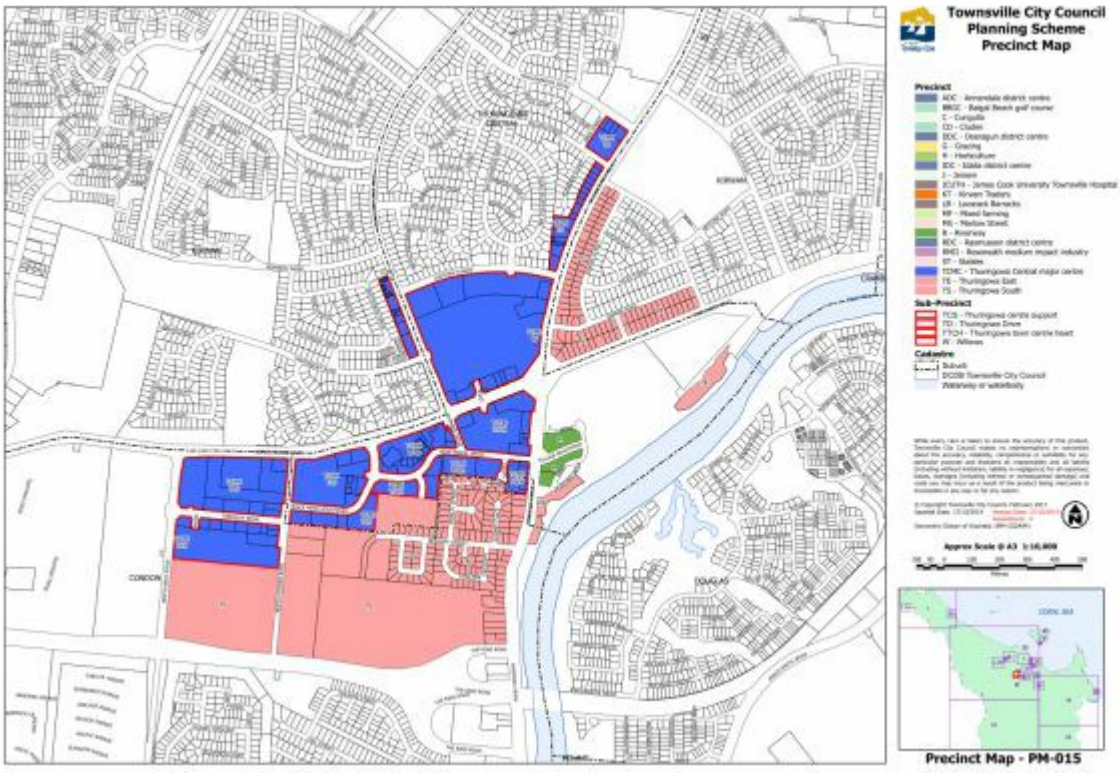

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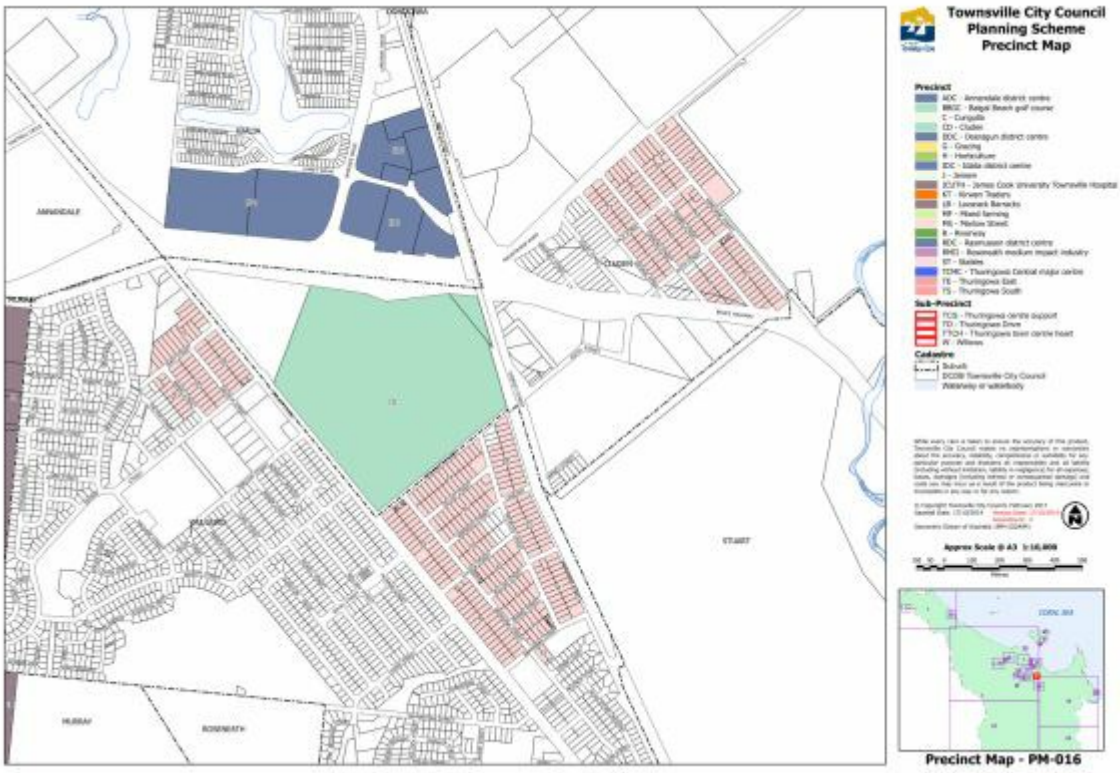

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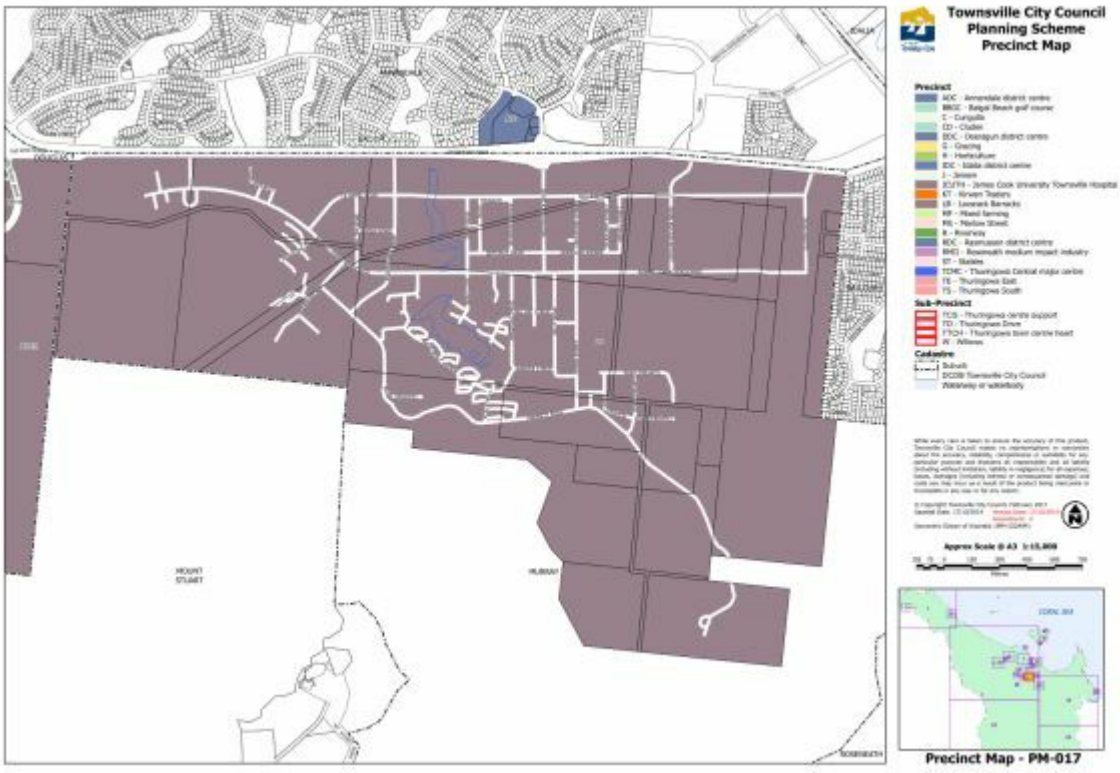

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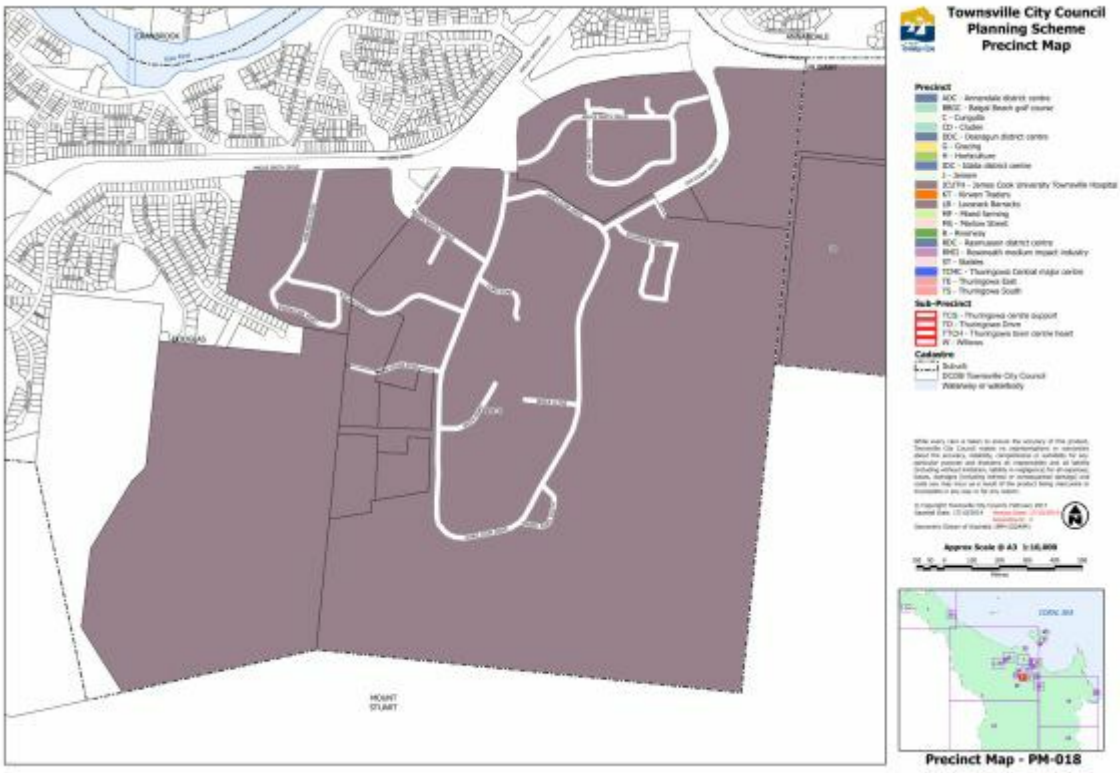

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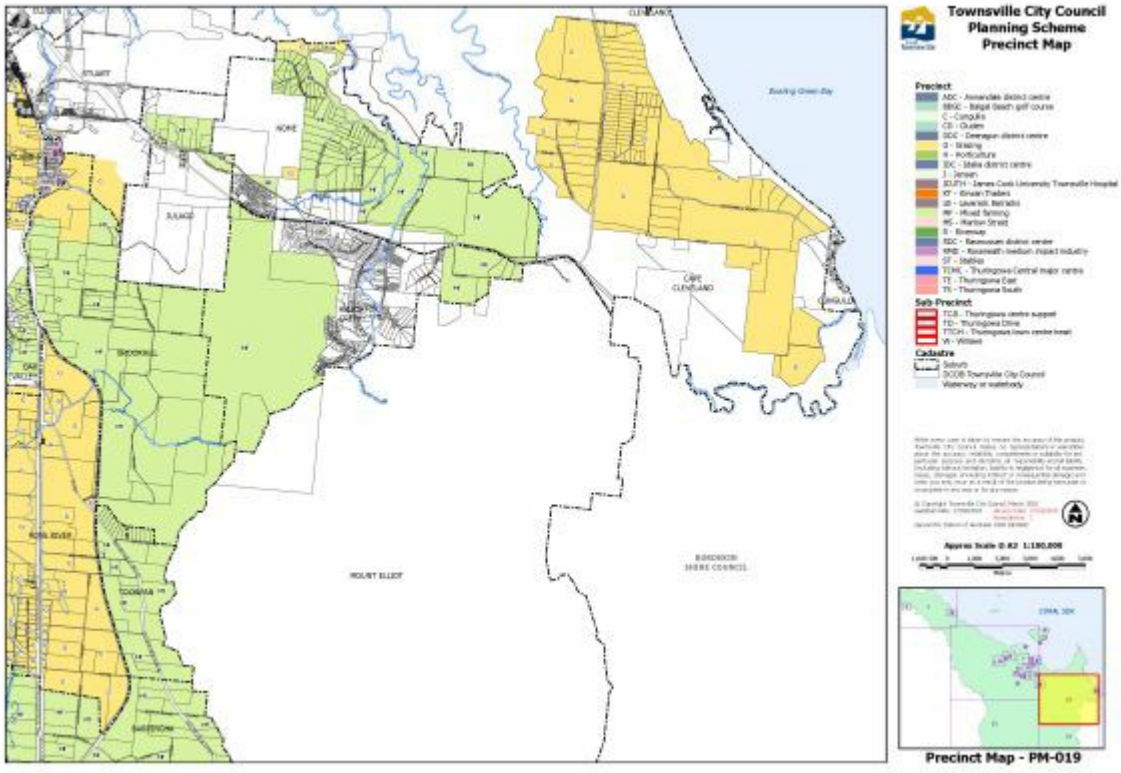

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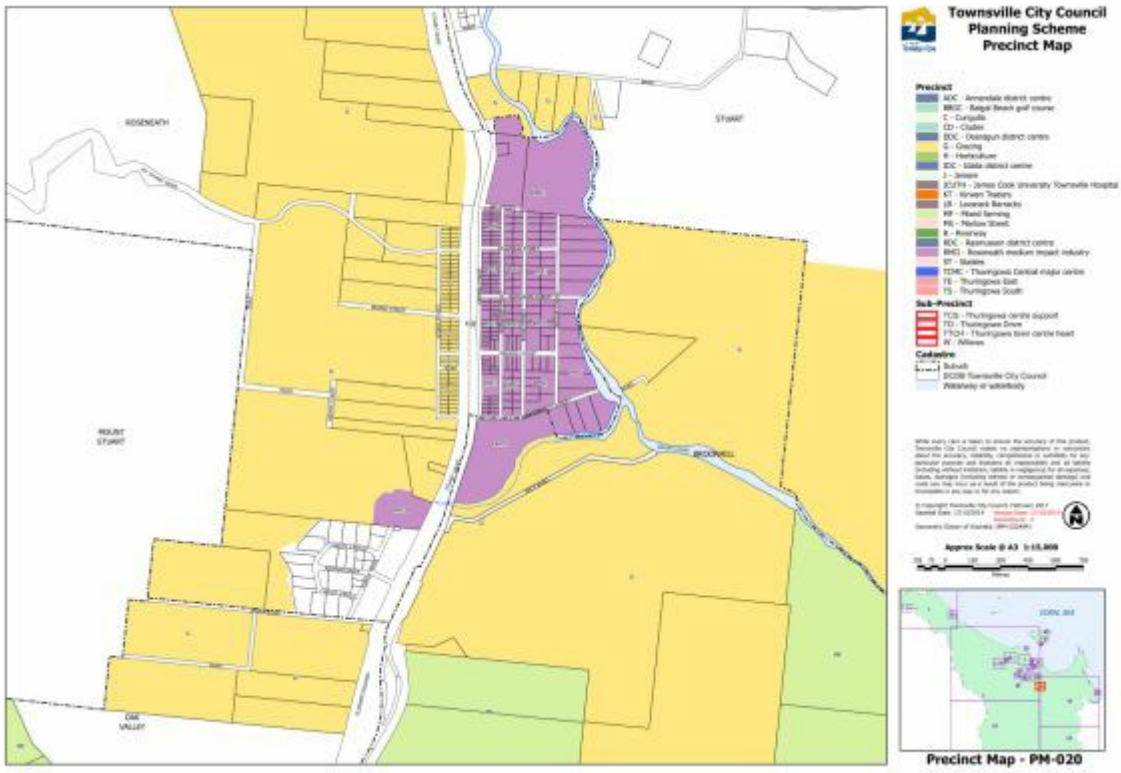

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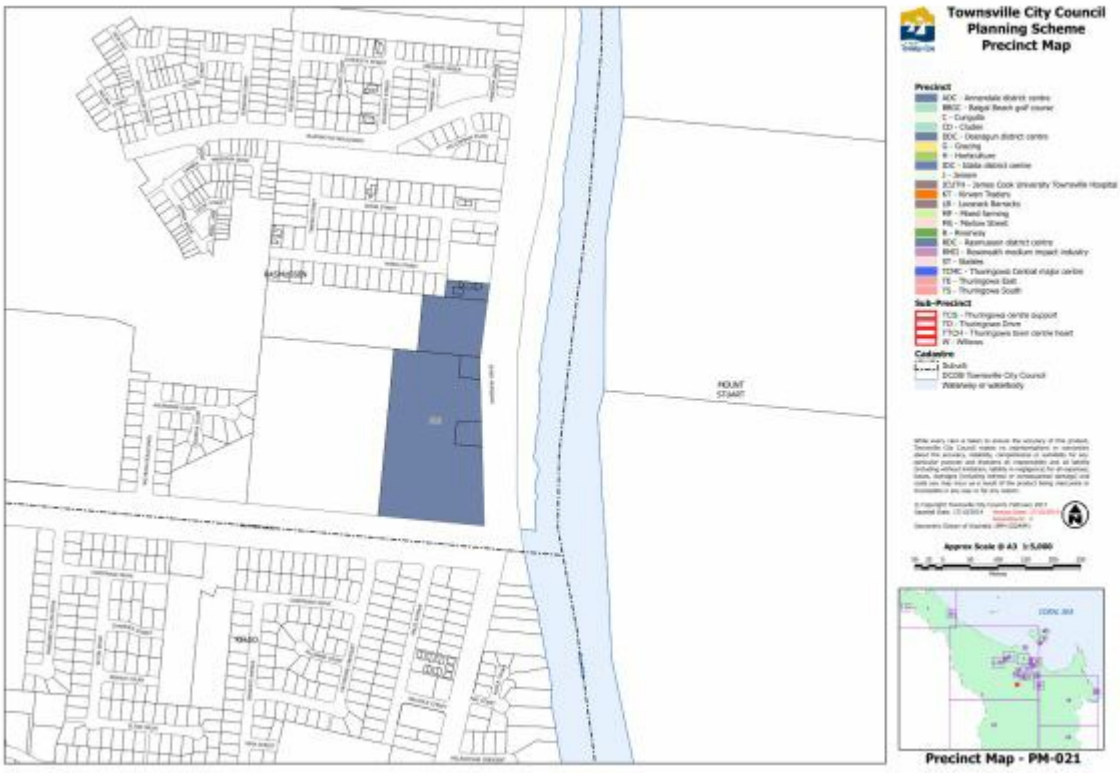

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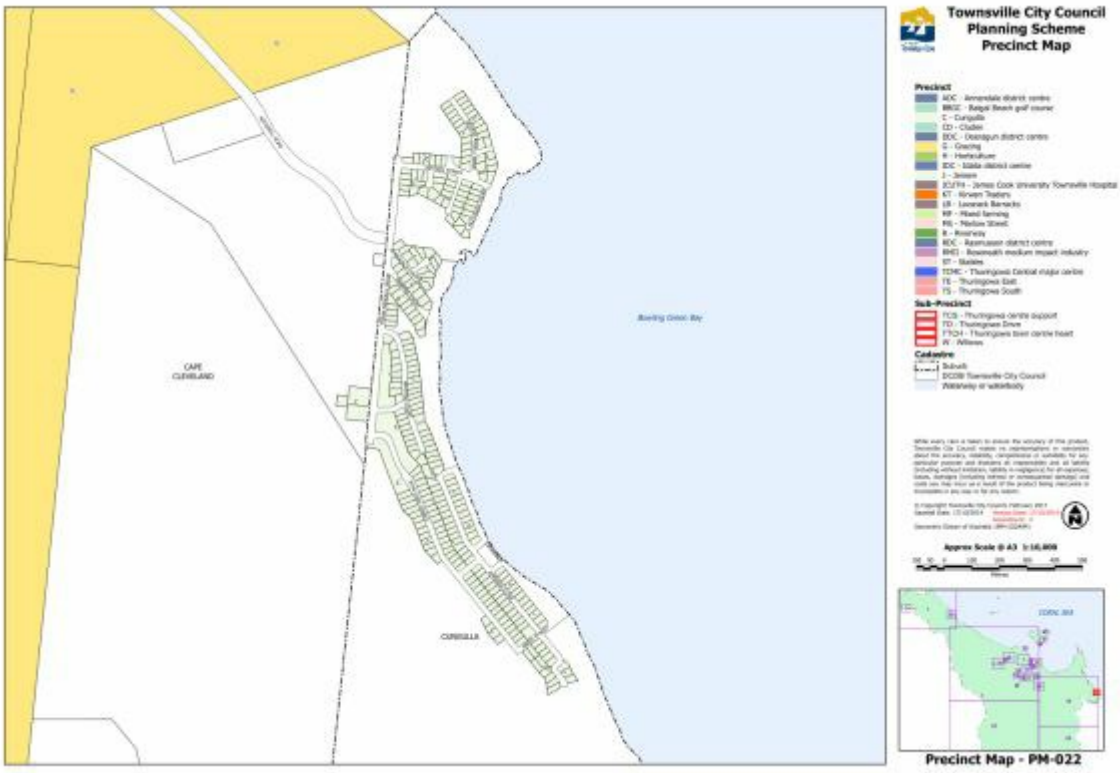

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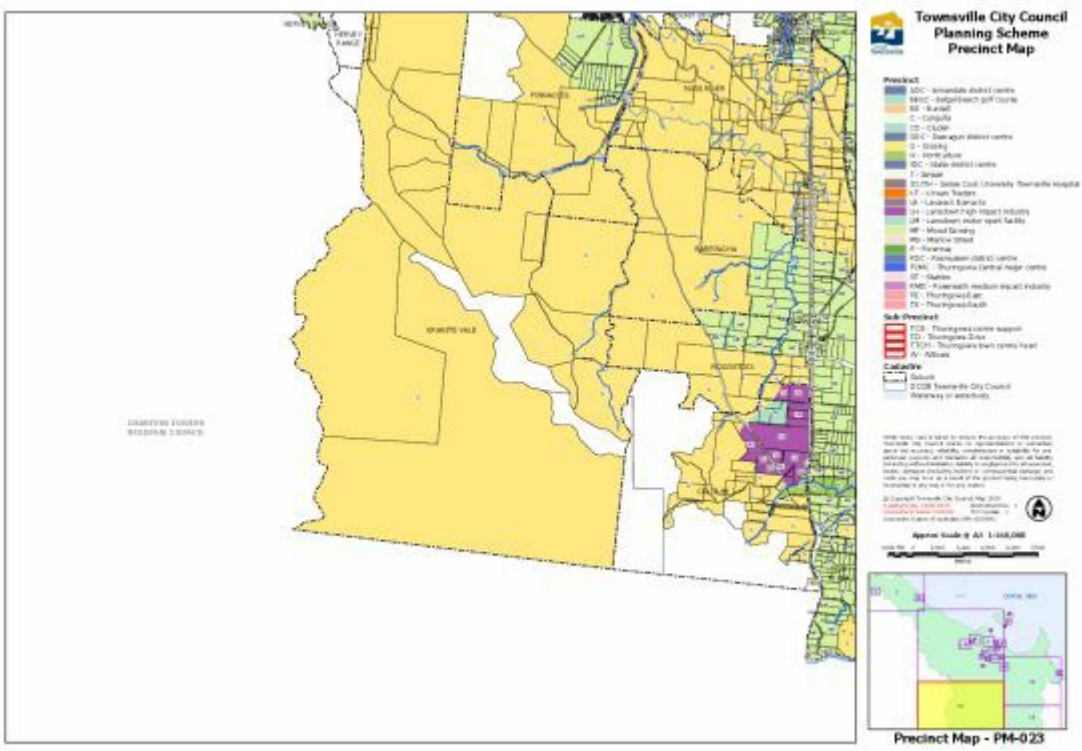

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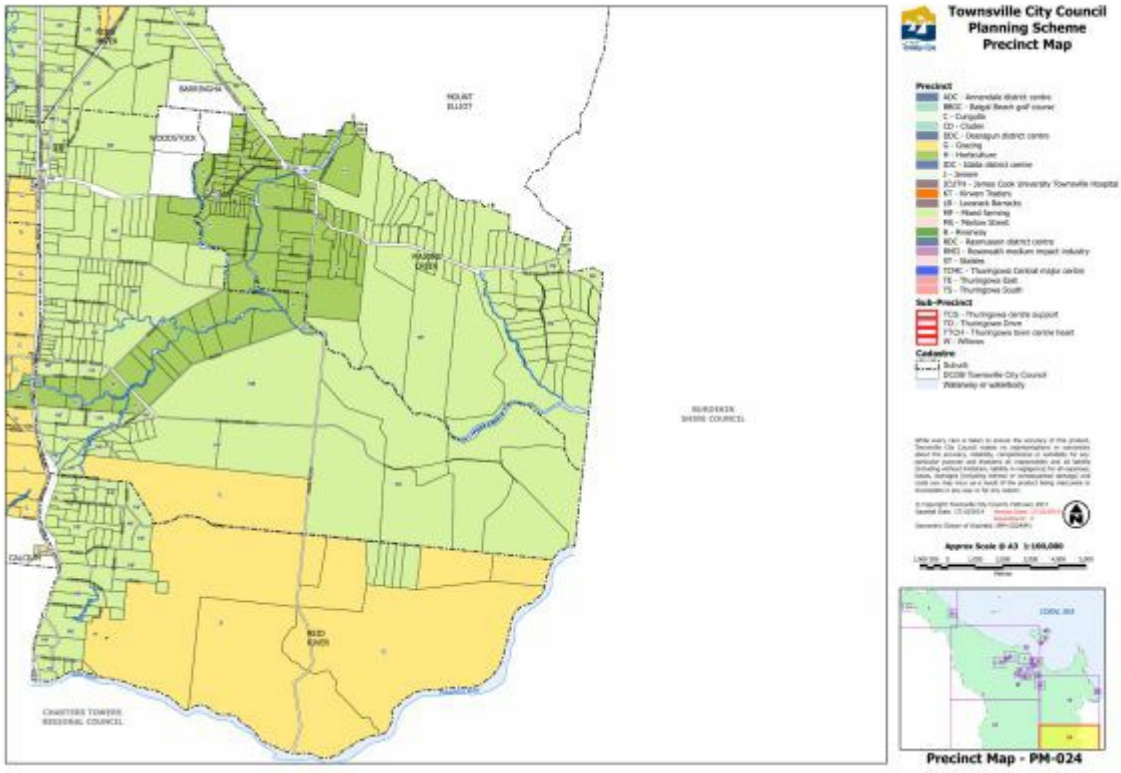

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Precinct Map PM-024

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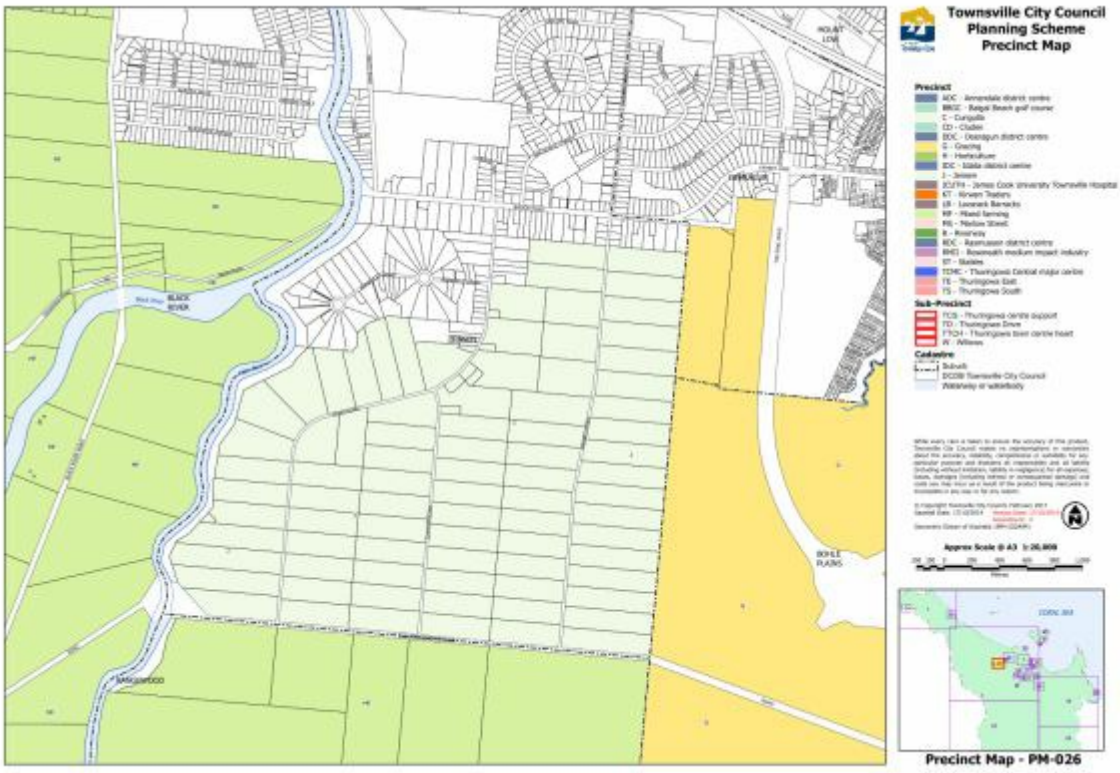
Precinct Map PM-025



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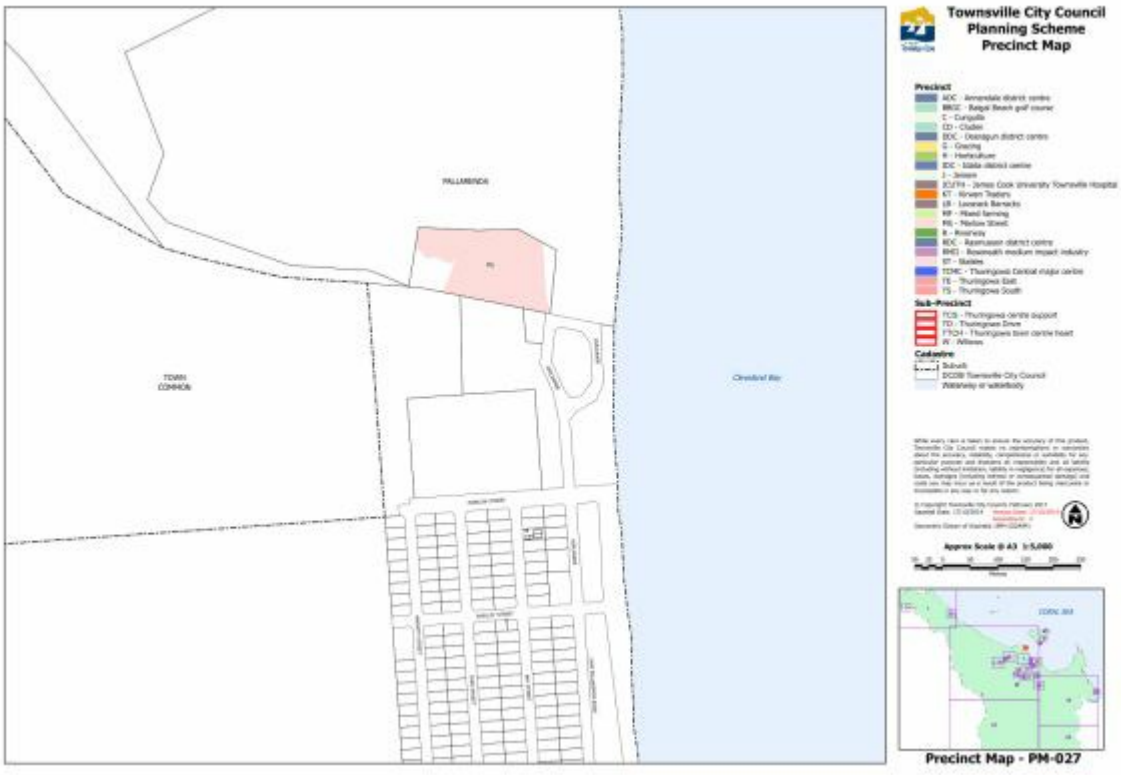

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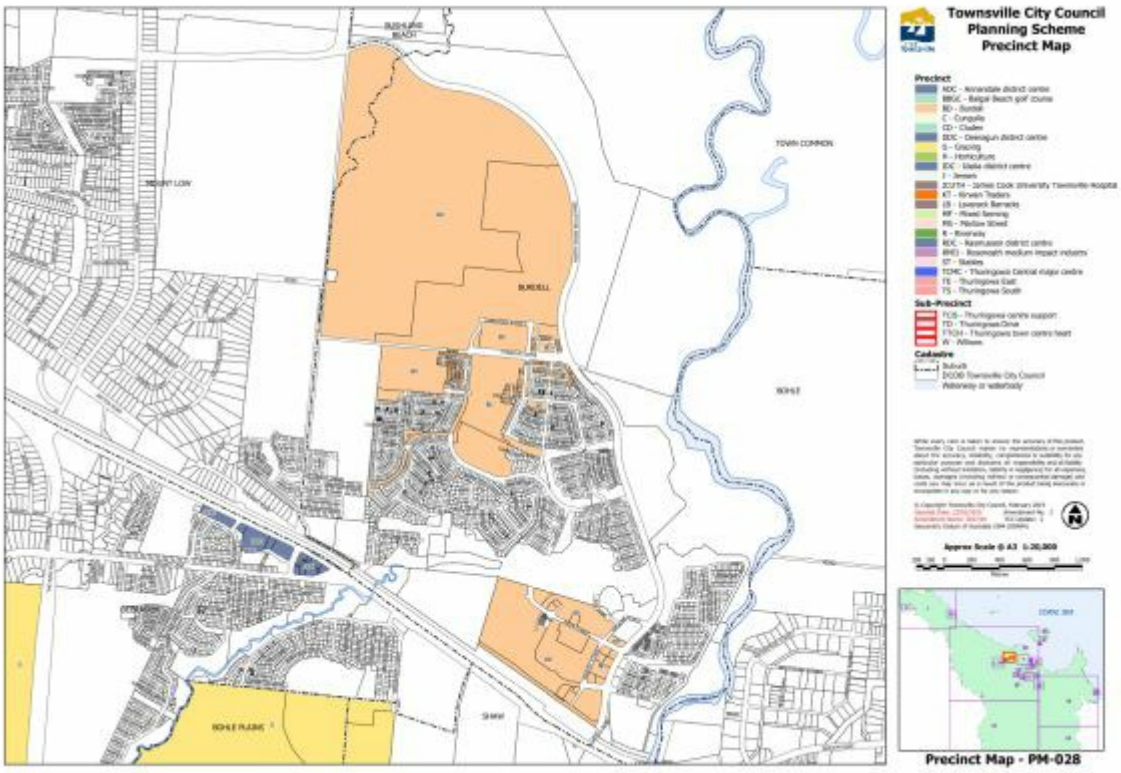
Precinct Map PM-027

Precinct Map PM-028



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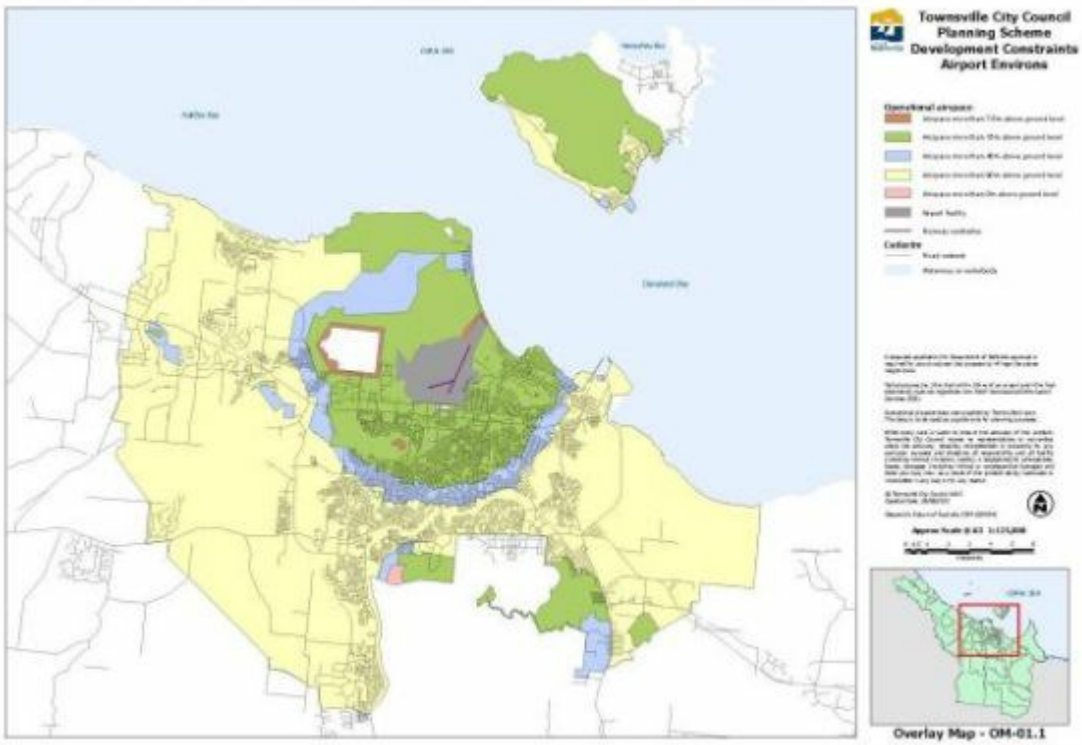
Precinct Map PM-028

SC2.4 Local plan maps

There are no local plan maps in this planning scheme.

SC2.5 Overlay maps



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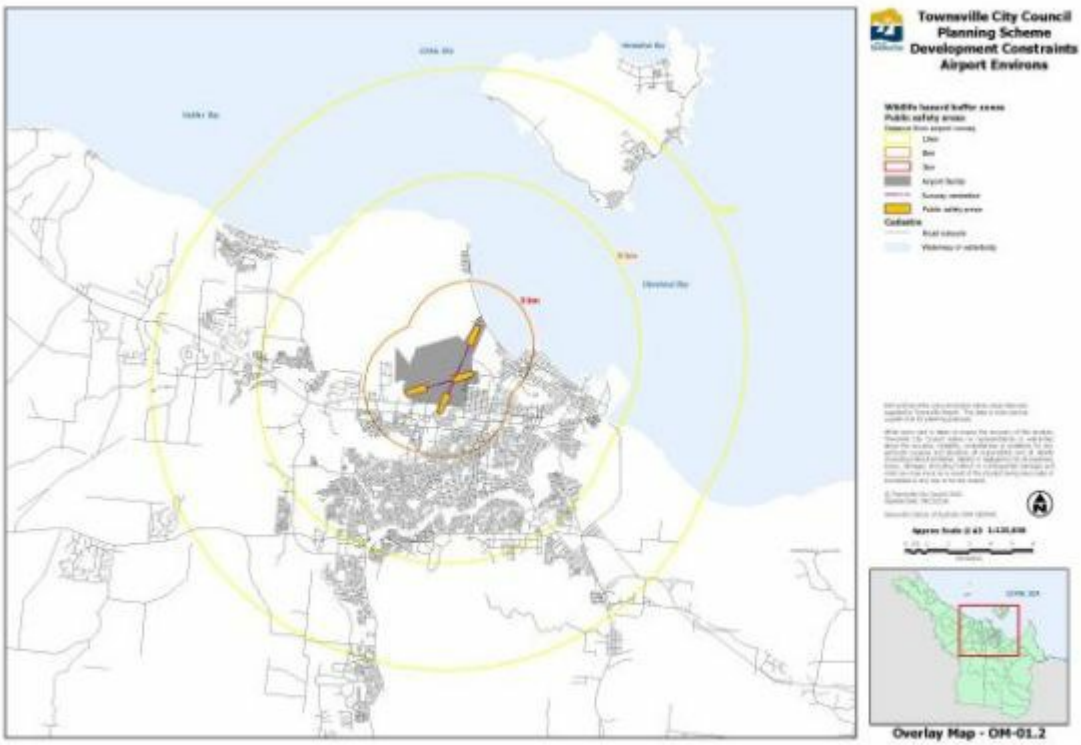
Development constraints airport environs overlay map OM-01.1 (Operational airspace)



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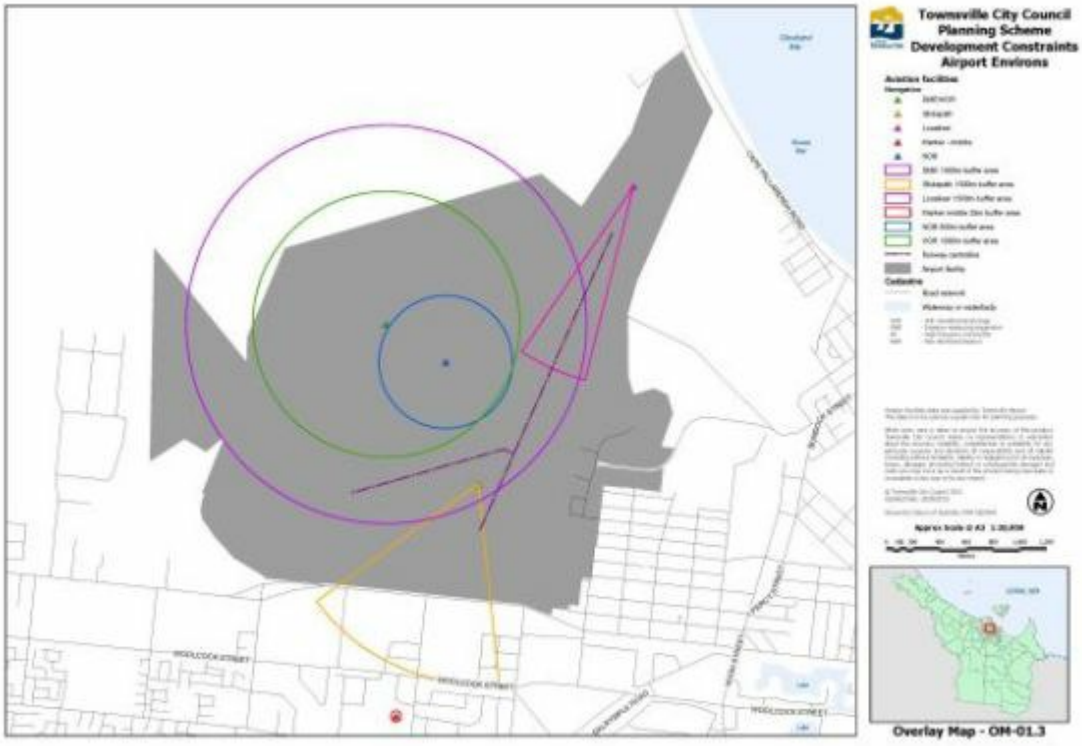
Development constraints airport environs overlay map OM-01.2 (Wildlife hazard buffer zones and Public safety areas)



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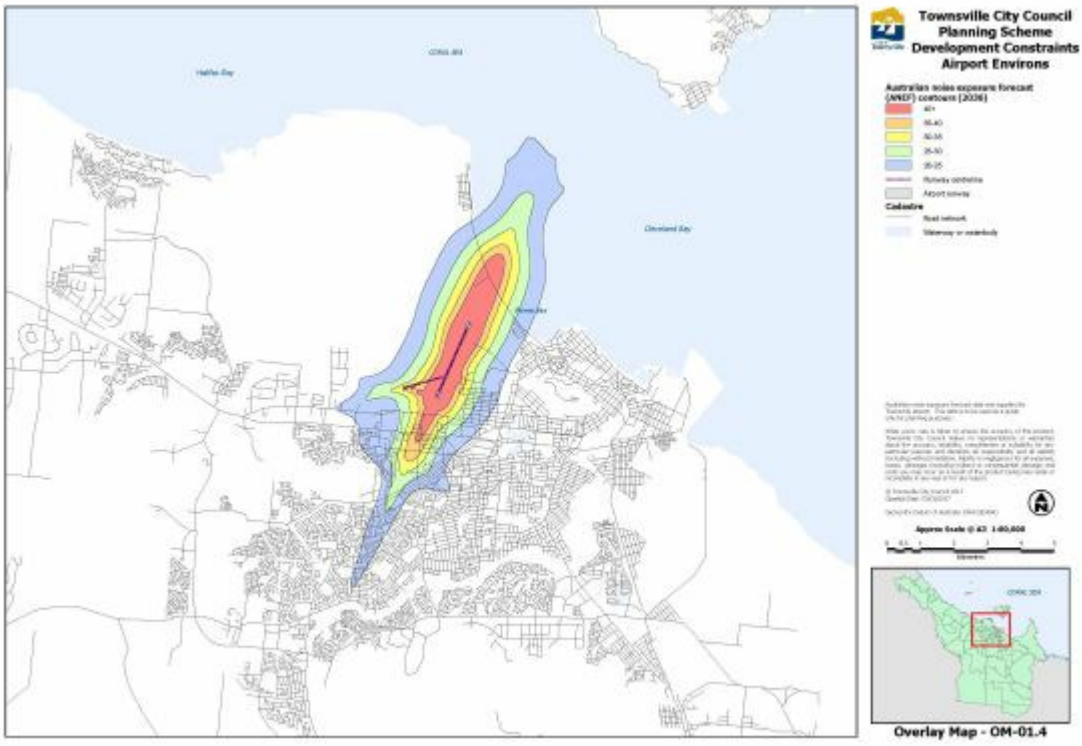
Development constraints airport environs overlay map OM-01.3 (Aviation facilities)



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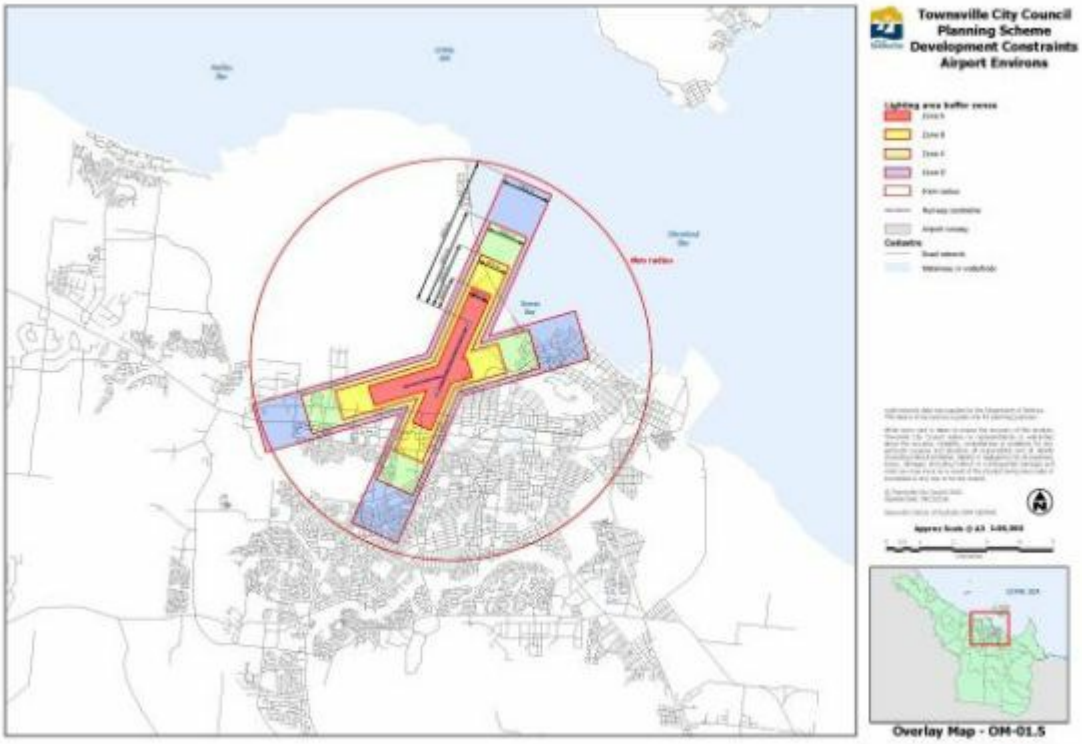
Development constraints airport environs overlay map OM-01.4 (Australian noise exposure forecast (ANEF) contours (2036))



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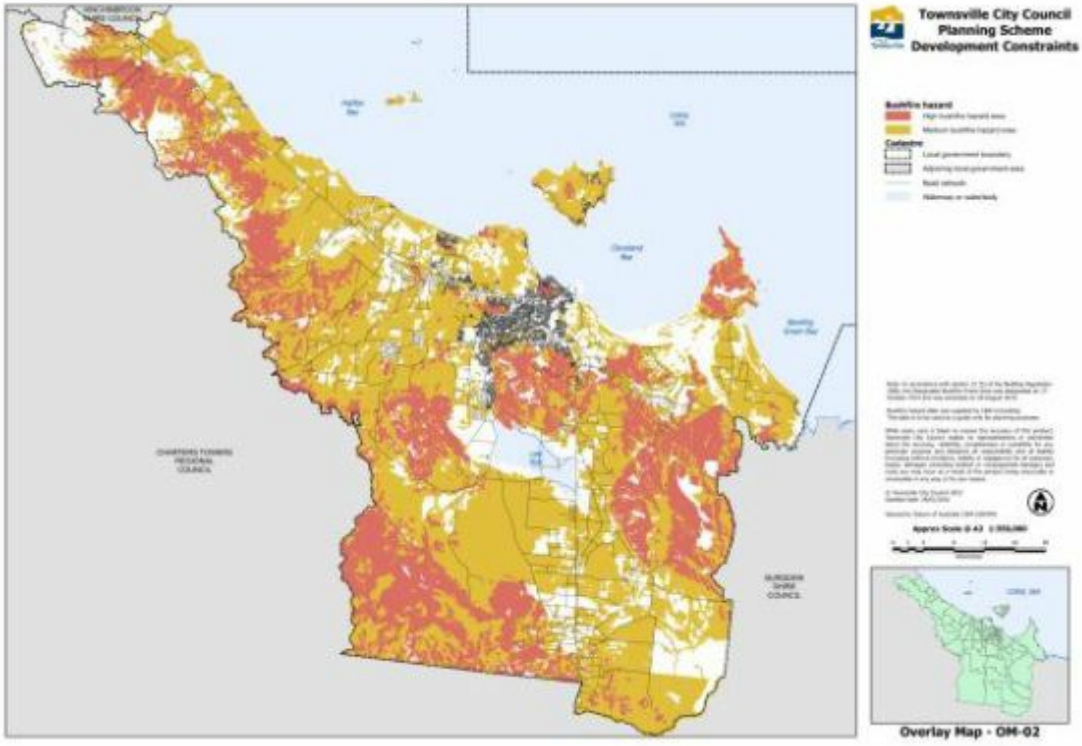
Development constraints airport environs overlay map OM-01.5 (Lighting area buffer zones)



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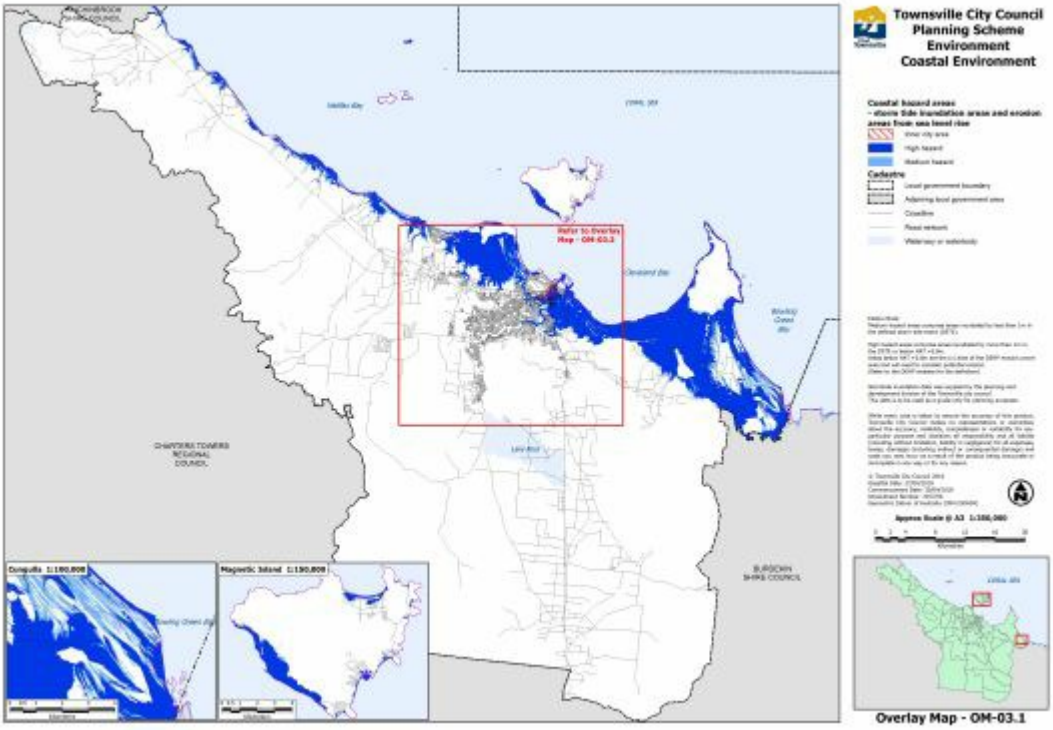
Development constraints overlay map OM-02 (Bushfire hazard)



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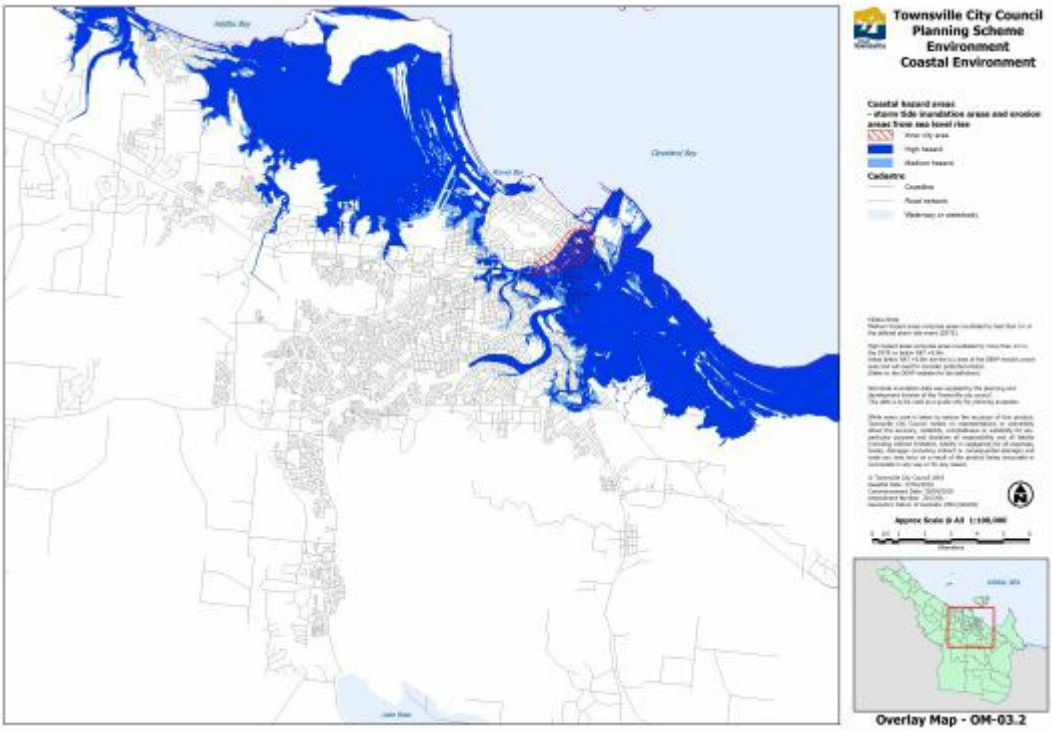
Coastal Environment overlay map OM-03.1 (Coastal hazard areas - storm tide inundation areas and erosion areas from sea level rise)



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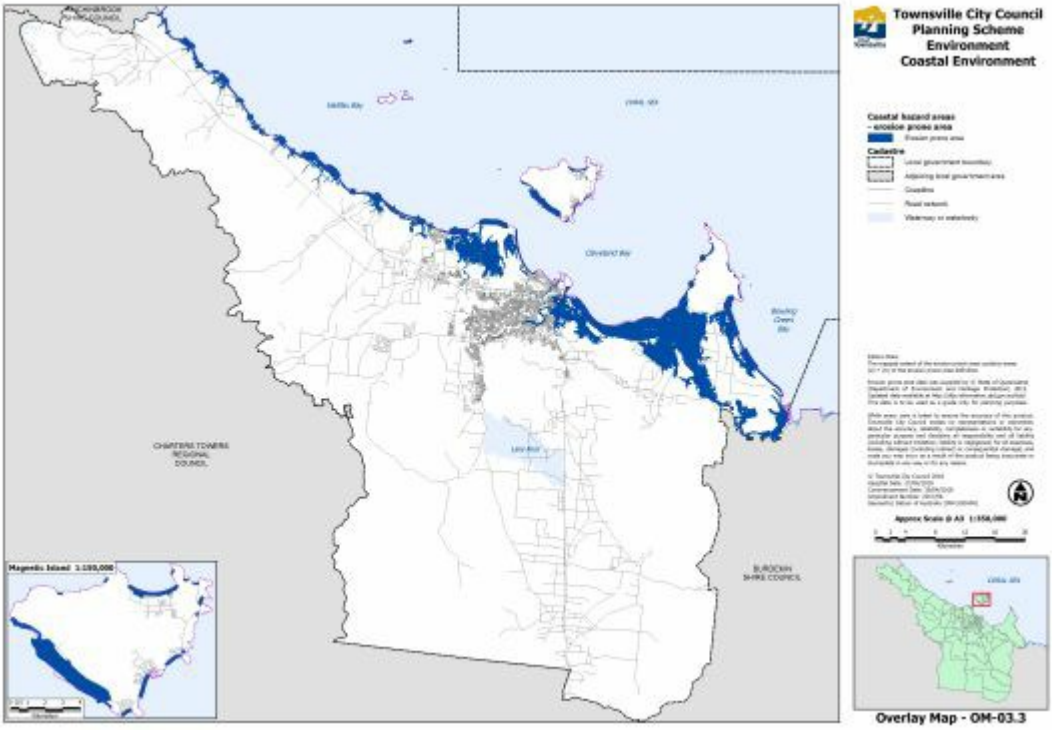
Coastal Environment overlay map OM-03.2 (Coastal hazard areas - storm tide inundation areas and erosion areas from sea level rise)



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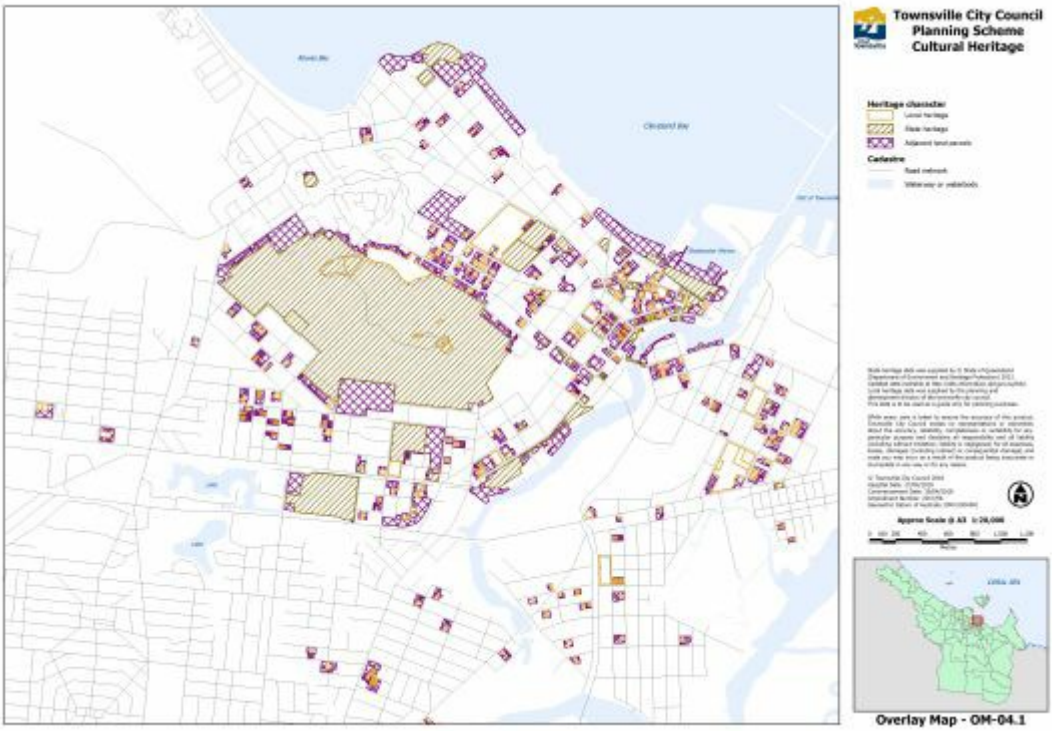
Coastal Environment overlay map OM-03.3 (Coastal hazard areas - erosion prone area)



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Cultural Heritage overlay map OM-04.1 (Heritage value)

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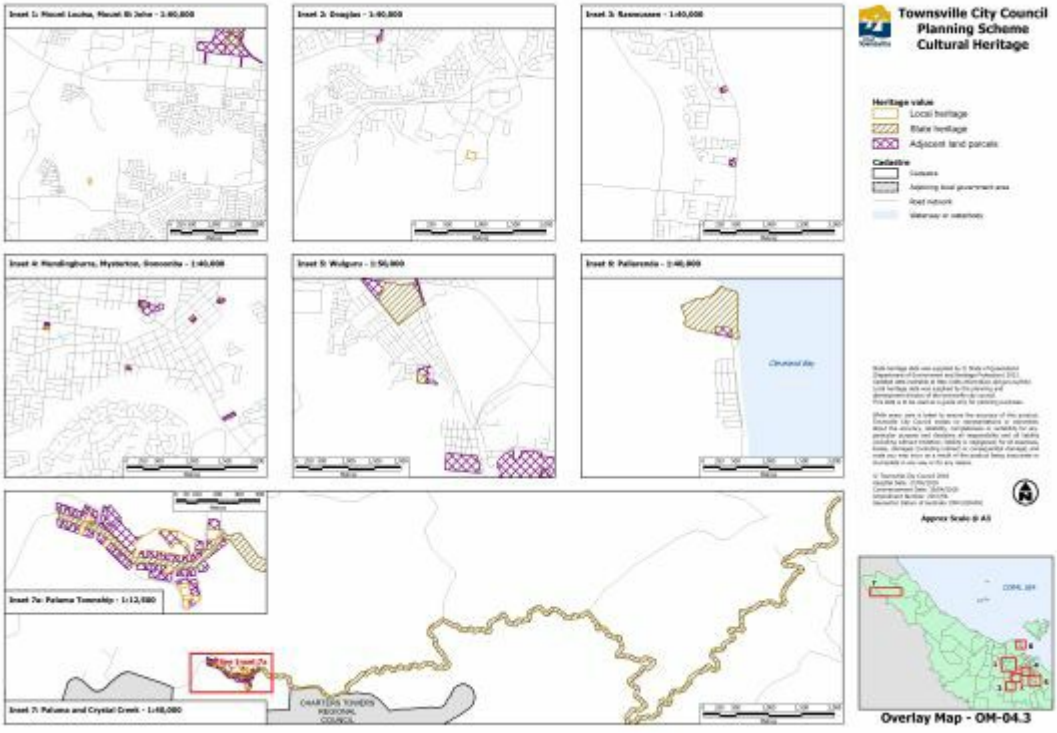
Cultural Heritage overlay map OM-04.2 (Heritage value)



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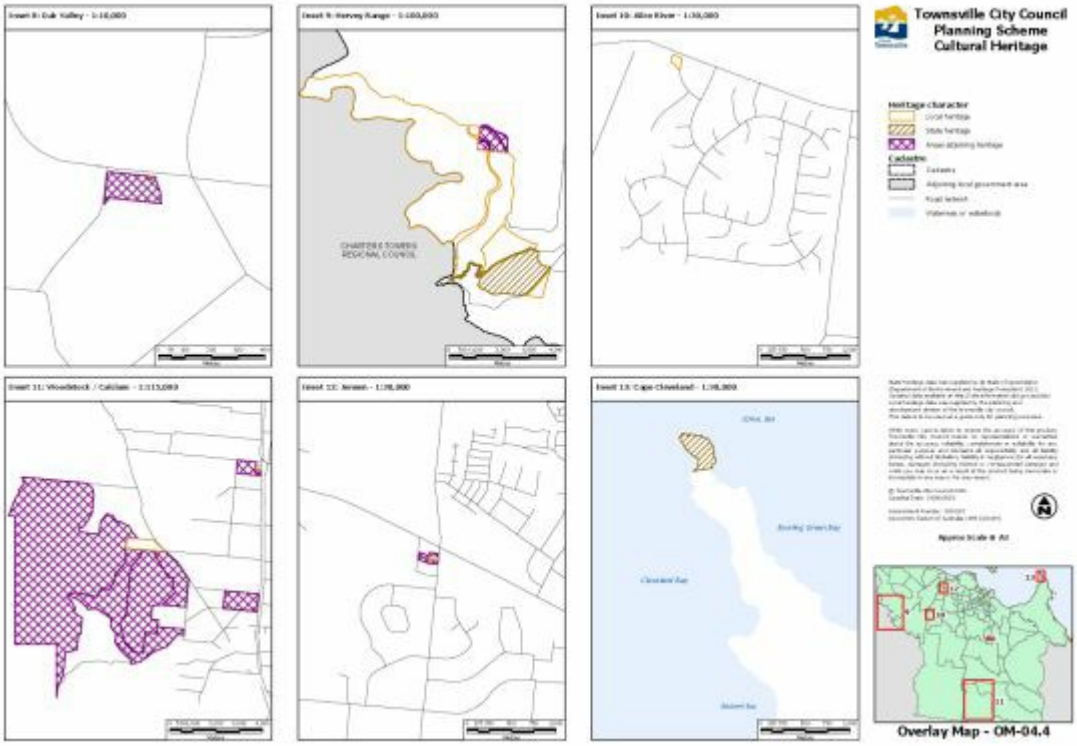
Cultural Heritage overlay map OM-04.3 (Heritage value)



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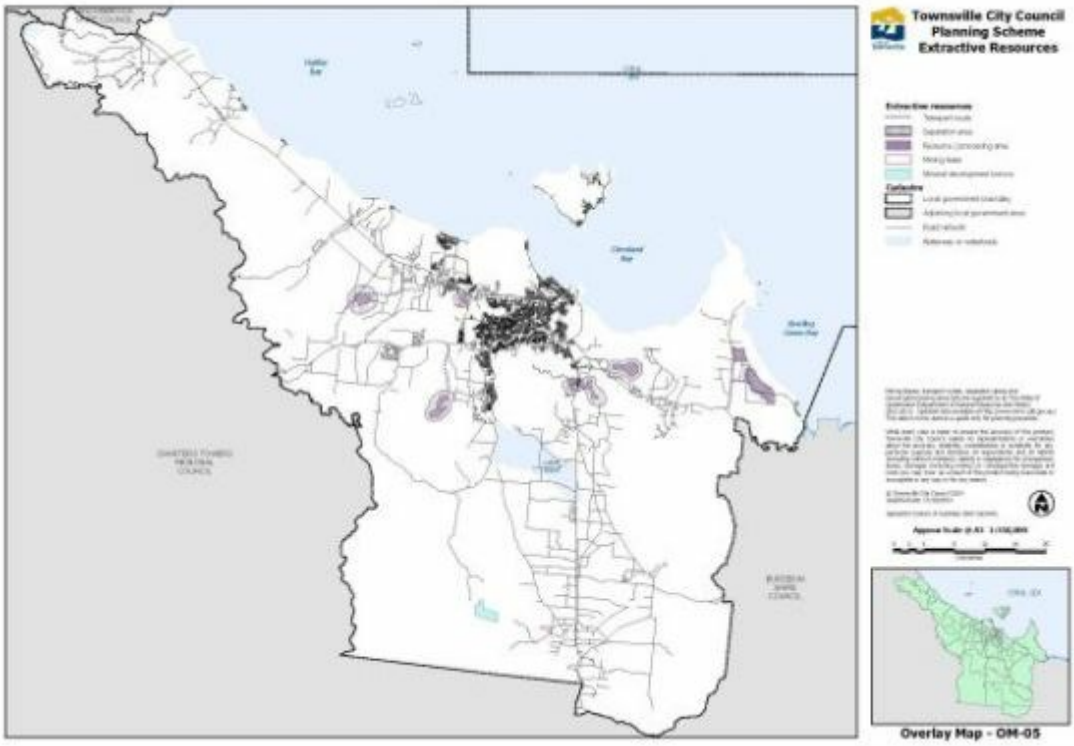
Cultural Heritage overlay map OM-04.4 (Heritage value)



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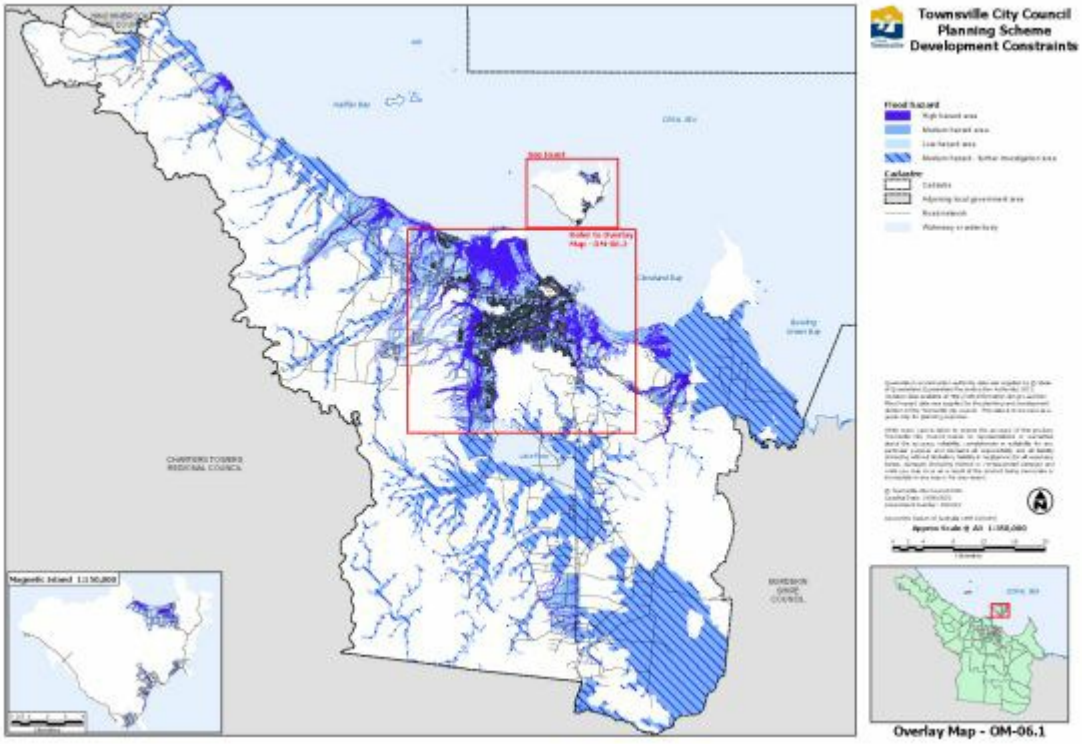
Natural assets overlay map OM-05 (Extractive Resources)



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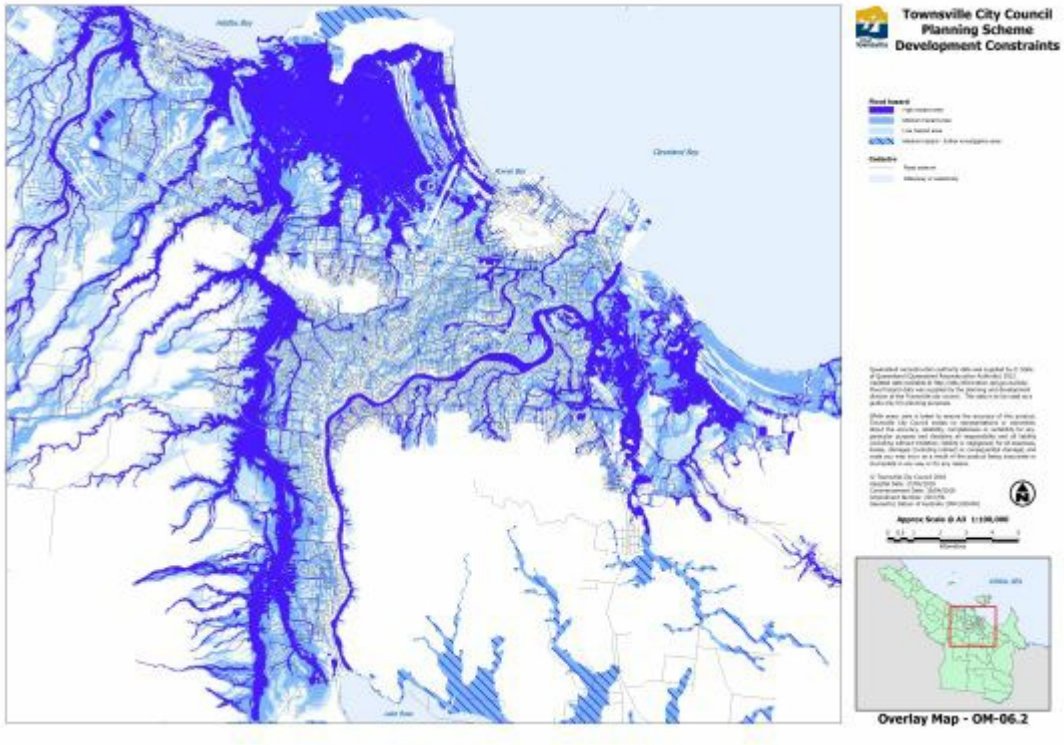
Click here to access Council's Flood Mapping Service.

Development constraints overlay map OM-06.1 (Flood hazard)



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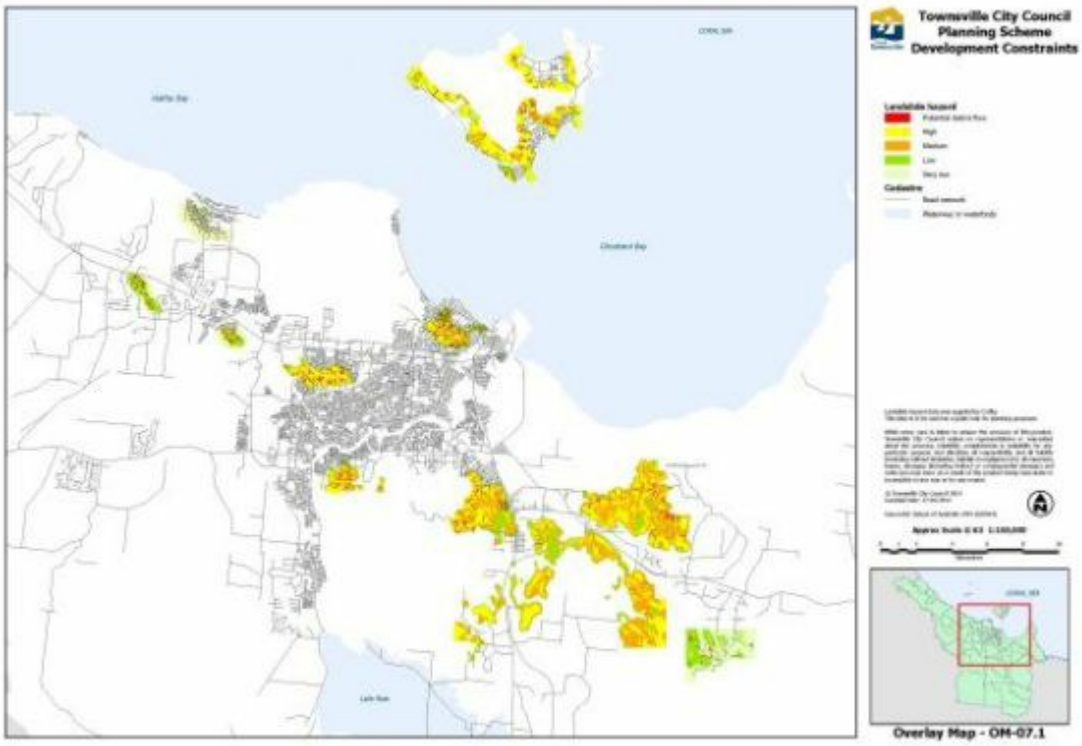
Development constraints overlay map OM-06.2 (Flood hazard)



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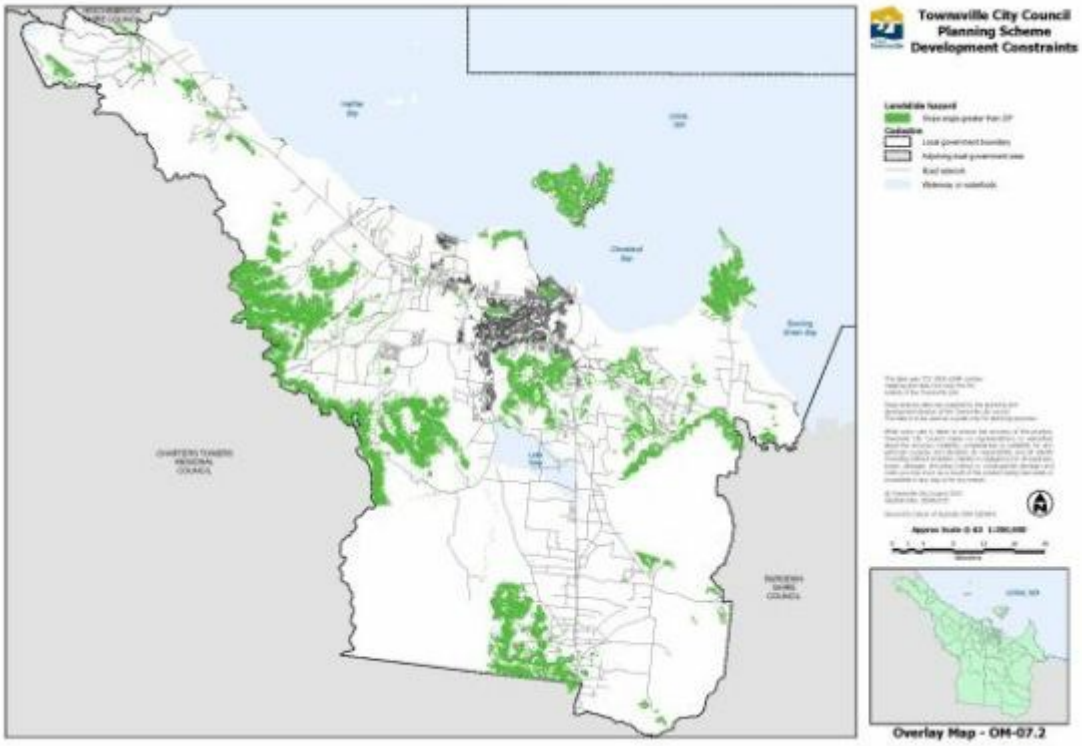
Development constraint overlay map OM-07.1 (Landslide hazard)



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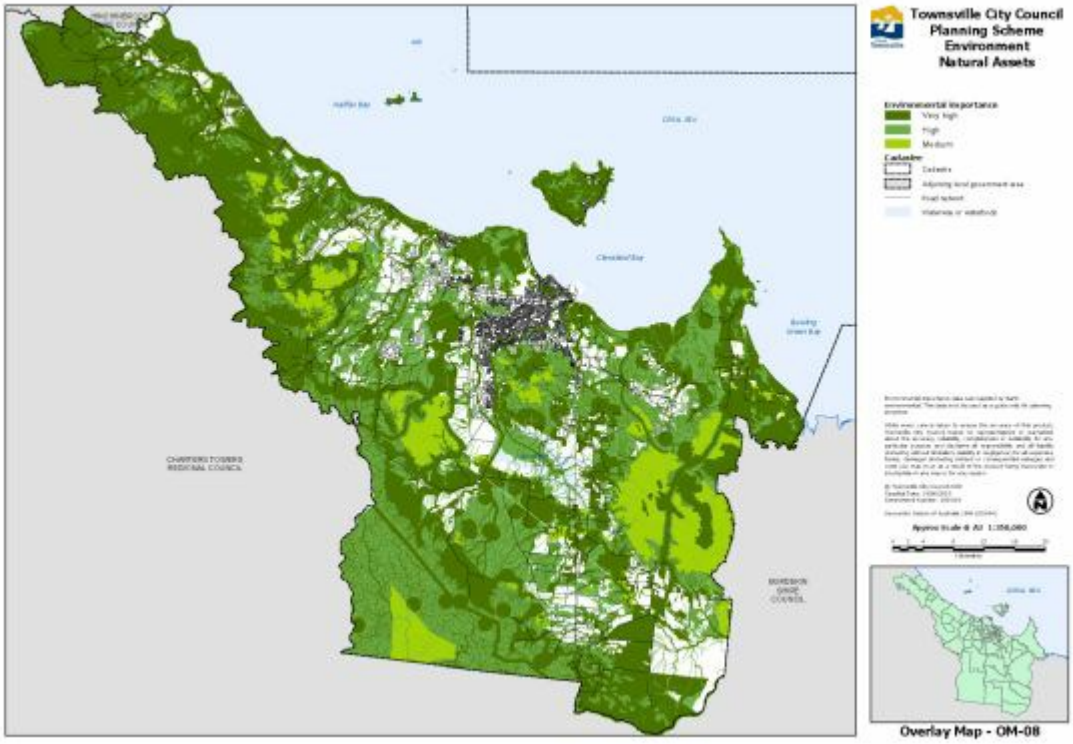
Development constraints overlay map OM-07.2 (Landslide hazard)



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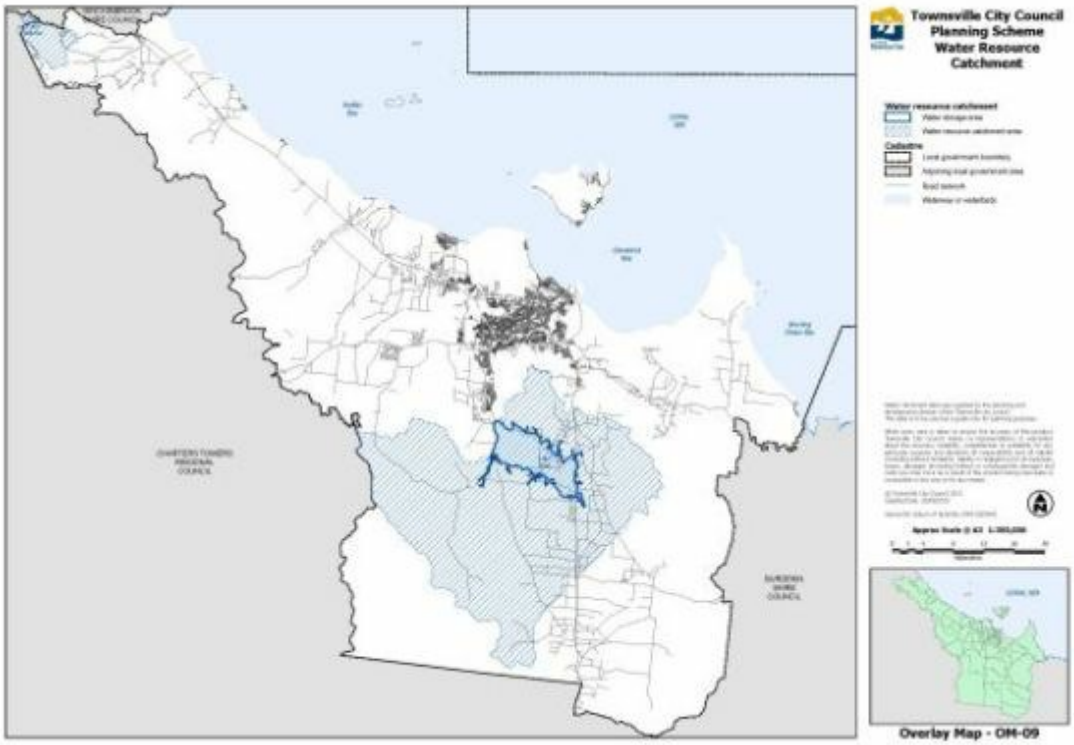
Natural assets environmental importance Overlay Map OM-08



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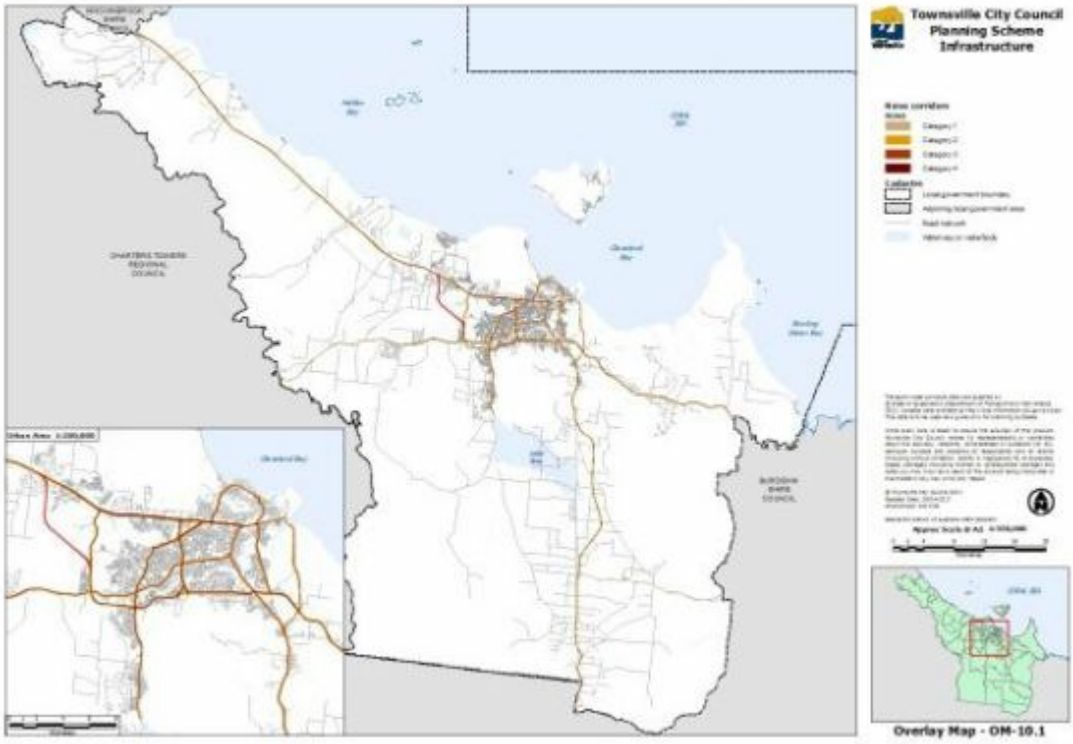
Natural resources overlay map OM-09 (Water resource catchments)



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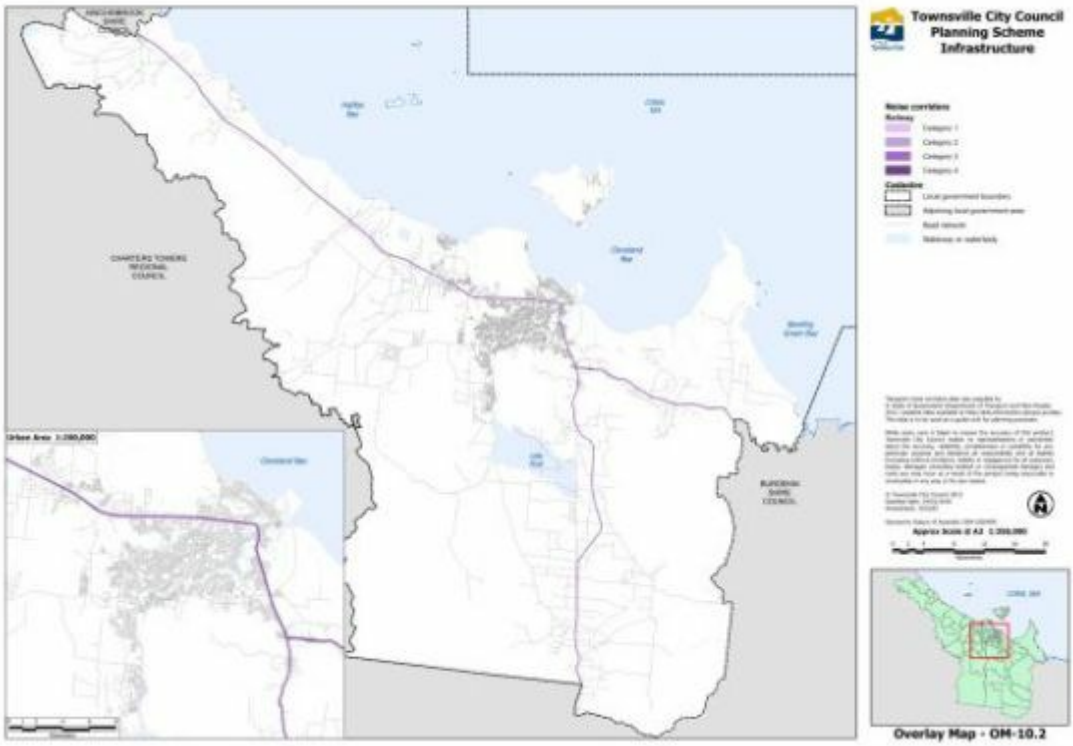
Infrastructure overlay map OM-10.1 (Noise corridors - Roads)



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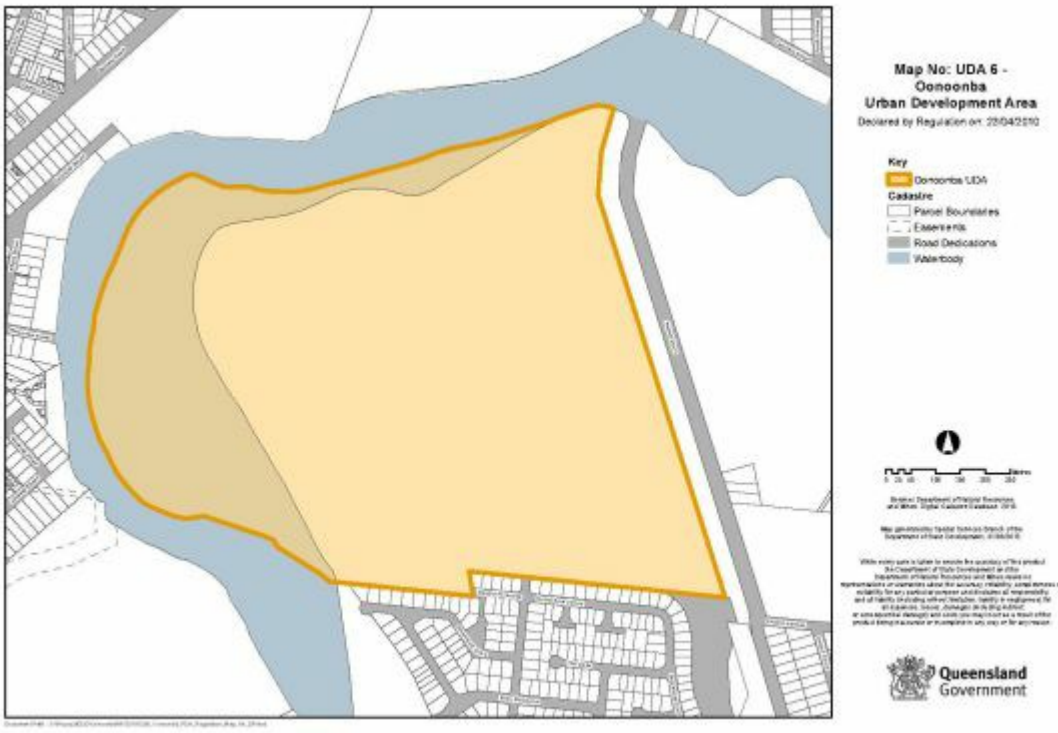
Infrastructure overlay map OM-10.2 (Noise corridors - Railway)

SC2.6 Other plans maps



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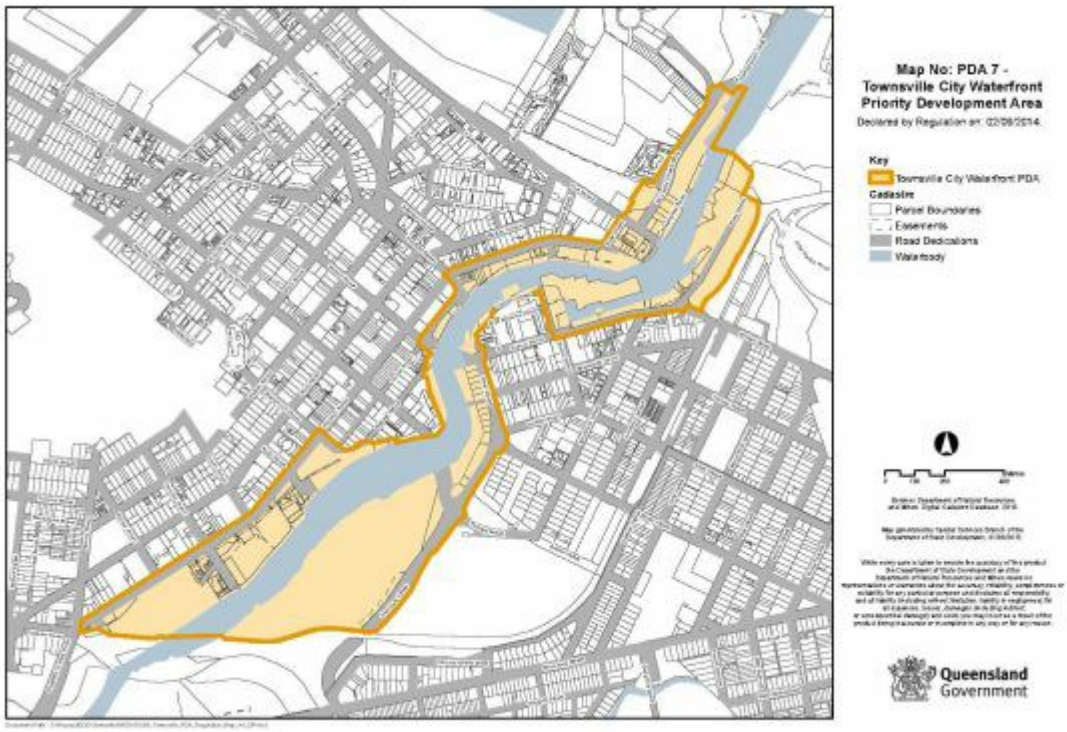
Oonoonba Urban Development Area Development Scheme Map OPM-01 (Map 2 - Oonoonba Urban Development Area)



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Townsville City Waterfront Priority Development Area OPM-02 (Map No. PDA 7 - Townsville City Waterfront Priority Development Area)

Schedule 3 Local government infrastructure plan mapping and supporting material

SC3.1 Planning assumption tables

Table SC3.1.1 - Existing and projected population

Column 1		Column 2	Column 3					
Projection area		LGIP development type	Existing and projected population					
Location	LRA		2011	2016	2021	2026	2031	FDS
City to Pallarenda	1	Single dwelling	9,790	9,709	9,926	10,015	10,164	15,094
City to Pallarenda	1	Multiple dwelling	9,122	9,722	10,044	11,026	12,188	21,451
City to Pallarenda	1	Other dwelling	416	435	445	481	517	572
City to Pallarenda	1	Total	19,329	19,865	20,415	21,522	22,869	37,117
South Townsville	2	Single dwelling	5,855	5,847	5,866	5,997	6,158	8,133
South Townsville	2	Multiple dwelling	2,963	3,932	4,062	4,148	4,251	6,948
South Townsville	2	Other dwelling	79	76	75	76	76	78
South Townsville	2	Total	8,897	9,855	10,003	10,221	10,485	15,159
Central Suburbs	3	Single dwelling	27,126	26,718	26,482	26,010	25,342	35,482
Central Suburbs	3	Multiple dwelling	7,452	7,477	7,411	7,279	7,092	18,732
Central Suburbs	3	Other dwelling	278	276	273	268	261	278
Central Suburbs	3	Total	34,856	34,471	34,166	33,557	32,696	54,492
Bohle Mt Louisa	4	Single dwelling	8,011	9,590	10,350	11,319	12,563	21,003
Bohle Mt Louisa	4	Multiple dwelling	125	275	297	387	525	2,352
Bohle Mt Louisa	4	Other dwelling	261	247	267	269	266	261
Bohle Mt Louisa	4	Total	8,397	10,112	10,914	11,975	13,354	23,616
Kirwan	5	Single dwelling	23,124	21,003	21,104	21,400	21,735	24,749
Kirwan	5	Multiple dwelling	1,461	1,376	1,383	1,402	1,424	6,496
Kirwan	5	Other dwelling	15	13	14	14	14	12
Kirwan	5	Total	24,600	22,393	22,500	22,815	23,173	31,257
Bohle Plains	6	Single dwelling	1,261	2,815	3,653	4,937	6,158	11,517
Bohle Plains	6	Multiple dwelling	17	82	131	222	318	1,767
Bohle Plains	6	Other dwelling	4	4	4	4	4	4
Bohle Plains	6	Total	1,281	2,901	3,788	5,163	6,480	13,288
Northern beaches	7	Single dwelling	10,508	15,986	19,274	25,870	33,630	53,196
Northern beaches	7	Multiple dwelling	272	582	730	1,231	1,959	8,864
Northern beaches	7	Other dwelling	71	64	72	71	70	71
Northern beaches	7	Total	10,851	16,631	20,075	27,173	35,658	62,131
North Rural	8	Single dwelling	-	-	-	-	-	-
North Rural	8	Multiple dwelling	-	-	-	-	-	-
North Rural	8	Other dwelling	-	-	-	-	-	-
North Rural	8	Total	-	-	-	-	-	-
South Rural	9	Single dwelling	-	-	-	-	-	-
South Rural	9	Multiple dwelling	-	-	-	-	-	-
South Rural	9	Other dwelling	-	-	-	-	-	-
South Rural	9	Total	-	-	-	-	-	-
Upper Ross	10	Single dwelling	17,668	17,255	18,048	19,125	20,975	28,532
Upper Ross	10	Multiple dwelling	778	933	976	1,095	1,752	12,482
Upper Ross	10	Other dwelling	158	144	151	158	157	160
Upper Ross	10	Total	18,604	18,332	19,174	20,378	22,884	41,174
Southern Suburbs	11	Single dwelling	25,305	23,100	23,721	24,808	26,447	35,700
Southern Suburbs	11	Multiple dwelling	2,270	2,569	2,639	2,759	2,942	4,656
Southern Suburbs	11	Other dwelling	402	746	767	802	855	3,273
Southern Suburbs	11	Total	27,978	26,416	27,126	28,369	30,243	43,629
Eastern Rural	12	Single dwelling	-	1,109	1,782	3,322	5,473	29,509
Eastern Rural	12	Multiple dwelling	1	105	243	581	960	1

Column 1		Column 2	Column 3					
Projection area		LGIP development type	Existing and projected population					
Location	LRA		2011	2016	2021	2026	2031	FDS
Eastern Rural	12	Other dwelling	41	40	46	43	43	41
Eastern Rural	12	Total	42	1,254	2,071	3,946	6,476	29,551
Magnetic Island	13	Single dwelling	1,609	3,319	3,479	3,617	3,739	5,332
Magnetic Island	13	Multiple dwelling	532	894	907	912	943	2,819
Magnetic Island	13	Other dwelling	40	40	40	39	41	40
Magnetic Island	13	Total	2,182	4,254	4,426	4,568	4,723	8,191
Inside priority infrastructure area (total)		Single dwelling	130,257	136,451	143,684	156,421	172,385	268,247
		Multiple dwelling	24,994	27,947	28,821	31,042	34,353	86,568
		Other dwelling	1,766	2,085	2,153	2,225	2,303	4,790
		Total	157,017	166,484	174,658	189,687	209,041	359,605
Outside priority infrastructure area (total)		Single dwelling	22,120	24,606	26,056	26,367	27,285	43,310
		Multiple dwelling	121	153	162	170	185	555
		Other dwelling	856	873	894	865	871	856
		Total	23,097	25,631	27,112	27,402	28,341	44,721
Townsville City Council Local Government Area		Single dwelling	152,377	161,057	169,740	182,788	199,670	311,557
		Multiple dwelling	25,115	28,100	28,982	31,212	34,538	87,123
		Other dwelling	2,622	2,958	3,048	3,090	3,174	5,646
		Total	180,114	192,115	201,770	217,089	237,382	404,326

Table SC3.1.2 - Existing and projected employment

Column 1		Column 2	Column 3					
Projection area		LGIP development type	Existing and projected employees					
Location	LRA		2011	2016	2021	2026	2031	FDS
City to Pallarenda	1	Retail	1,294	1,468	1,541	1,683	1,961	8,942
City to Pallarenda	1	Services	5,173	6,443	6,857	8,044	9,934	45,455
City to Pallarenda	1	Professional	7,908	8,634	9,093	10,082	11,657	40,854
City to Pallarenda	1	Industrial	2,562	2,440	2,530	2,578	2,632	3,049
City to Pallarenda	1	Other	354	362	376	396	432	1,485
City to Pallarenda	1	Total	17,292	19,348	20,398	22,783	26,617	99,785
South Townsville	2	Retail	802	827	862	944	1,089	5,366
South Townsville	2	Services	1,445	1,405	1,463	1,558	1,675	3,876
South Townsville	2	Professional	1,320	1,260	1,313	1,375	1,454	2,953
South Townsville	2	Industrial	1,863	1,915	2,006	2,154	2,281	3,320
South Townsville	2	Other	130	126	131	136	142	408
South Townsville	2	Total	5,559	5,534	5,776	6,166	6,641	15,923
Central Suburbs	3	Retail	3,632	3,710	3,858	4,016	4,292	7,569
Central Suburbs	3	Services	8,084	7,978	8,300	8,615	9,059	13,685
Central Suburbs	3	Professional	3,041	3,168	3,312	3,532	3,855	8,066
Central Suburbs	3	Industrial	2,172	2,102	2,184	2,246	2,318	2,737
Central Suburbs	3	Other	126	152	153	175	207	855
Central Suburbs	3	Total	17,055	17,111	17,808	18,585	19,730	32,912
Bohle Mt Louisa	4	Retail	3,819	3,684	3,821	3,904	4,039	12,982
Bohle Mt Louisa	4	Services	2,155	2,124	2,212	2,306	2,440	8,615
Bohle Mt Louisa	4	Professional	2,054	1,980	2,056	2,112	2,191	5,278
Bohle Mt Louisa	4	Industrial	7,489	7,819	8,222	8,985	10,017	40,971
Bohle Mt Louisa	4	Other	1,394	1,336	1,385	1,412	1,450	4,158
Bohle Mt Louisa	4	Total	16,911	16,943	17,695	18,719	20,138	72,004
Kirwan	5	Retail	1,587	1,672	1,741	1,832	1,983	3,638
Kirwan	5	Services	3,349	3,502	3,652	3,839	4,050	4,941
Kirwan	5	Professional	1,403	1,546	1,621	1,753	1,906	2,775
Kirwan	5	Industrial	652	614	636	644	650	654
Kirwan	5	Other	19	71	77	101	140	309

Column 1		Column 2	Column 3					
Projection area		LGIP development type	Existing and projected employees					
Location	LRA		2011	2016	2021	2026	2031	FDS
Kirwan	5	Total	7,010	7,405	7,728	8,168	8,729	12,317
Bohle Plains	6	Retail	26	27	29	31	34	2,312
Bohle Plains	6	Services	19	22	23	25	31	2,586
Bohle Plains	6	Professional	21	22	23	24	26	884
Bohle Plains	6	Industrial	90	116	125	155	197	10,833
Bohle Plains	6	Other	11	12	12	14	14	968
Bohle Plains	6	Total	168	198	211	249	302	17,583
Northern beaches	7	Retail	316	397	419	475	589	4,274
Northern beaches	7	Services	516	688	740	920	1,236	6,249
Northern beaches	7	Professional	200	256	274	331	420	2,000
Northern beaches	7	Industrial	363	461	495	603	742	2,323
Northern beaches	7	Other	11	32	34	49	78	1,068
Northern beaches	7	Total	1,405	1,835	1,962	2,377	3,066	15,914
North Rural	8	Retail	-	-	-	-	-	-
North Rural	8	Services	-	-	-	-	-	-
North Rural	8	Professional	-	-	-	-	-	-
North Rural	8	Industrial	-	-	-	-	-	-
North Rural	8	Other	-	-	-	-	-	-
North Rural	8	Total	-	-	-	-	-	-
South Rural	9	Retail	-	-	-	-	-	-
South Rural	9	Services	-	-	-	-	-	-
South Rural	9	Professional	-	-	-	-	-	-
South Rural	9	Industrial	-	-	-	-	-	-
South Rural	9	Other	-	-	-	-	-	-
South Rural	9	Total	-	-	-	-	-	-
Upper Ross	10	Retail	385	429	446	483	563	4,257
Upper Ross	10	Services	1,384	1,375	1,433	1,500	1,595	3,424
Upper Ross	10	Professional	374	399	419	458	522	2,251
Upper Ross	10	Industrial	507	478	495	499	504	520
Upper Ross	10	Other	32	41	42	51	62	426
Upper Ross	10	Total	2,683	2,722	2,835	2,991	3,247	10,878
Southern Suburbs	11	Retail	1,027	1,098	1,147	1,227	1,387	20,098
Southern Suburbs	11	Services	8,558	8,246	8,558	8,784	9,094	24,755
Southern Suburbs	11	Professional	4,883	4,696	4,876	5,004	5,179	14,620
Southern Suburbs	11	Industrial	2,761	2,975	3,140	3,507	4,009	25,873
Southern Suburbs	11	Other	126	161	167	193	244	6,828
Southern Suburbs	11	Total	17,356	17,176	17,889	18,715	19,914	92,174
Eastern Rural	12	Retail	7	7	11	66	271	1,959
Eastern Rural	12	Services	17	16	22	89	379	6,672
Eastern Rural	12	Professional	5	4	6	28	143	3,480
Eastern Rural	12	Industrial	38	36	38	42	160	116
Eastern Rural	12	Other	6	5	7	18	58	326
Eastern Rural	12	Total	74	69	83	244	1,011	12,553
Magnetic Island	13	Retail	126	119	123	125	126	805
Magnetic Island	13	Services	360	340	352	356	360	1,312
Magnetic Island	13	Professional	150	142	147	150	151	981
Magnetic Island	13	Industrial	155	146	151	153	156	307
Magnetic Island	13	Other	21	20	21	21	21	175
Magnetic Island	13	Total	813	767	794	804	814	3,580
		Retail	13,022	13,440	13,998	14,787	16,335	72,202

Column 1		Column 2	Column 3					
Projection area		LGIP development type	Existing and projected employees					
Location	LRA		2011	2016	2021	2026	2031	FDS
Inside priority infrastructure area (total)		Services	31,061	32,138	33,611	36,035	39,852	121,570
		Professional	21,359	22,108	23,141	24,848	27,504	84,142
		Industrial	18,652	19,103	20,022	21,565	23,666	90,703
		Other	2,230	2,319	2,406	2,565	2,850	17,006
		Total	86,325	89,107	93,178	99,801	110,208	385,623
Outside priority infrastructure area (total)		Retail	171	205	214	236	287	8,412
		Services	740	751	783	832	901	6,948
		Professional	583	586	611	645	696	4,253
		Industrial	1,800	2,049	2,169	2,496	2,920	7,882
		Other	438	440	456	479	513	4,917
		Total	3,732	4,030	4,234	4,689	5,317	32,412
Townsville City Council Local Government Area		Retail	13,193	13,644	14,213	15,023	16,623	80,614
		Services	31,801	32,889	34,395	36,867	40,754	128,518
		Professional	21,943	22,693	23,752	25,493	28,200	88,395
		Industrial	20,452	21,152	22,191	24,061	26,586	98,585
		Other	2,668	2,759	2,862	3,045	3,362	21,923
		Total	90,057	93,137	97,412	104,489	115,525	418,035

Table SC3.1.3 - Existing and projected residential dwellings

Column 1		Column 2	Column 3					
Projection area		LGIP development type	Existing and projected dwellings					
Location	LRA		2011	2016	2021	2026	2031	FDS
City to Pallarenda	1	Single dwelling	3,761	3,840	3,853	3,970	4,138	5,391
City to Pallarenda	1	Multiple dwelling	5,068	5,488	5,549	6,087	6,756	11,917
City to Pallarenda	1	Other dwelling	231	245	246	265	287	318
City to Pallarenda	1	Total	9,060	9,574	9,648	10,323	11,181	17,626
South Townsville	2	Single dwelling	2,187	2,345	2,377	2,419	2,507	2,905
South Townsville	2	Multiple dwelling	1,646	2,171	2,248	2,280	2,347	3,860
South Townsville	2	Other dwelling	44	42	42	42	42	43
South Townsville	2	Total	3,877	4,558	4,667	4,741	4,896	6,808
Central Suburbs	3	Single dwelling	10,179	10,273	10,273	10,273	10,273	12,672
Central Suburbs	3	Multiple dwelling	4,140	4,193	4,193	4,193	4,193	10,407
Central Suburbs	3	Other dwelling	155	155	155	155	155	154
Central Suburbs	3	Total	14,474	14,620	14,620	14,620	14,620	23,233
Bohle Mt Louisa	4	Single dwelling	2,776	3,603	3,603	3,952	4,487	7,501
Bohle Mt Louisa	4	Multiple dwelling	69	161	161	208	284	1,307
Bohle Mt Louisa	4	Other dwelling	145	145	145	145	144	145
Bohle Mt Louisa	4	Total	2,990	3,909	3,909	4,305	4,916	8,953
Kirwan	5	Single dwelling	8,149	8,286	8,286	8,286	8,286	8,839
Kirwan	5	Multiple dwelling	812	842	842	842	842	3,609
Kirwan	5	Other dwelling	8	8	8	8	8	7
Kirwan	5	Total	8,969	9,136	9,136	9,136	9,136	12,454
Bohle Plains	6	Single dwelling	390	959	1,305	1,748	2,210	4,113
Bohle Plains	6	Multiple dwelling	9	48	78	120	171	982
Bohle Plains	6	Other dwelling	2	2	2	2	2	2
Bohle Plains	6	Total	402	1,009	1,386	1,871	2,383	5,097
Northern beaches	7	Single dwelling	3,517	6,279	6,635	9,095	12,324	18,999
Northern beaches	7	Multiple dwelling	151	361	395	659	1,064	4,924
Northern beaches	7	Other dwelling	39	39	39	38	38	39
Northern beaches	7	Total	3,708	6,679	7,069	9,792	13,425	23,962
North Rural	8	Single dwelling	-	-	-	-	-	-
North Rural	8	Multiple dwelling	-	-	-	-	-	-

North Rural	8	Other dwelling	-	-	-	-	-	-
North Rural	8	Total	-	-	-	-	-	-
South Rural	9	Single dwelling	-	-	-	-	-	-
South Rural	9	Multiple dwelling	-	-	-	-	-	-
South Rural	9	Other dwelling	-	-	-	-	-	-
South Rural	9	Total	-	-	-	-	-	-
Upper Ross	10	Single dwelling	6,156	6,697	6,697	6,829	7,786	10,190
Upper Ross	10	Multiple dwelling	432	566	566	607	968	6,934
Upper Ross	10	Other dwelling	88	88	88	87	87	89
Upper Ross	10	Total	6,676	7,351	7,351	7,523	8,841	17,213
Southern Suburbs	11	Single dwelling	8,952	9,555	9,555	9,555	9,555	12,750
Southern Suburbs	11	Multiple dwelling	1,261	1,643	1,643	1,643	1,643	2,587
Southern Suburbs	11	Other dwelling	223	477	477	477	477	1,818
Southern Suburbs	11	Total	10,437	11,676	11,676	11,676	11,676	17,155
Eastern Rural	12	Single dwelling	-	443	673	1,189	1,986	10,539
Eastern Rural	12	Multiple dwelling	1	65	153	304	512	1
Eastern Rural	12	Other dwelling	23	23	23	23	23	23
Eastern Rural	12	Total	24	530	849	1,516	2,521	10,562
Magnetic Island	13	Single dwelling	660	1,362	1,438	1,519	1,519	1,904
Magnetic Island	13	Multiple dwelling	296	477	488	499	499	1,566
Magnetic Island	13	Other dwelling	22	21	21	21	21	22
Magnetic Island	13	Total	978	1,861	1,948	2,039	2,039	3,493
Inside priority infrastructure area (total)		Single dwelling	46,728	53,641	54,696	58,836	65,071	95,803
		Multiple dwelling	13,885	16,017	16,318	17,442	19,279	48,093
		Other dwelling	981	1,246	1,246	1,264	1,284	2,661
		Total	61,595	70,904	72,260	77,542	85,635	146,557
Outside priority infrastructure area (total)		Single dwelling	8,159	9,975	10,049	10,294	10,671	15,468
		Multiple dwelling	67	84	85	91	99	308
		Other dwelling	476	474	474	472	472	476
		Total	8,702	10,533	10,607	10,857	11,241	16,252
Townsville City Council Local Government Area		Single dwelling	54,888	63,616	64,745	69,130	75,742	111,270
		Multiple dwelling	13,953	16,101	16,403	17,533	19,378	48,402
		Other dwelling	1,457	1,720	1,719	1,736	1,756	3,137
		Total	70,297	81,437	82,867	88,399	96,876	162,809

Table SC3.1.4 - Existing and projected non-residential floorspace (m2 GFA)

Column 1		Column 2	Column 3					
Projection area		LGIP development type	Existing and projected non-residential floorspace					
Location	LRA		2011	2016	2021	2026	2031	FDS
City to Pallarenda	1	Retail	45,291	51,390	53,920	58,919	68,641	312,970
City to Pallarenda	1	Services	87,946	109,529	116,572	136,744	168,874	772,735
City to Pallarenda	1	Professional	142,353	155,416	163,681	181,473	209,824	735,372
City to Pallarenda	1	Industrial	230,542	219,600	227,711	232,030	236,910	274,410
City to Pallarenda	1	Other	7,086	7,244	7,527	7,924	8,649	29,700
City to Pallarenda	1	Total	513,218	543,179	569,410	617,090	692,897	2,125,187
South Townsville	2	Retail	28,069	28,941	30,183	33,048	38,123	187,810
South Townsville	2	Services	24,558	23,888	24,863	26,478	28,474	65,892
South Townsville	2	Professional	23,756	22,676	23,640	24,747	26,164	53,154
South Townsville	2	Industrial	167,627	172,390	180,568	193,847	205,296	298,800
South Townsville	2	Other	2,595	2,530	2,628	2,712	2,836	8,160
South Townsville	2	Total	246,604	250,424	261,882	280,832	300,893	613,816
Central Suburbs	3	Retail	127,134	129,866	135,039	140,557	150,219	264,915
Central Suburbs	3	Services	137,430	135,628	141,094	146,463	153,999	232,645
Central Suburbs	3	Professional	54,735	57,022	59,622	63,576	69,382	145,188
Central Suburbs	3	Industrial	195,463	189,200	196,565	202,183	208,587	246,330
Central Suburbs	3	Other	2,516	3,048	3,066	3,493	4,143	17,100

Column 1		Column 2	Column 3					
Projection area		LGIP development type	Existing and projected non-residential floorspace					
Location	LRA		2011	2016	2021	2026	2031	FDS
Central Suburbs	3	Total	517,278	514,764	535,387	556,272	586,330	906,178
Bohle Mt Louisa	4	Retail	133,654	128,941	133,722	136,651	141,375	454,370
Bohle Mt Louisa	4	Services	36,641	36,105	37,600	39,197	41,488	146,455
Bohle Mt Louisa	4	Professional	36,968	35,638	37,010	38,018	39,437	95,004
Bohle Mt Louisa	4	Industrial	674,032	703,680	739,951	808,626	901,573	3,687,390
Bohle Mt Louisa	4	Other	27,882	26,722	27,692	28,244	29,001	83,160
Bohle Mt Louisa	4	Total	909,176	931,086	975,975	1,050,735	1,152,874	4,466,379
Kirwan	5	Retail	55,544	58,517	60,947	64,123	69,411	127,330
Kirwan	5	Services	56,932	59,527	62,087	65,255	68,845	83,997
Kirwan	5	Professional	25,259	27,829	29,183	31,546	34,315	49,950
Kirwan	5	Industrial	58,706	55,277	57,249	57,952	58,466	58,860
Kirwan	5	Other	375	1,419	1,540	2,018	2,800	6,180
Kirwan	5	Total	196,816	202,568	211,007	220,893	233,837	326,317
Bohle Plains	6	Retail	918	959	1,005	1,082	1,188	80,920
Bohle Plains	6	Services	328	368	386	431	519	43,962
Bohle Plains	6	Professional	382	388	405	432	476	15,912
Bohle Plains	6	Industrial	8,085	10,425	11,257	13,947	17,690	974,970
Bohle Plains	6	Other	225	231	245	276	290	19,360
Bohle Plains	6	Total	9,938	12,370	13,299	16,168	20,163	1,135,124
Northern beaches	7	Retail	11,072	13,899	14,652	16,630	20,612	149,590
Northern beaches	7	Services	8,766	11,694	12,575	15,640	21,014	106,233
Northern beaches	7	Professional	3,593	4,615	4,939	5,955	7,564	36,000
Northern beaches	7	Industrial	32,667	41,518	44,576	54,229	66,811	209,070
Northern beaches	7	Other	210	637	685	974	1,565	21,360
Northern beaches	7	Total	56,309	72,364	77,426	93,428	117,566	522,253
North Rural	8	Retail	-	-	-	-	-	-
North Rural	8	Services	-	-	-	-	-	-
North Rural	8	Professional	-	-	-	-	-	-
North Rural	8	Industrial	-	-	-	-	-	-
North Rural	8	Other	-	-	-	-	-	-
North Rural	8	Total	-	-	-	-	-	-
South Rural	9	Retail	-	-	-	-	-	-
South Rural	9	Services	-	-	-	-	-	-
South Rural	9	Professional	-	-	-	-	-	-
South Rural	9	Industrial	-	-	-	-	-	-
South Rural	9	Other	-	-	-	-	-	-
South Rural	9	Total	-	-	-	-	-	-
Upper Ross	10	Retail	13,484	15,016	15,622	16,906	19,720	148,995
Upper Ross	10	Services	23,535	23,373	24,359	25,500	27,113	58,208
Upper Ross	10	Professional	6,735	7,181	7,540	8,244	9,400	40,518
Upper Ross	10	Industrial	45,638	43,015	44,515	44,926	45,370	46,800
Upper Ross	10	Other	637	819	849	1,017	1,248	8,520
Upper Ross	10	Total	90,029	89,403	92,885	96,593	102,851	303,041
Southern Suburbs	11	Retail	35,937	38,440	40,154	42,935	48,534	703,430
Southern Suburbs	11	Services	145,493	140,181	145,493	149,330	154,605	420,835
Southern Suburbs	11	Professional	87,899	84,537	87,763	90,068	93,228	263,160
Southern Suburbs	11	Industrial	248,526	267,733	282,614	315,624	360,848	2,328,570
Southern Suburbs	11	Other	2,521	3,216	3,340	3,868	4,888	136,560
Southern Suburbs	11	Total	520,377	534,108	559,364	601,824	662,104	3,852,555
Eastern Rural	12	Retail	262	247	368	2,316	9,496	68,565
Eastern Rural	12	Services	296	278	381	1,512	6,435	113,424
Eastern Rural	12	Professional	84	79	111	508	2,568	62,640

Column 1		Column 2	Column 3					
Projection area		LGIP development type	Existing and projected non-residential floorspace					
Location	LRA		2011	2016	2021	2026	2031	FDS
Eastern Rural	12	Industrial	3,462	3,259	3,383	3,778	14,420	10,440
Eastern Rural	12	Other	115	109	132	369	1,160	6,520
Eastern Rural	12	Total	4,218	3,972	4,375	8,484	34,079	261,589
Magnetic Island	13	Retail	4,419	4,172	4,321	4,376	4,415	28,175
Magnetic Island	13	Services	6,119	5,774	5,978	6,046	6,123	22,304
Magnetic Island	13	Professional	2,705	2,557	2,651	2,694	2,718	17,658
Magnetic Island	13	Industrial	13,939	13,139	13,600	13,752	13,999	27,630
Magnetic Island	13	Other	428	405	412	414	417	3,500
Magnetic Island	13	Total	27,610	26,047	26,962	27,282	27,672	99,267
Inside priority infrastructure area (total)		Retail	455,785	470,388	489,933	517,543	571,734	2,527,070
		Services	528,042	546,346	571,389	612,596	677,489	2,066,690
		Professional	384,470	397,937	416,546	447,261	495,074	1,514,556
		Industrial	1,678,685	1,719,236	1,801,990	1,940,893	2,129,970	8,163,270
		Other	44,592	46,379	48,115	51,308	56,997	340,120
		Total	3,091,573	3,180,286	3,327,973	3,569,602	3,931,264	14,611,706
Outside priority infrastructure area (total)		Retail	5,978	7,168	7,505	8,277	10,054	294,420
		Services	12,573	12,760	13,319	14,142	15,323	118,116
		Professional	10,502	10,543	10,992	11,606	12,532	76,554
		Industrial	162,005	184,408	195,220	224,627	262,798	709,380
		Other	8,766	8,804	9,127	9,589	10,250	98,340
		Total	199,824	223,682	236,162	268,242	310,957	1,296,810
Townsville City Council Local Government Area		Retail	461,763	477,555	497,438	525,820	581,788	2,821,490
		Services	540,616	559,105	584,707	626,738	692,812	2,184,806
		Professional	394,972	408,480	427,538	458,868	507,606	1,591,110
		Industrial	1,840,690	1,903,644	1,997,210	2,165,521	2,392,768	8,872,650
		Other	53,358	55,183	57,242	60,897	67,247	438,460
		Total	3,291,397	3,403,968	3,564,135	3,837,844	4,242,222	15,908,516

Table SC3.1.5 - Existing and projected education enrolments

Column 1		Column 2	Column 3					
Projection area		LGIP development type	Existing and projected enrolments					
Location	LRA		2011	2016	2021	2026	2031	FDS
City to Pallarenda	1	Pre & primary	1407	1329	1333	1338	1351	1533
City to Pallarenda	1	Secondary	1365	1305	1367	1386	1466	1571
City to Pallarenda	1	Tertiary	0	0	0	0	0	0
City to Pallarenda	1	Total	2772	2634	2700	2724	2816	3104
South Townsville	2	Pre & primary	272	243	232	235	241	278
South Townsville	2	Secondary	675	790	786	811	835	980
South Townsville	2	Tertiary	0	0	0	0	0	0
South Townsville	2	Total	947	1033	1018	1047	1076	1258
Central Suburbs	3	Pre & primary	6057	5467	5438	5528	5858	6987
Central Suburbs	3	Secondary	4347	4285	4405	4476	4638	5012
Central Suburbs	3	Tertiary	1340	1418	1488	1604	1746	1855
Central Suburbs	3	Total	11744	11170	11330	11607	12242	13854
Bohle Mt Louisa	4	Pre & primary	563	509	815	1114	1218	1470
Bohle Mt Louisa	4	Secondary	279	301	324	332	364	600
Bohle Mt Louisa	4	Tertiary	420	444	466	503	547	582
Bohle Mt Louisa	4	Total	1262	1254	1606	1948	2129	2652
Kirwan	5	Pre & primary	2713	2393	2386	2458	2561	3015
Kirwan	5	Secondary	3144	2864	2837	2902	2962	3044
Kirwan	5	Tertiary	0	0	0	0	0	0
Kirwan	5	Total	5857	5258	5223	5360	5523	6059

Column 1		Column 2	Column 3					
Projection area		LGIP development type	Existing and projected enrolments					
Location	LRA		2011	2016	2021	2026	2031	FDS
Bohle Plains	6	Pre & primary	0	1083	1138	1231	1336	1550
Bohle Plains	6	Secondary	0	0	0	0	0	0
Bohle Plains	6	Tertiary	0	0	0	0	0	0
Bohle Plains	6	Total	0	1083	1138	1231	1336	1550
Northern beaches	7	Pre & primary	889	1387	1574	1820	1841	2127
Northern beaches	7	Secondary	495	821	901	1022	1146	1667
Northern beaches	7	Tertiary	0	0	0	0	0	0
Northern beaches	7	Total	1384	2208	2475	2843	2987	3793
North Rural	8	Pre & primary	0	0	0	0	0	0
North Rural	8	Secondary	0	0	0	0	0	0
North Rural	8	Tertiary	0	0	0	0	0	0
North Rural	8	Total	0	0	0	0	0	0
South Rural	9	Pre & primary	0	0	0	0	0	0
South Rural	9	Secondary	0	0	0	0	0	0
South Rural	9	Tertiary	0	0	0	0	0	0
South Rural	9	Total	0	0	0	0	0	0
Upper Ross	10	Pre & primary	2309	2075	2103	2189	2249	2693
Upper Ross	10	Secondary	739	769	792	845	882	1076
Upper Ross	10	Tertiary	0	0	0	0	0	0
Upper Ross	10	Total	3048	2844	2895	3034	3132	3769
Southern Suburbs	11	Pre & primary	3340	2963	3013	3165	3328	3823
Southern Suburbs	11	Secondary	1154	1099	1107	1163	1290	1931
Southern Suburbs	11	Tertiary	12015	12712	13338	14378	15657	16832
Southern Suburbs	11	Total	16509	16774	17458	18706	20274	22585
Eastern Rural	12	Pre & primary	0	0	290	402	572	650
Eastern Rural	12	Secondary	0	0	294	688	863	1267
Eastern Rural	12	Tertiary	0	0	0	0	0	0
Eastern Rural	12	Total	0	0	583	1090	1435	1917
Magnetic Island	13	Pre & primary	164	283	283	283	283	283
Magnetic Island	13	Secondary	0	0	0	0	0	0
Magnetic Island	13	Tertiary	0	0	0	0	0	0
Magnetic Island	13	Total	164	283	283	283	283	283
Inside priority infrastructure area (total)		Pre & primary	17714	17731	18605	19764	20837	24408
		Secondary	12198	12235	12813	13625	14447	17148
		Tertiary	13775	14574	15292	16484	17950	19269
		Total	43687	44540	46710	49873	53234	60824
Outside priority infrastructure area (total)		Pre & primary	998	998	1011	1044	1088	1254
		Secondary	694	669	701	710	753	800
		Tertiary	0	0	0	0	0	0
		Total	1692	1667	1711	1754	1842	2054
Townsville City Council Local Government Area		Pre & primary	18712	18730	19615	20807	21926	25662
		Secondary	12892	12904	13514	14335	15200	17948
		Tertiary	13775	14574	15292	16484	17950	19269
		Total	45379	46208	48421	51627	55076	62879

Table SC3.1.6a - Planned demand generation rate for a trunk infrastructure network
(Lots less than threshold)

Column 1 – Area			Column 2 (n/a)	Column 3 – Planned density			Column 4 - Demand generation rate for a trunk infrastructure network (per net developable Ha)				
Zone	Zone	Precinct		Plot ratio (Non-residential)	Plot ratio (Residential)	Dwelling density (no./Ha)	Water (EP)	Sewerage (EP)	Roads (trip ends/day)	Pathways (trip ends/day)	Parks (ERP)
CF	Community Facilities	All		-	-	-	-	-	-	-	-
CR	Character Residential	All		-	-	16.7	46.7	46.7	121.2	7.2	47.8
DC	District Centre	All		0.45	-	-	81.6	103.5	1,128.5	13.2	-
EC	Emerging Communities	MCF2		0.35	-	-	63.5	80.5	877.7	10.2	-
EC	Emerging Communities	MCNS		0.80	-	-	145.1	184.0	2,006.1	23.4	-
EC	Emerging Communities	Other		0.50	0.50	21.5	56.8	57.3	181.0	9.7	56.4
HDR	High Density Residential	PS		6.90	6.90	590.6	1,273.2	1,335.7	4,694.2	265.8	1,063.2
HDR	High Density Residential	Other		1.08	1.08	80.0	164.1	168.2	694.3	36.5	144.0
HII	High Impact Industry	All		0.65	-	-	9.5	9.7	687.0	7.0	-
LC	Local Centre	All		0.45	-	-	81.6	103.5	1,128.5	13.2	-
LDR	Low Density Residential	MCF1		0.35	-	-	63.5	80.5	877.7	10.2	-
LDR	Low Density Residential	MHF1		0.53	-	-	66.6	81.1	2,026.9	24.4	-
LDR	Low Density Residential	RRRC		0.50	0.50	20.9	57.1	57.4	165.1	9.3	57.7
LDR	Low Density Residential	ST		-	-	10.0	28.0	28.0	72.7	4.3	28.7
LDR	Low Density Residential	Other		0.50	0.50	21.0	57.0	57.2	156.6	9.2	58.0
LII	Low Impact Industry	All		0.56	-	-	35.6	44.0	871.5	9.5	-
MC	Major Centre	ACC		0.80	1.80	36.0	180.9	212.0	1,777.7	33.6	64.8
MC	Major Centre	ACF		0.50	-	-	90.7	115.0	1,253.8	14.6	-
MC	Major Centre	HPMC(MCC)		0.80	-	-	145.1	184.0	2,006.1	23.4	-
MC	Major Centre	HPMC(Other)		0.80	-	-	145.1	184.0	2,006.1	23.4	-
MC	Major Centre	MCF3		0.35	-	-	63.5	80.5	877.7	10.2	-
MC	Major Centre	TCMC(TD)		0.73	0.73	21.9	132.1	157.0	1,386.5	24.0	39.4
MC	Major Centre	TCMC(TCS)		0.73	0.73	21.9	132.1	157.0	1,386.5	24.0	39.4
MC	Major Centre	Other		0.80	1.80	18.0	163.0	198.0	1,891.9	28.5	32.4
MDR	Medium Density Residential	AV		1.97	1.97	137.9	355.4	384.2	2,144.0	74.3	248.2
MDR	Medium Density Residential	AMD		0.35	2.24	221.3	398.9	399.0	1,072.3	91.7	398.5
MDR	Medium Density Residential	HPMD		0.35	2.24	222.3	400.7	400.8	1,073.7	92.0	400.2
MDR	Medium Density Residential	PB		0.50	0.50	21.0	57.0	57.2	156.6	9.2	58.0
MDR	Medium Density Residential	NBT		0.84	0.84	42.0	145.9	163.5	1,380.6	31.2	75.6
MDR	Medium Density Residential	NWV		0.35	1.30	75.4	147.2	147.3	401.8	31.6	147.4
MDR	Medium Density Residential	S		0.35	1.30	72.3	143.3	144.3	437.8	31.0	141.4
MDR	Medium Density Residential	Other		0.35	1.97	108.8	207.2	207.4	559.1	45.4	207.6

Column 1 – Area			Column 2 (n/a)	Column 3 – Planned density			Column 4 - Demand generation rate for a trunk infrastructure network (per net developable Ha)				
Zone	Zone	Precinct		Plot ratio (Non-residential)	Plot ratio (Residential)	Dwelling density (no./Ha)	Water (EP)	Sewerage (EP)	Roads (trip ends/day)	Pathways (trip ends/day)	Parks (ERP)
MII	Medium Impact Industry	AII		0.62	-	-	23.4	28.2	798.6	8.5	-
MU	Mixed Use	AC		0.84	0.84	42.0	145.9	163.5	1,380.6	31.2	75.6
MU	Mixed Use	BRM		0.53	-	-	66.6	81.1	2,026.9	24.4	-
MU	Mixed Use	CTR		0.73	0.73	24.3	128.2	156.4	1,582.1	28.6	43.8
MU	Mixed Use	KT		0.65	-	-	77.9	94.2	1,833.4	21.3	-
MU	Mixed Use	KR		0.35	1.97	108.8	207.2	207.4	559.1	45.4	207.6
MU	Mixed Use	NBG		0.84	0.84	42.0	145.9	163.5	1,380.6	31.2	75.6
MU	Mixed Use	CBDG		0.73	0.73	21.9	118.2	136.3	1,683.1	27.5	39.4
MU	Mixed Use	STRD		4.40	4.40	341.0	823.1	885.3	3,489.2	162.4	613.8
MU	Mixed Use	WS		0.35	1.30	75.5	147.4	147.5	399.5	31.6	147.8
MU	Mixed Use	Other		0.73	0.73	21.9	118.2	136.3	1,683.1	27.5	39.4
NC	Neighbourhood Centre	AII		0.35	-	-	63.5	80.5	877.7	10.2	-
OS	Open Space	R		0.65	-	-	77.1	93.5	1,833.4	21.3	-
OS	Open Space	Other		-	-	-	-	-	-	-	-
PC	Principal Centre	CA		6.50	-	-	835.2	987.5	23,601.5	277.5	-
PC	Principal Centre	FSR		9.70	9.70	357.0	1,483.3	1,652.1	22,848.1	395.9	642.5
PC	Principal Centre	Other		9.50	9.50	399.0	1,431.1	1,562.5	21,818.8	399.0	718.2
RR	Rural Residential	RRRD		-	-	0.0	0.1	0.1	0.2	0.0	0.1
RR	Rural Residential	Other		-	-	1.6	4.6	4.6	12.0	0.7	4.7
RUR	Rural	H		-	-	0.0	0.1	0.1	0.2	0.0	0.1
RUR	Rural	C		-	-	0.0	0.0	0.0	0.0	0.0	0.0
RUR	Rural	J		-	-	0.1	0.3	0.3	0.7	0.0	0.3
RUR	Rural	RRRD		-	-	0.0	0.0	0.0	0.0	0.0	0.0
RUR	Rural	Other		-	-	0.0	0.0	0.0	0.0	0.0	0.0
SC	Specialised Centre	Other		-	-	-	-	-	-	-	-
SC	Specialised Centre	BRM		0.53	-	-	66.6	81.1	2,026.9	24.4	-
SC	Specialised Centre	D		0.35	-	-	74.0	96.0	654.9	7.6	-
SC	Specialised Centre	FRM		0.67	0.67	33.5	110.7	129.1	1,397.8	29.9	60.3
SC	Specialised Centre	MH		1.20	-	-	150.7	183.5	4,589.1	55.3	-
SC	Specialised Centre	MHF2		0.53	-	-	66.6	81.1	2,026.9	24.4	-
SP	Special Purpose	TSDA (B, EC, ECO)		-	-	-	-	-	-	-	-
SP	Special Purpose	TSDA (HIIP)		0.35	-	-	15.1	17.8	454.1	4.8	-
SP	Special Purpose	TSDA (LMI)		0.56	-	-	31.2	39.6	506.3	5.8	-
SP	Special Purpose	TSDA (Other)		0.62	-	-	17.1	21.9	285.6	3.3	-
SR	Sport and Recreation	BBGC		0.50	0.50	7.7	21.9	22.1	61.5	3.4	22.0
SR	Sport and Recreation	Other		-	-	-	-	-	-	-	-

Table SC3.1.6b - Planned demand generation rate for a trunk infrastructure network
(Lots greater than threshold)

Column 1 – Area			Column 2 (n/a)	Column 3 – Planned density			Column 4 - Demand generation rate for a trunk infrastructure network (per net developable Ha)				
Zone	Zone	Precinct		Plot ratio (Non-residential)	Plot ratio (Residential)	Dwelling density (no./Ha)	Water (EP)	Sewerage (EP)	Roads (trip ends/day)	Pathways (trip ends/day)	Parks (ERP)
CF	Community Facilities	All		-	-	-	-	-	-	-	-
CR	Character Residential	All		-	-	11.3	31.7	31.7	82.4	4.9	32.5
DC	District Centre	All		0.45	-	-	81.6	103.5	1,128.5	13.2	-
EC	Emerging Communities	MCF2		0.23	-	-	40.8	51.8	564.2	6.6	-
EC	Emerging Communities	MCNS		0.52	-	-	94.3	119.6	1,304.0	15.2	-
EC	Emerging Communities	Other		0.33	0.33	14.0	36.9	37.3	117.7	6.3	36.7
HDR	High Density Residential	PS		6.90	6.90	590.6	1,273.2	1,335.7	4,694.2	265.8	1,063.2
HDR	High Density Residential	Other		0.70	0.70	51.9	106.4	109.0	450.0	23.7	93.3
HII	High Impact Industry	All		0.16	-	-	2.4	2.4	171.7	1.8	-
LC	Local Centre	All		0.45	-	-	81.6	103.5	1,128.5	13.2	-
LDR	Low Density Residential	MCF1		0.23	-	-	40.8	51.8	564.2	6.6	-
LDR	Low Density Residential	MHF1		0.53	-	-	66.6	81.1	2,026.9	24.4	-
LDR	Low Density Residential	RRRC		0.33	0.33	13.6	37.1	37.3	107.3	6	37.5
LDR	Low Density Residential	ST		-	-	6.5	18.2	18.2	47.3	2.8	18.7
LDR	Low Density Residential	Other		0.33	0.33	13.6	37.1	37.2	101.8	6.0	37.7
LII	Low Impact Industry	All		0.36	-	-	22.9	28.3	560.2	6.1	-
MC	Major Centre	ACC		0.52	1.17	23.4	117.6	137.8	1,155.5	21.8	42.1
MC	Major Centre	ACF		0.33	-	-	59.0	74.8	815.0	9.5	-
MC	Major Centre	HPMC(MCC)		0.65	-	-	117.9	149.5	1,630.0	19.0	-
MC	Major Centre	HPMC(Other*)		0.52	-	-	94.3	119.6	1,304.0	15.2	-
MC	Major Centre	MCF3		0.23	-	-	40.8	51.8	564.2	6.6	-
MC	Major Centre	TCMC(TD)		0.47	0.47	14.2	85.9	102.0	901.2	15.6	25.6
MC	Major Centre	TCMC(TCS)		0.47	0.47	14.2	85.9	102.0	901.2	15.6	25.6
MC	Major Centre	Other		0.52	1.17	11.7	106.0	128.7	1,229.7	18.5	21.1
MDR	Medium Density Residential	AV		1.28	1.28	89.6	231.0	249.7	1,393.6	48.3	161.3
MDR	Medium Density Residential	AMD		0.23	1.46	144.3	260.0	260.1	698.9	59.7	259.7
MDR	Medium Density Residential	HPMD		0.23	1.46	144.9	261.1	261.2	699.9	60.0	260.8
MDR	Medium Density Residential	PB		0.33	0.33	13.6	37.1	37.2	101.8	6.0	37.7
MDR	Medium Density Residential	NBT		0.55	0.55	27.3	94.8	106.3	897.4	20.3	49.1
MDR	Medium Density Residential	NWV		0.23	0.85	49.0	95.7	95.8	261.2	20.5	95.8
MDR	Medium Density Residential	S		0.23	0.85	47.0	93.2	93.8	284.5	20.1	91.9
MDR	Medium Density Residential	Other		0.23	1.28	70.7	134.7	134.8	363.4	29.5	134.9

Column 1 – Area			Column 2 (n/a)	Column 3 – Planned density			Column 4 - Demand generation rate for a trunk infrastructure network (per net developable Ha)				
Zone	Zone	Precinct		Plot ratio (Non-residential)	Plot ratio (Residential)	Dwelling density (no./Ha)	Water (EP)	Sewerage (EP)	Roads (trip ends/day)	Pathways (trip ends/day)	Parks (ERP)
MII	Medium Impact Industry	All		0.40	-	-	15.1	20.2	515.2	5.5	-
MU	Mixed Use	AC		0.55	0.55	27.5	95.5	107.0	904.0	20.4	49.5
MU	Mixed Use	BRM		0.53	-	-	66.6	81.1	2,026.9	24.4	-
MU	Mixed Use	CTR		0.48	0.48	15.8	83.4	101.7	1,029.4	18.6	28.5
MU	Mixed Use	KT		0.42	-	-	50.2	61.3	1,193.1	13.9	-
MU	Mixed Use	KR		0.23	1.28	70.7	134.7	134.8	363.4	29.5	134.9
MU	Mixed Use	NBG		0.55	0.55	27.3	94.8	106.3	897.4	20.3	49.1
MU	Mixed Use	CBDG		0.48	0.48	14.3	76.9	88.7	1,095.2	17.9	25.7
MU	Mixed Use	STRD		4.40	4.40	341.0	823.1	885.3	3,489.2	162.4	613.8
MU	Mixed Use	WS		0.23	0.85	49.1	95.8	95.9	259.7	20.5	96.1
MU	Mixed Use	Other		0.48	0.48	14.3	76.9	88.7	1,095.2	17.9	25.7
NC	Neighbourhood Centre	All		0.35	-	-	63.5	80.5	877.7	10.2	-
OS	Open Space	R		0.42	-	-	50.1	60.7	1,191.7	13.8	-
OS	Open Space	Other		-	-	-	-	-	-	-	-
PC	Principal Centre	CA		6.50	-	-	835.2	987.5	23,601.5	277.5	-
PC	Principal Centre	FSR		9.70	9.70	357.0	1,483.3	1,652.1	22,848.1	395.9	642.5
PC	Principal Centre	Other		9.50	9.50	399.0	1,431.1	1,562.5	21,818.8	399.0	718.2
RR	Rural Residential	RRRD		-	-	0.0	0.1	0.1	0.1	0.0	0.1
RR	Rural Residential	Other		-	-	1.3	3.6	3.6	9.5	0.6	3.7
RUR	Rural	H		-	-	0.0	0.1	0.1	0.2	0.0	0.1
RUR	Rural	C		-	-	0.0	0.0	0.0	0.0	0.0	0.0
RUR	Rural	J		-	-	0.1	0.2	0.2	0.6	0.0	0.2
RUR	Rural	RRRD		-	-	0.0	0.0	0.0	0.0	0.0	0.0
RUR	Rural	Other		-	-	0.0	0.0	0.0	0.0	0.0	0.0
SC	Specialised Centre	Other		-	-	-	-	-	-	-	-
SC	Specialised Centre	BRM		0.53	-	-	66.6	81.1	2,026.9	24.4	-
SC	Specialised Centre	D		0.35	-	-	74.0	96.0	654.9	7.6	-
SC	Specialised Centre	FRM		0.44	0.44	21.8	71.9	83.9	907.7	19.4	39.2
SC	Specialised Centre	MH		1.20	-	-	150.7	183.5	4,589.1	55.3	-
SC	Specialised Centre	MHF2		0.53	-	-	66.6	81.1	2,026.9	24.4	-
SP	Special Purpose	TSDA (B, EC, ECO)		-	-	-	-	-	-	-	-
SP	Special Purpose	TSDA (HIIP)		0.19	-	-	7.3	8.8	249.1	2.6	-
SP	Special Purpose	TSDA (LMI)		0.36	-	-	20.0	25.4	325.5	3.7	-
SP	Special Purpose	TSDA (Other)		0.40	-	-	11.0	14.2	184.3	2.1	-
SR	Sport and Recreation	BBGC		0.33	0.33	5.0	14.2	14.3	40.0	2.2	14.3
SR	Sport and Recreation	Other		-	-	-	-	-	-	-	-

SC3.2 Schedule of works

Editor's note - the schedules of future works are located immediately after the plans for trunk infrastructure for which they are cross referenced. These schedules, and those identifying the existing works, are also located in the extrinsic material.

These schedules only provide one map reference for any given infrastructure element. In some cases, the infrastructure element may span multiple maps, and care should be taken when cross-referencing the map and schedule in this manner. The maps are also loaded in a GIS environment, whereupon the information in the schedules are able to be interrogated directly from the infrastructure element, regardless of mapping references. TownsvilleMaps is the current in-service GIS platform for this purpose, which can be publicly viewed at council, or privately accessed via subscription.

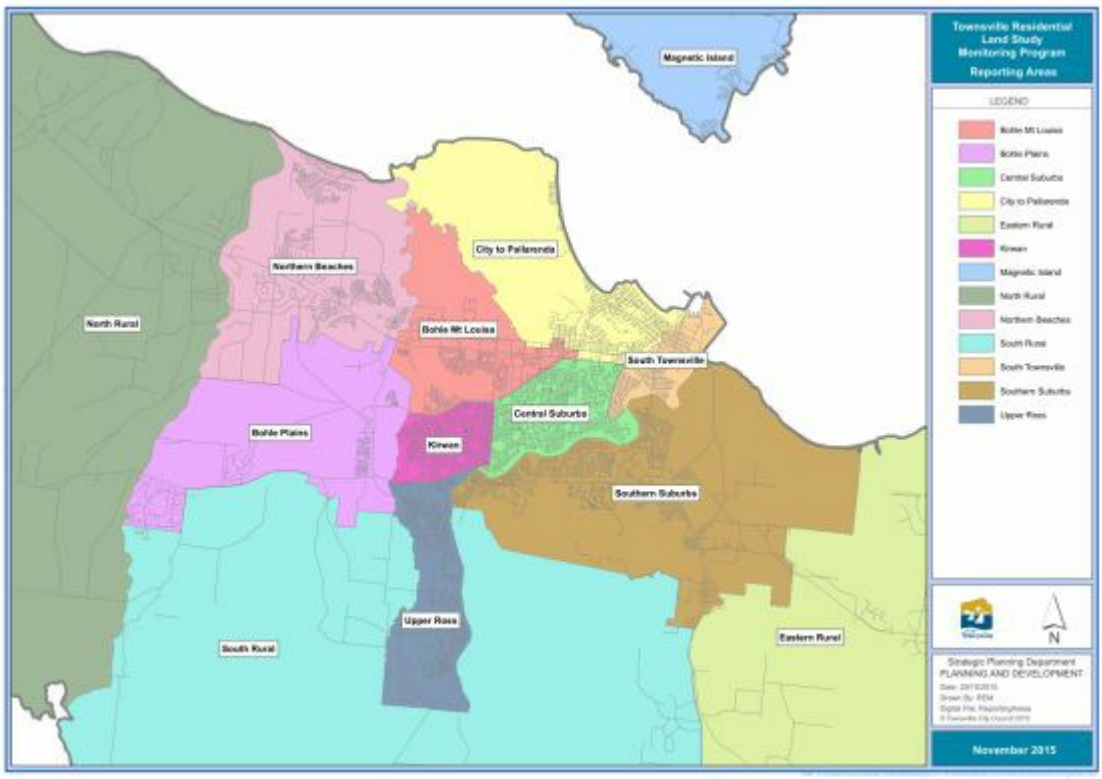
Where a discrepancy exists between the schedules of works and the plans for trunk infrastructure, the schedule of works shall take precedence.

The costs represented in these schedules are 'establishment cost', used for network valuation purposes, and do not necessarily represent the costs involved in the capital works program for acquiring land or embellishment. This information can be found in the Schedule of Works model. Where a negative value is evident, it represents a credit value of works that are being upgraded, and are to be deducted from the value of the upgraded profile associated with the new item (having the same LGIP ID and year of provision).

SC3.3 Local government infrastructure plan maps

SC3.3.1 - Reporting area map
SC3.3.2 - Developable area maps
SC3.3.3 - Service catchment maps
SC3.3.4 - Priority infrastructure area maps
SC3.3.5 - Plan for trunk water supply infrastructure
SC3.3.6 - Plan for trunk sewerage infrastructure
SC3.3.7 - Plan for trunk roads infrastructure
SC3.3.8 - Plan for trunk footpaths and cycleways infrastructure
SC3.3.9 - Plan for trunk parks and land for community facilities infrastructure

SC3.3.1 - Reporting area map



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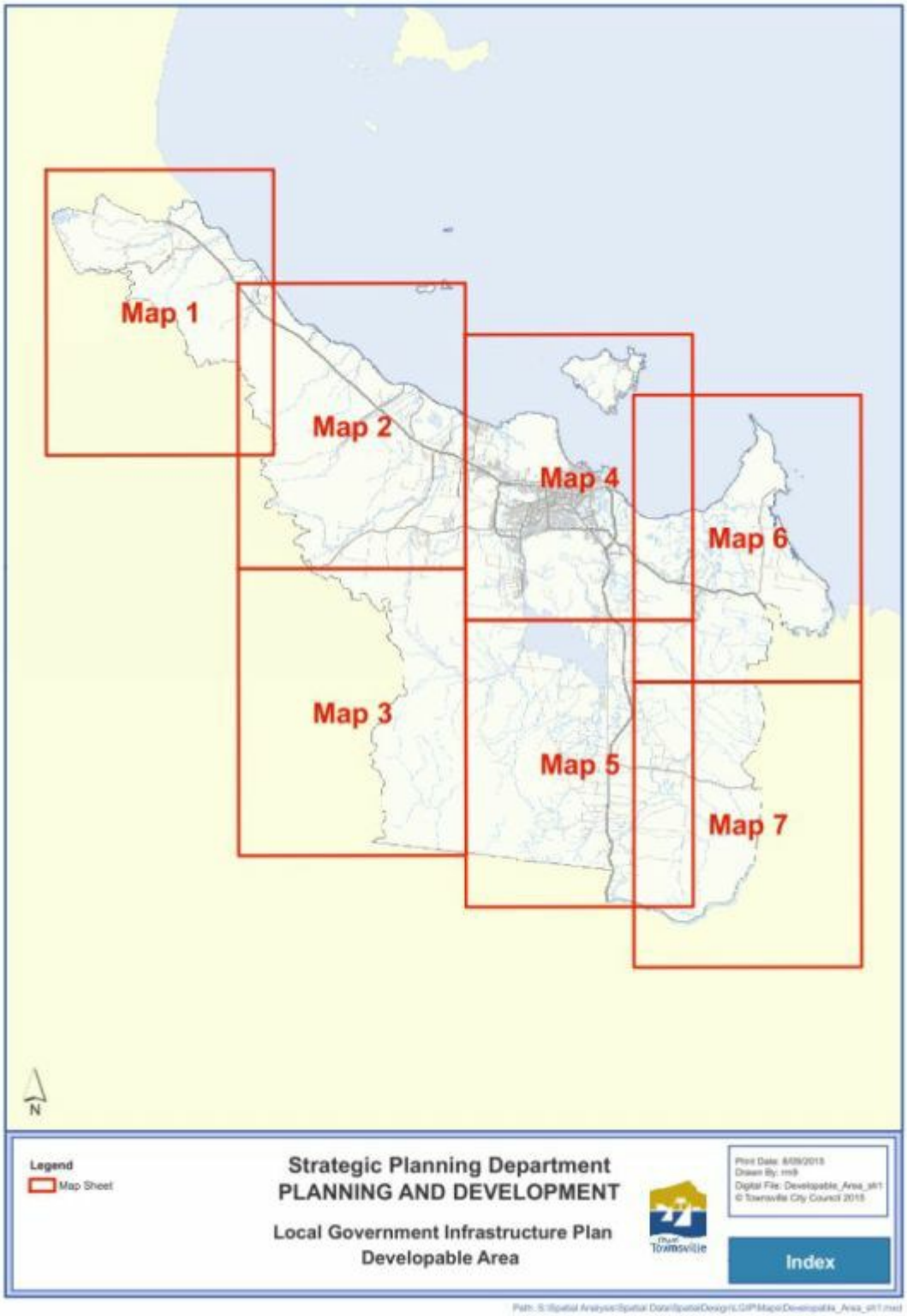
SC3.3.2 - Developable area maps



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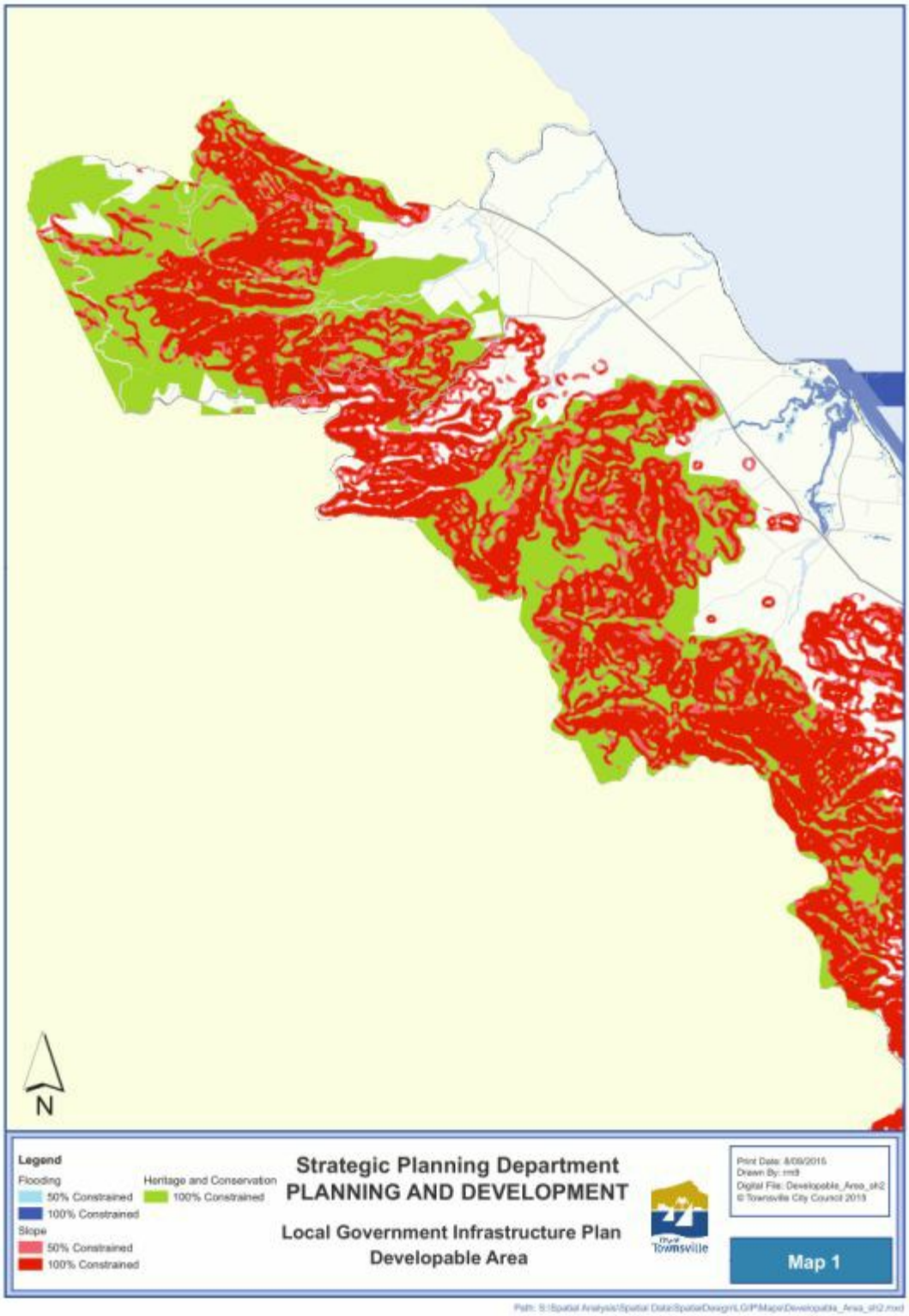

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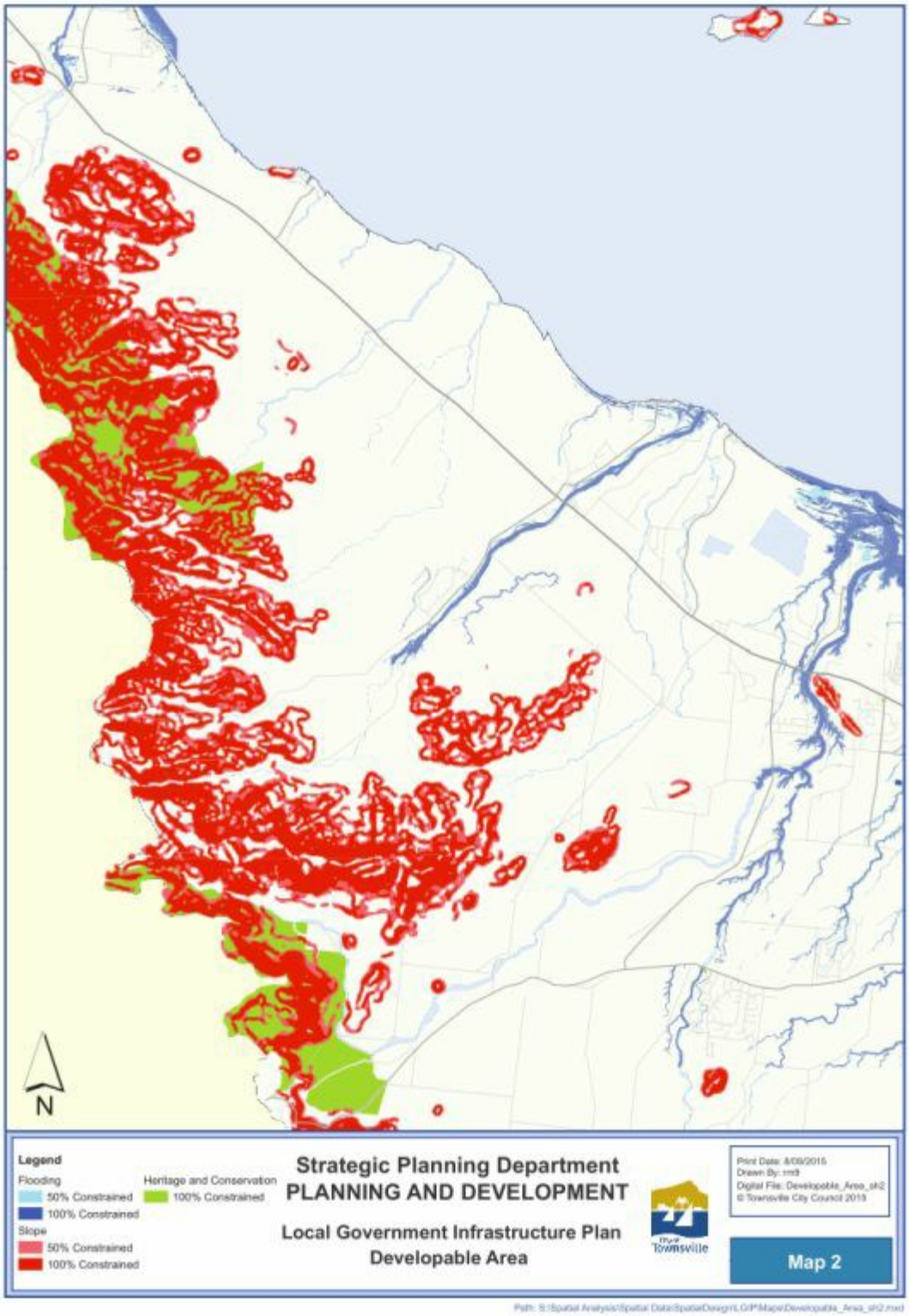

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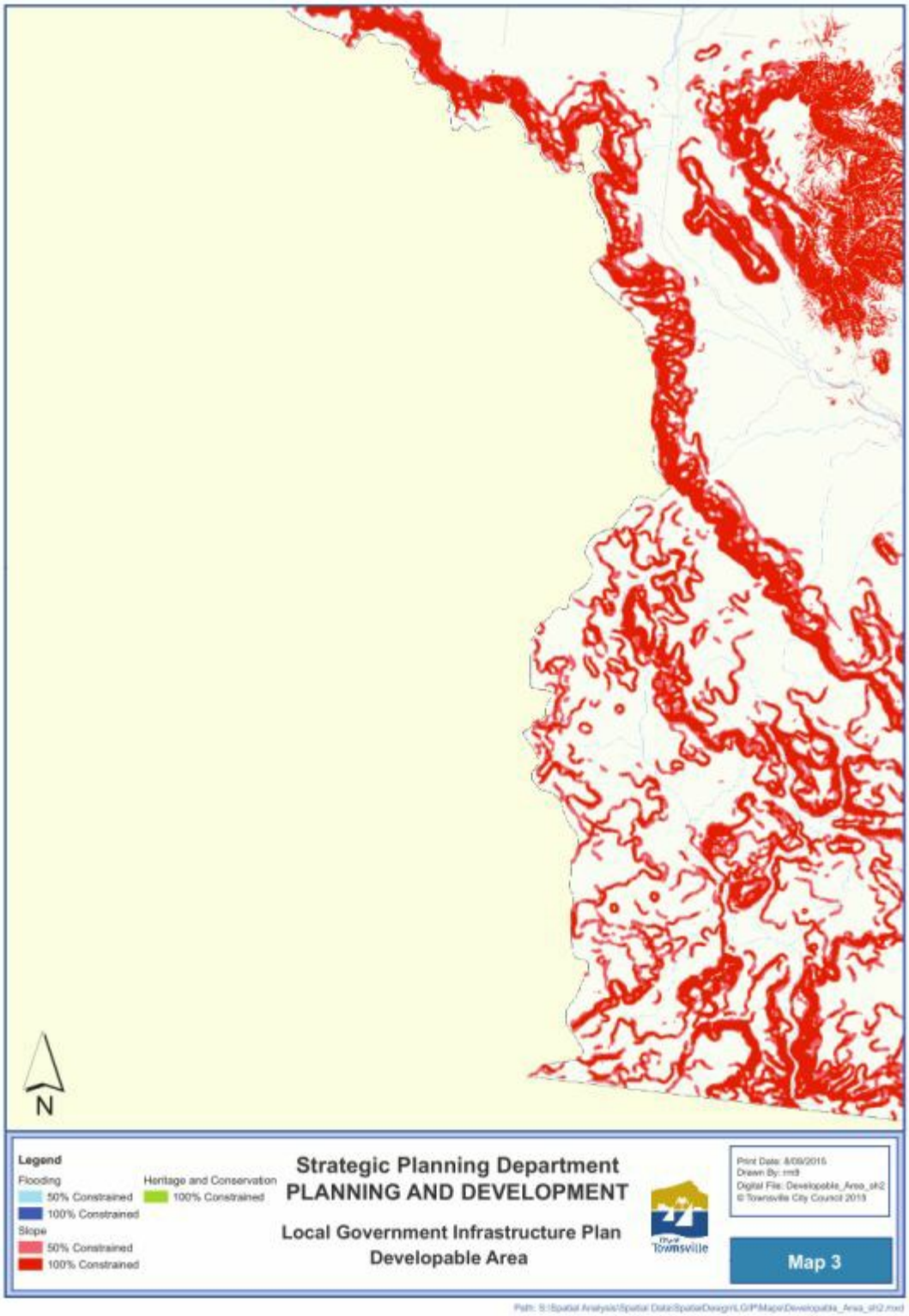

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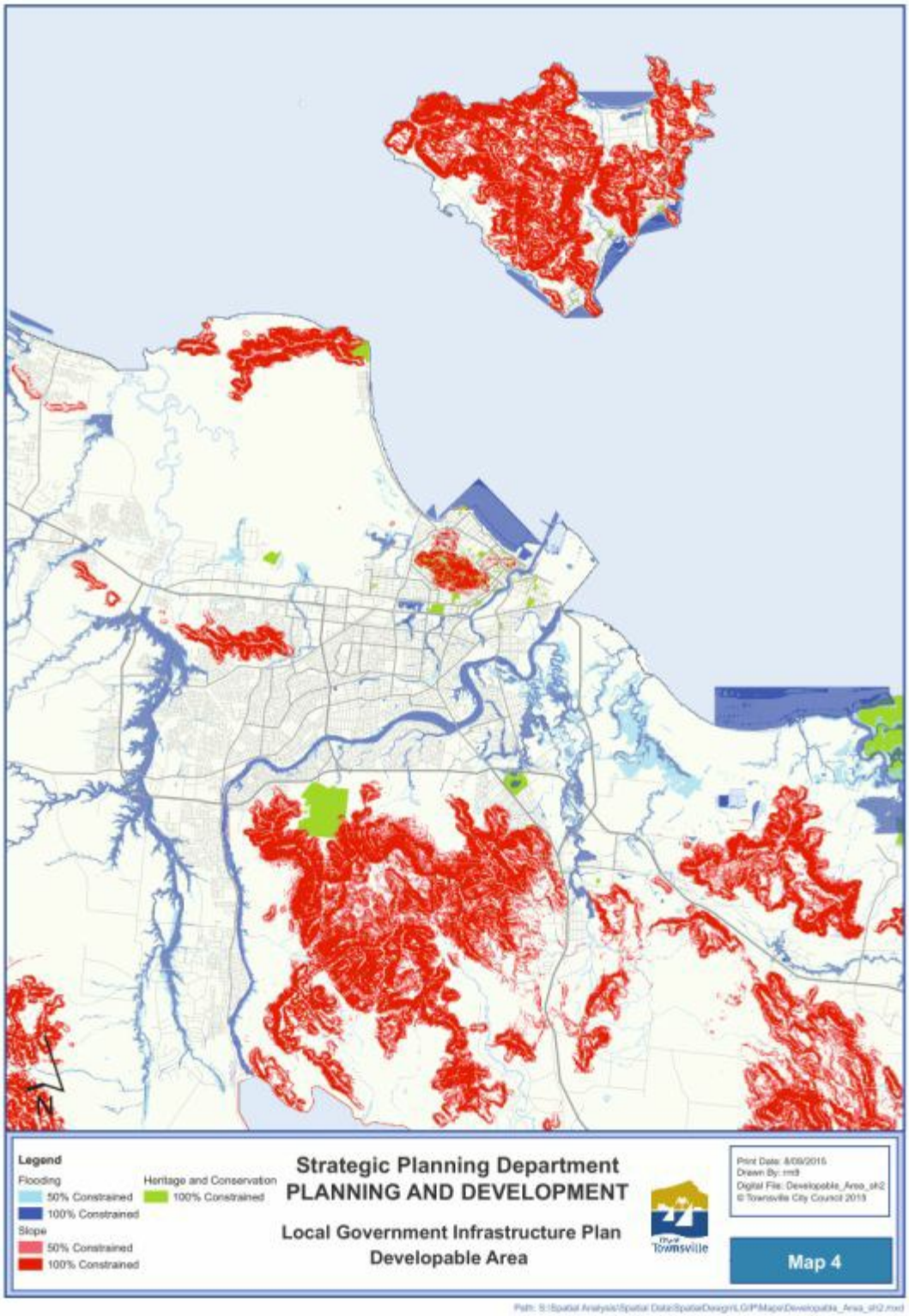

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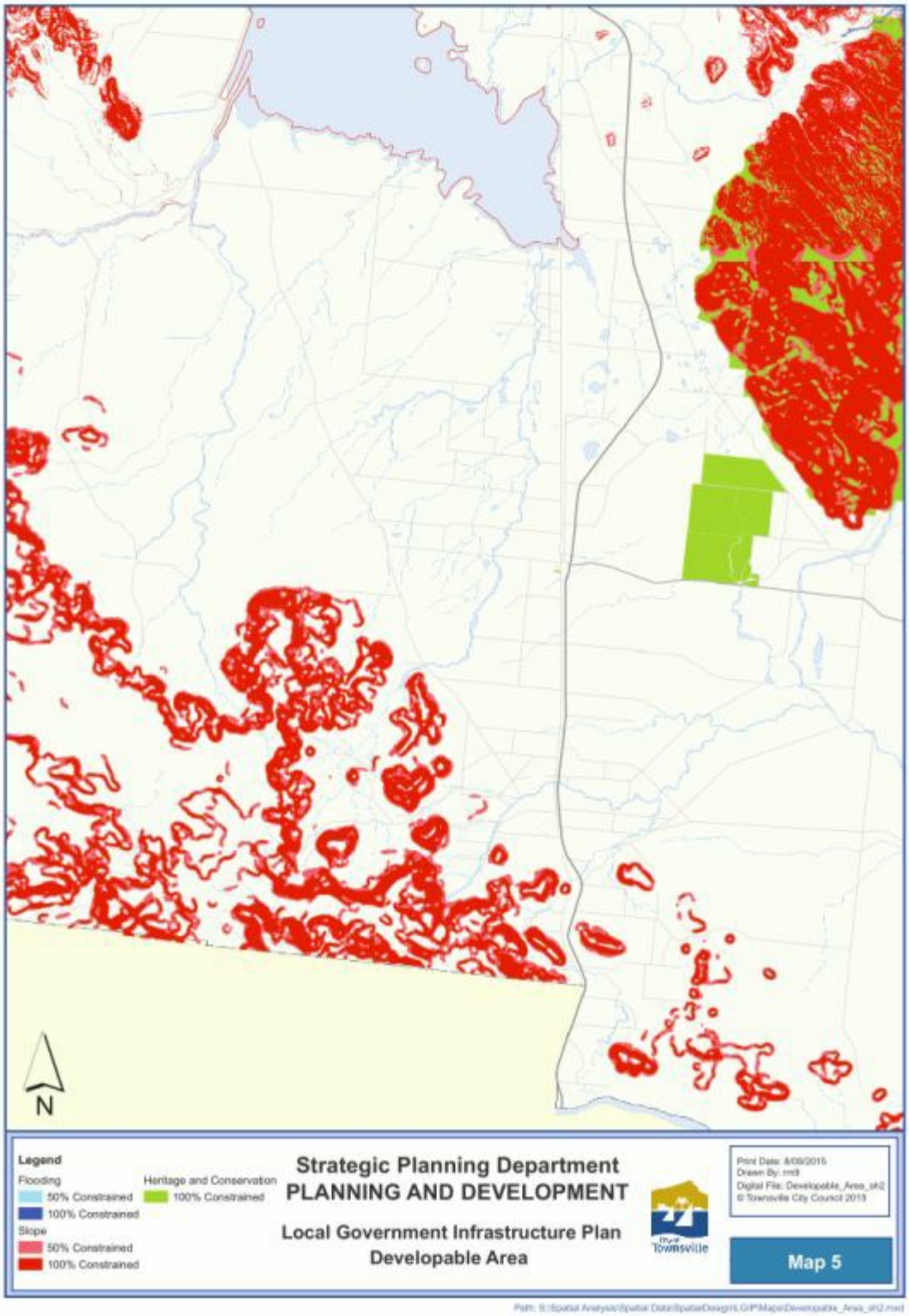

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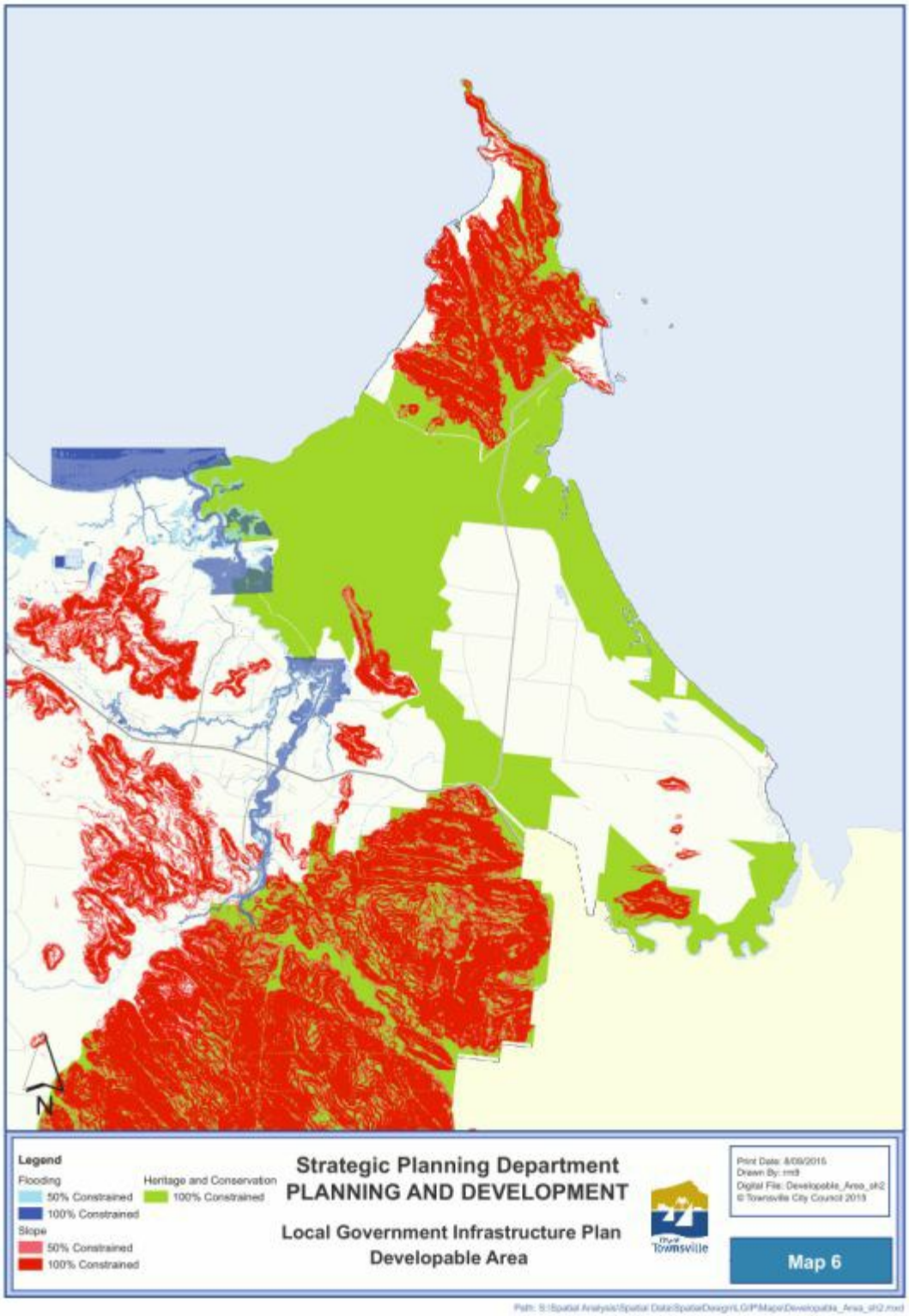

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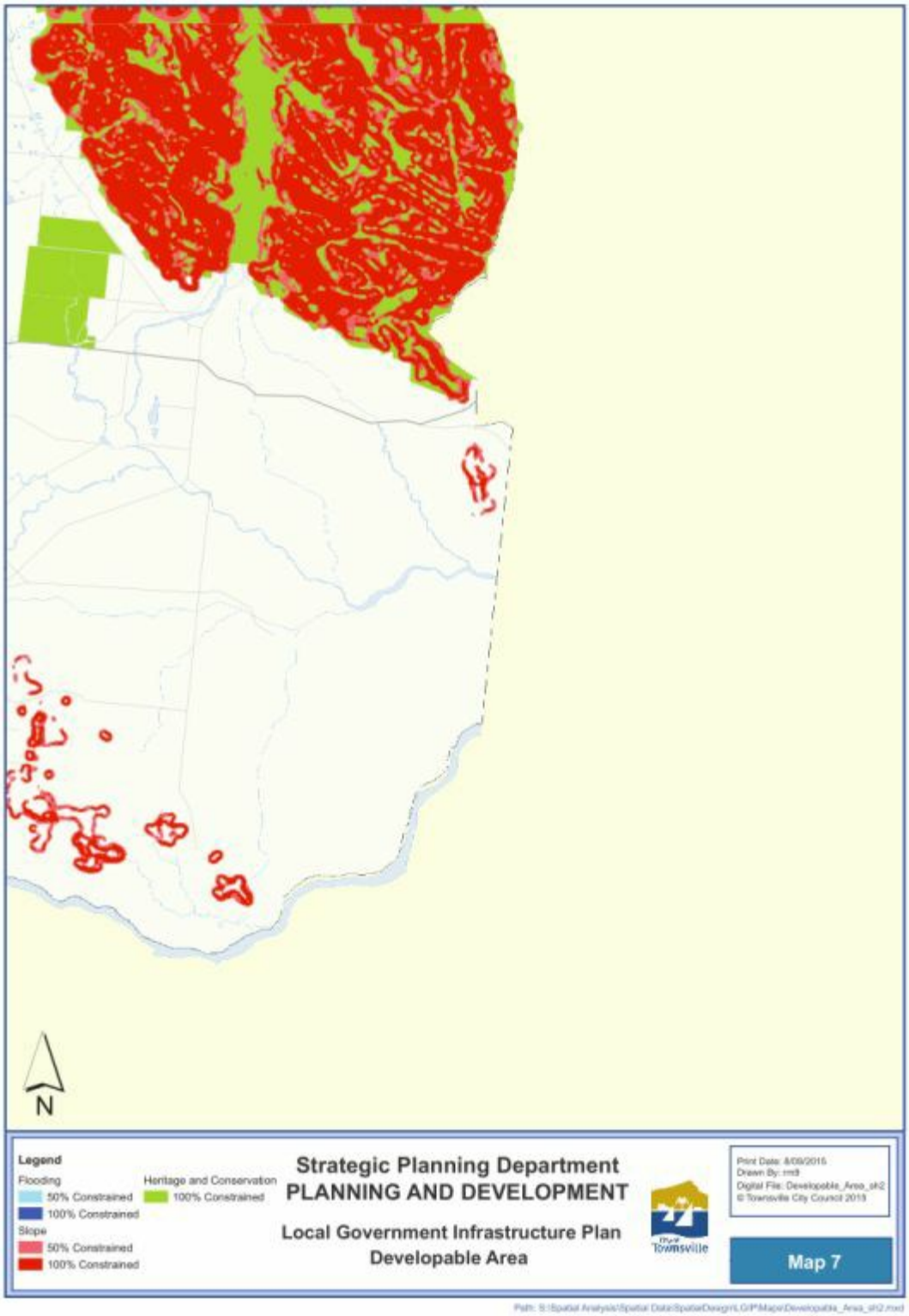

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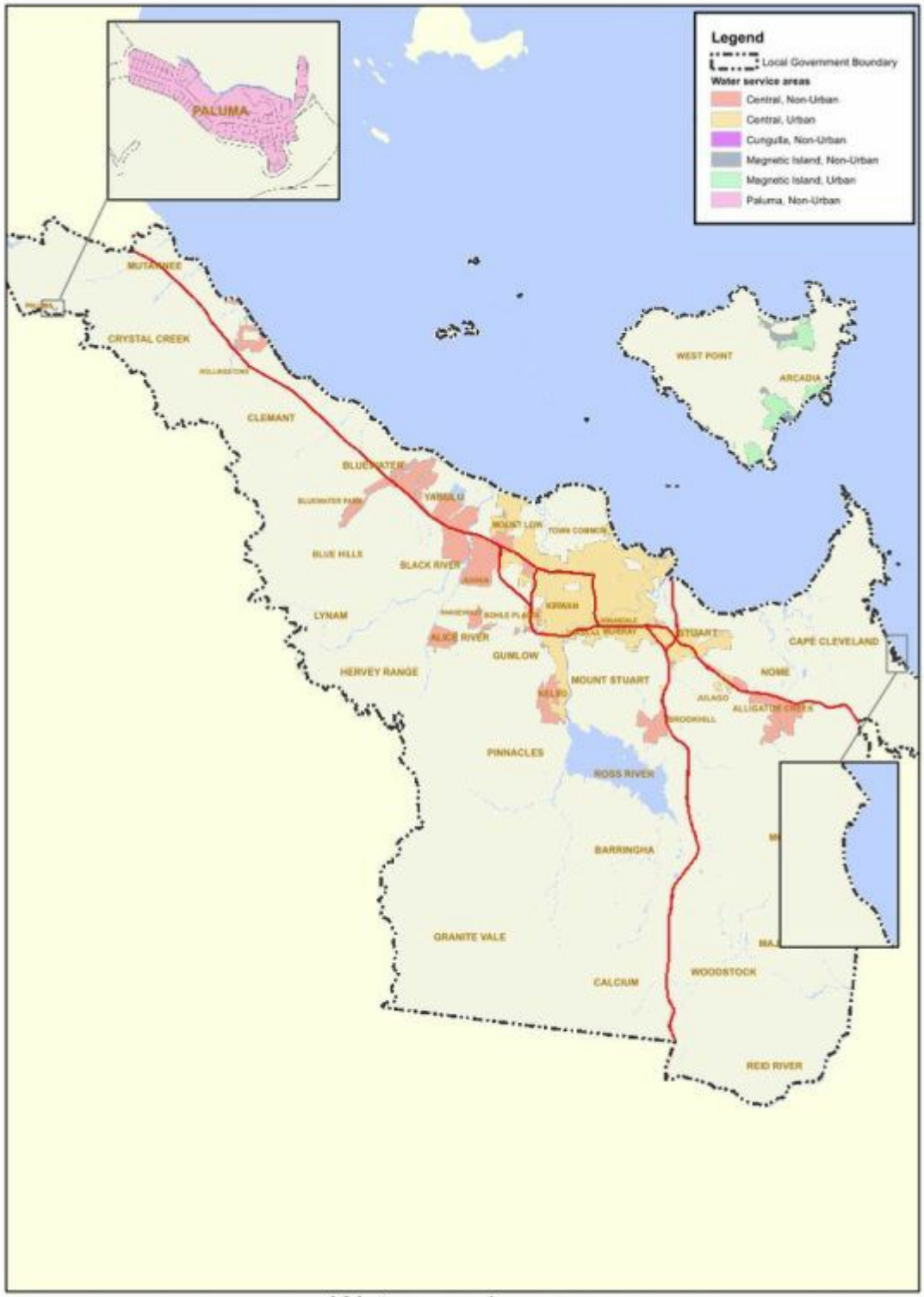
SC3.3.3 – Service catchment maps



Water service areas

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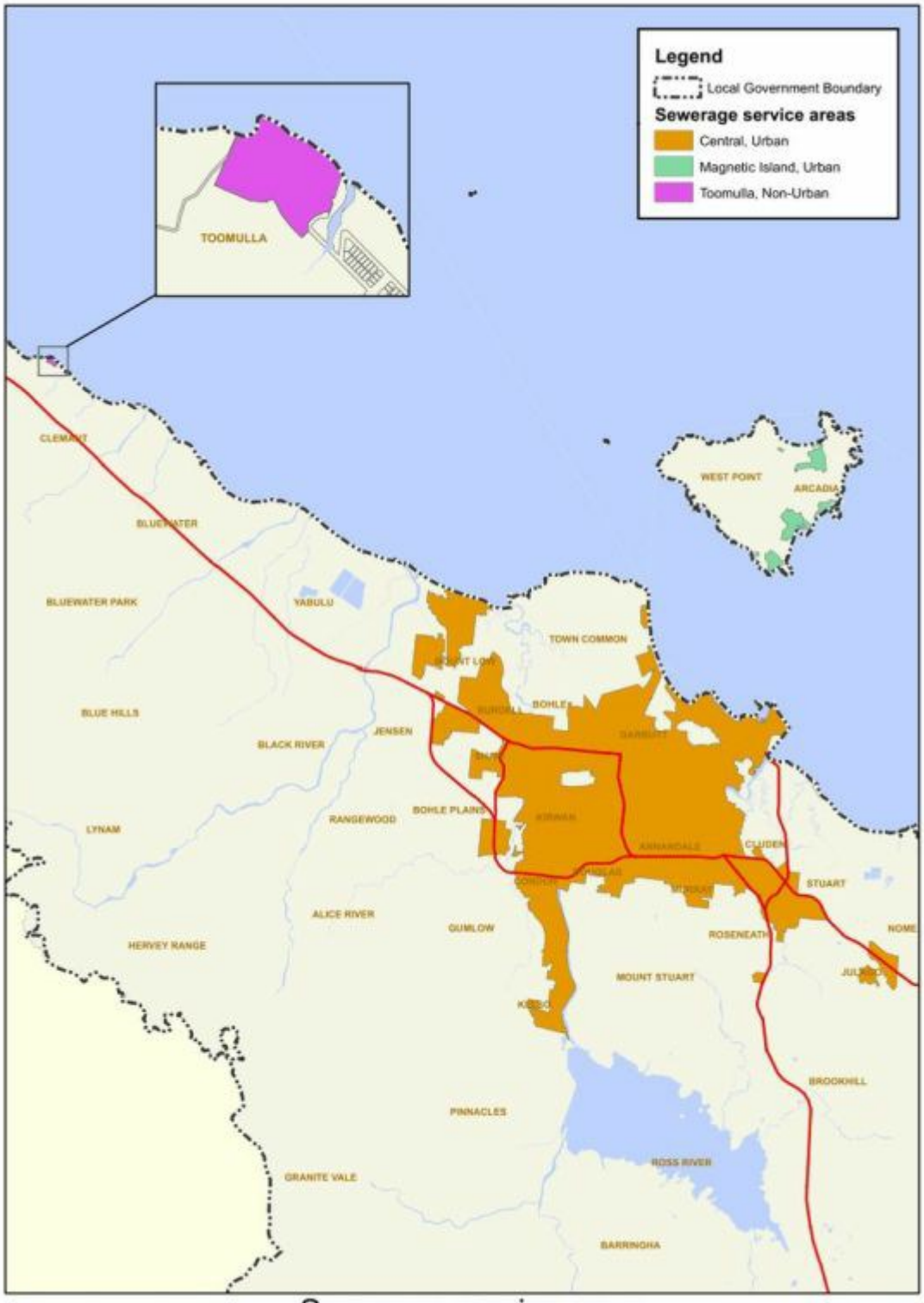

Sewerage service areas

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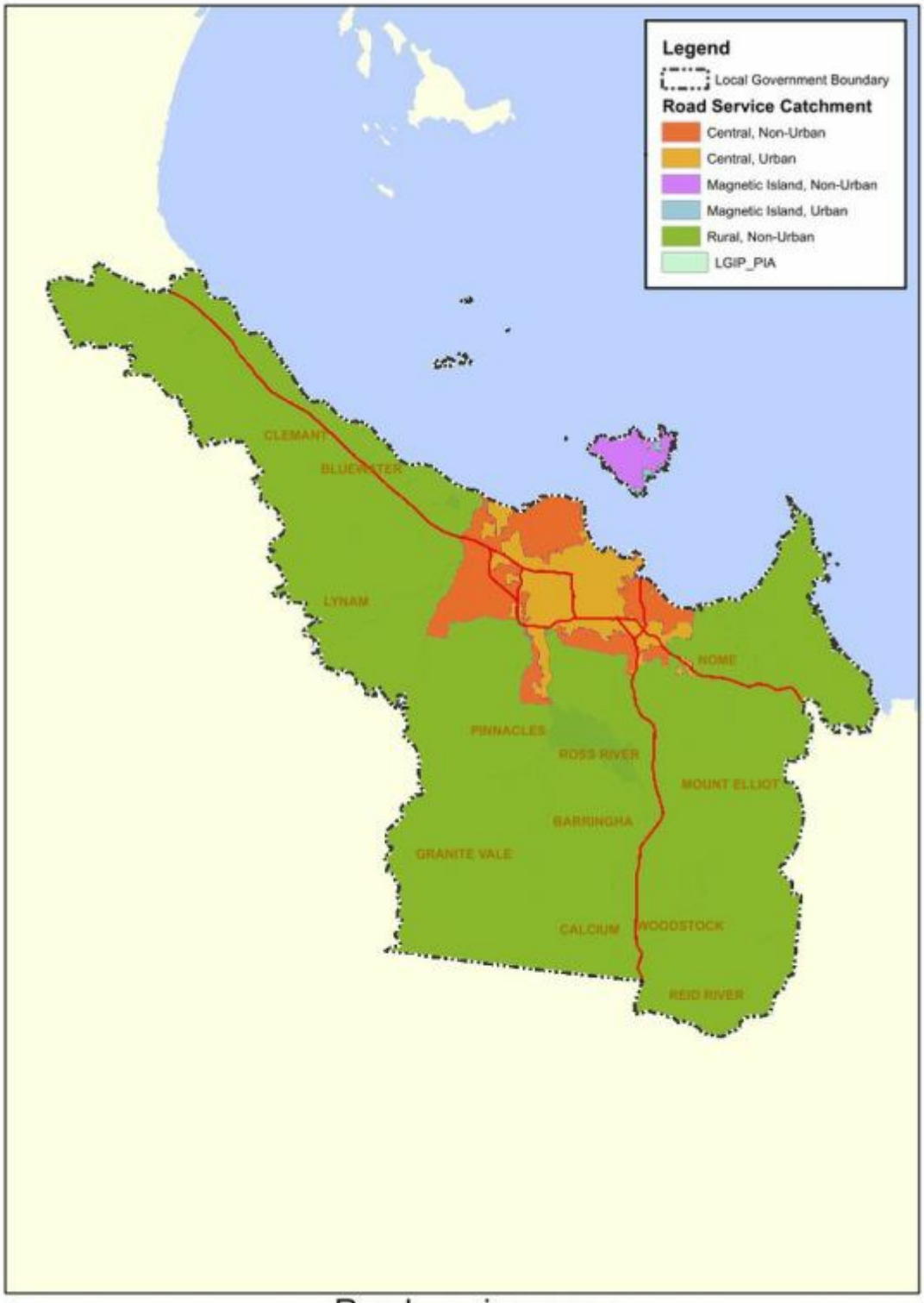

Road service areas

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Footpaths and cycleways service areas

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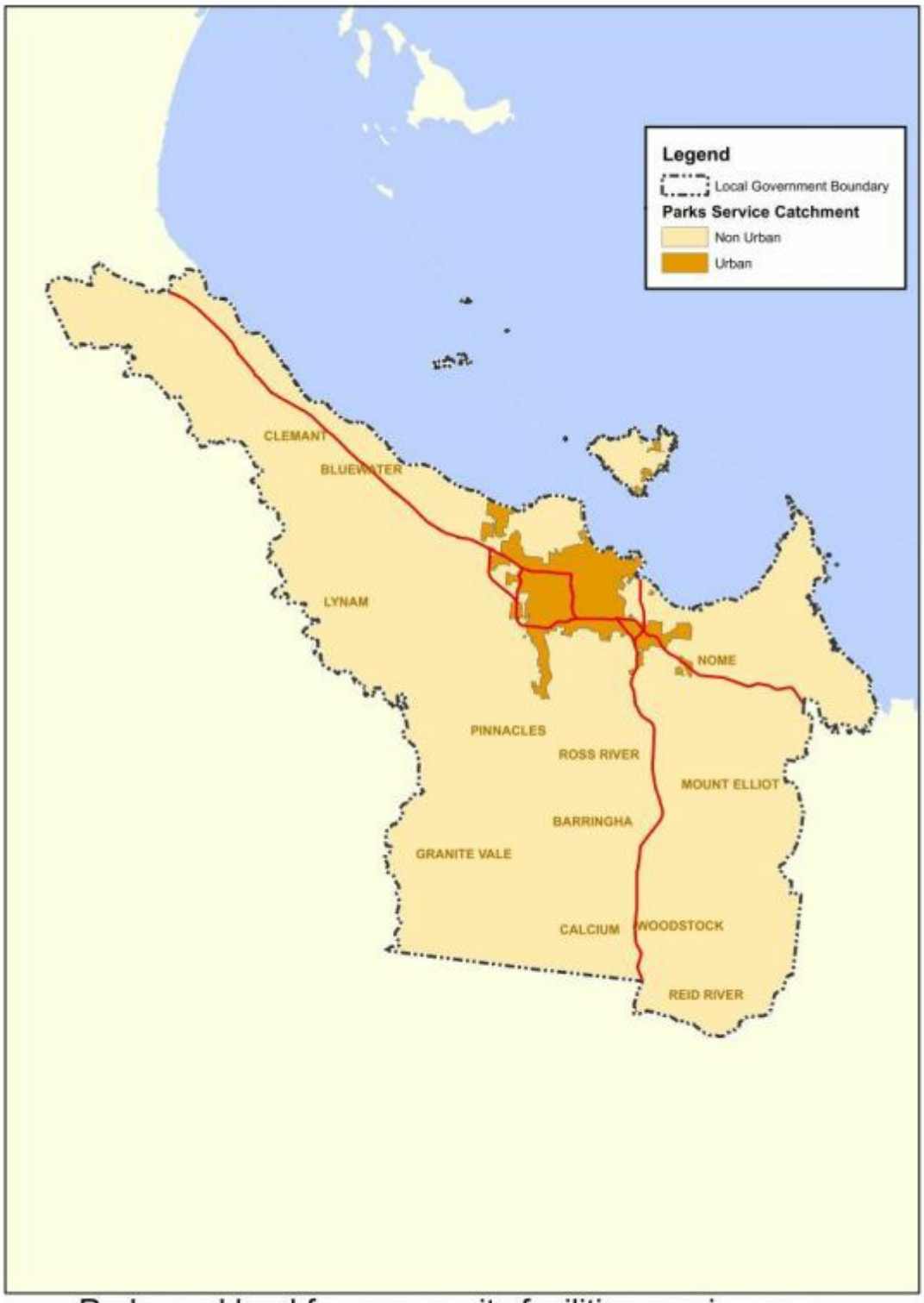

Parks and land for community facilities service areas

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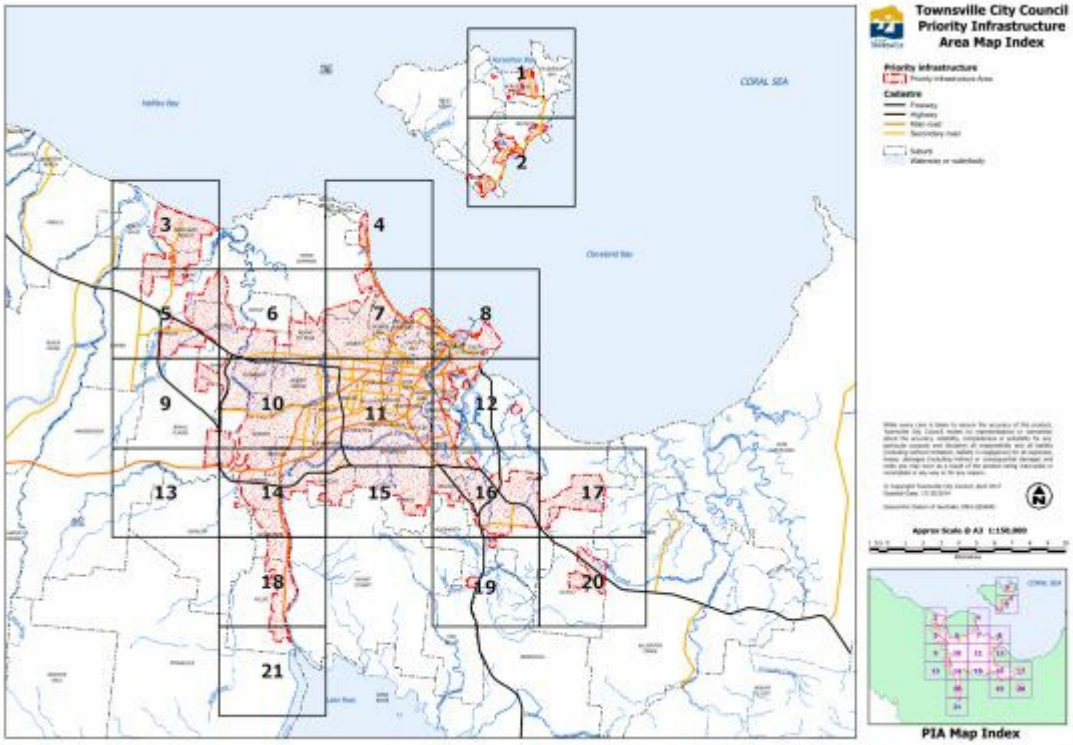
SC3.3.4 - Priority infrastructure area maps

Editor's note—This document is intended to function in an electronic environment whereupon hyperlinks to detailed PDF maps allow for closer examination of mapping information. The following images are true copies of such maps, but at a coarser scale. Notwithstanding this, the priority infrastructure area is also shown in finer detail on the plans for trunk infrastructure.

The maps are also loaded in a GIS environment. TownsvilleMaps is the current in-service GIS platform for this purpose, which can be publicly viewed at council, or privately accessed via subscription.



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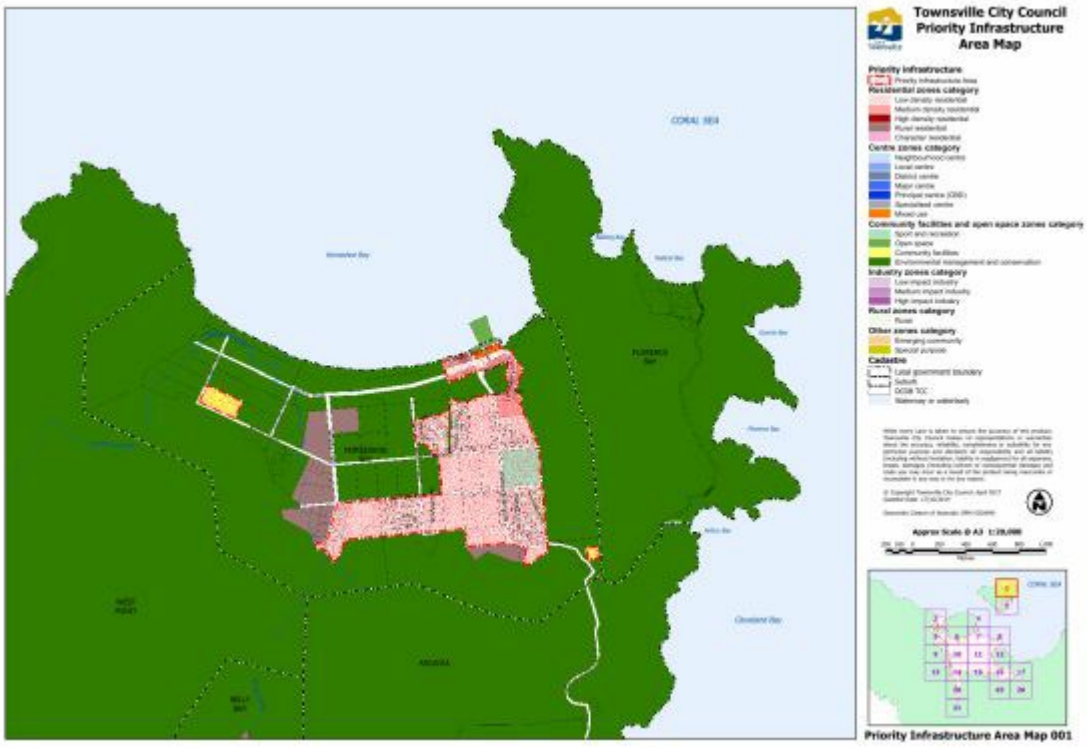

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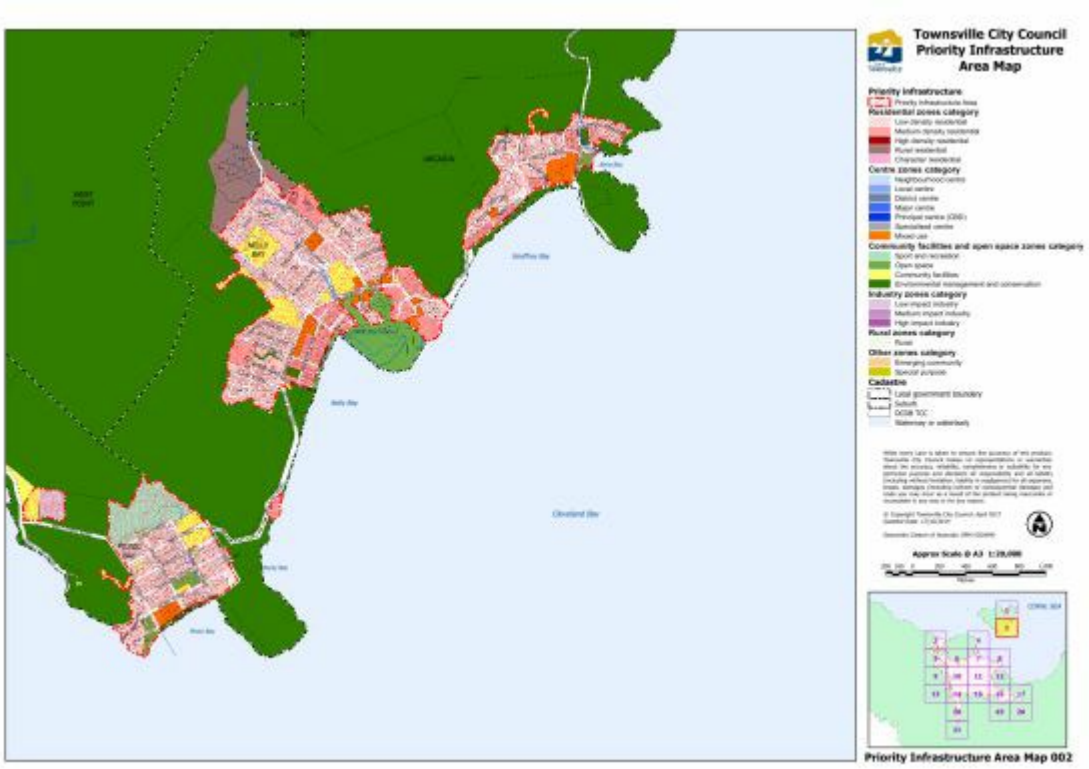

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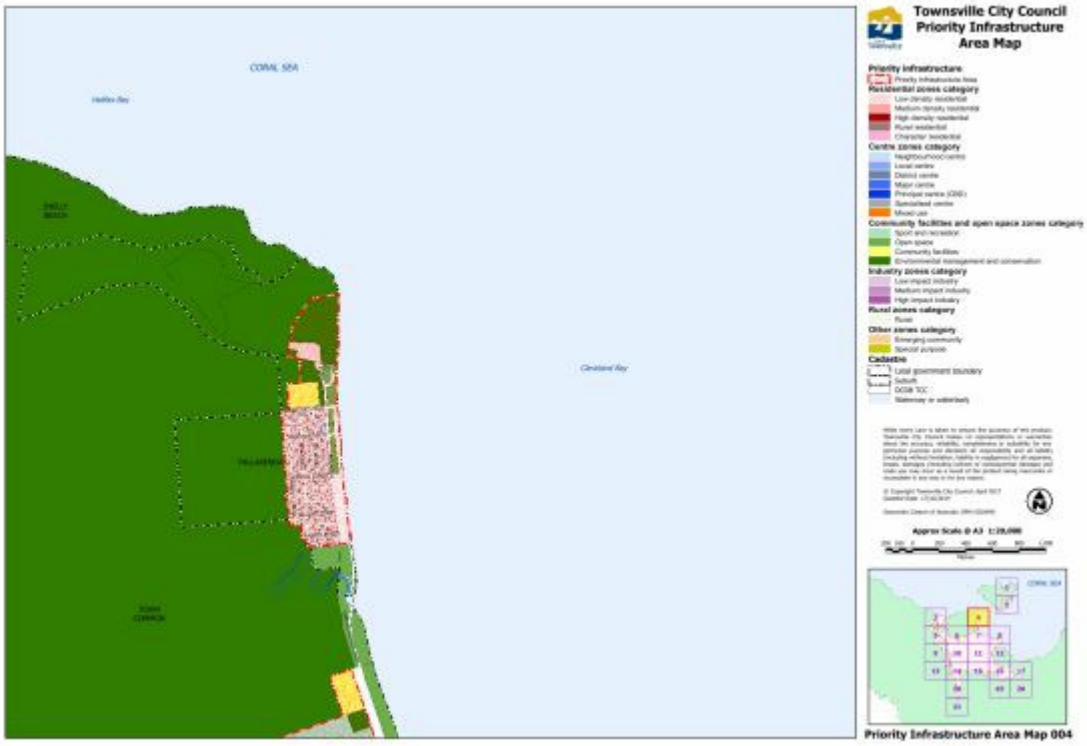

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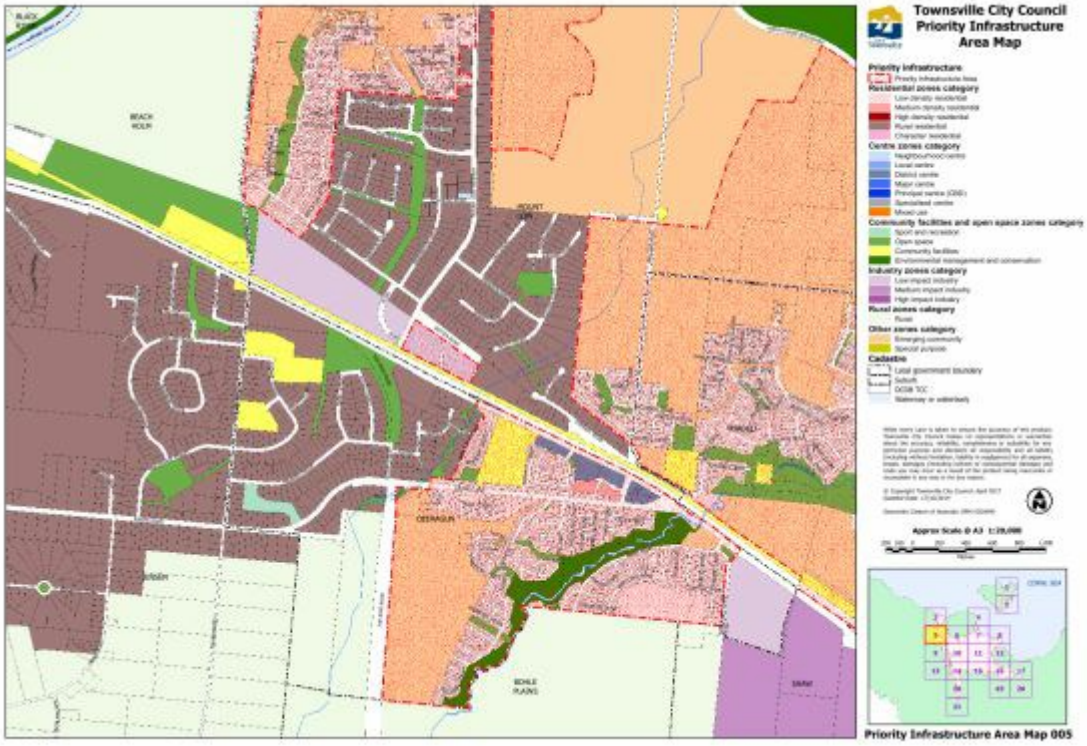

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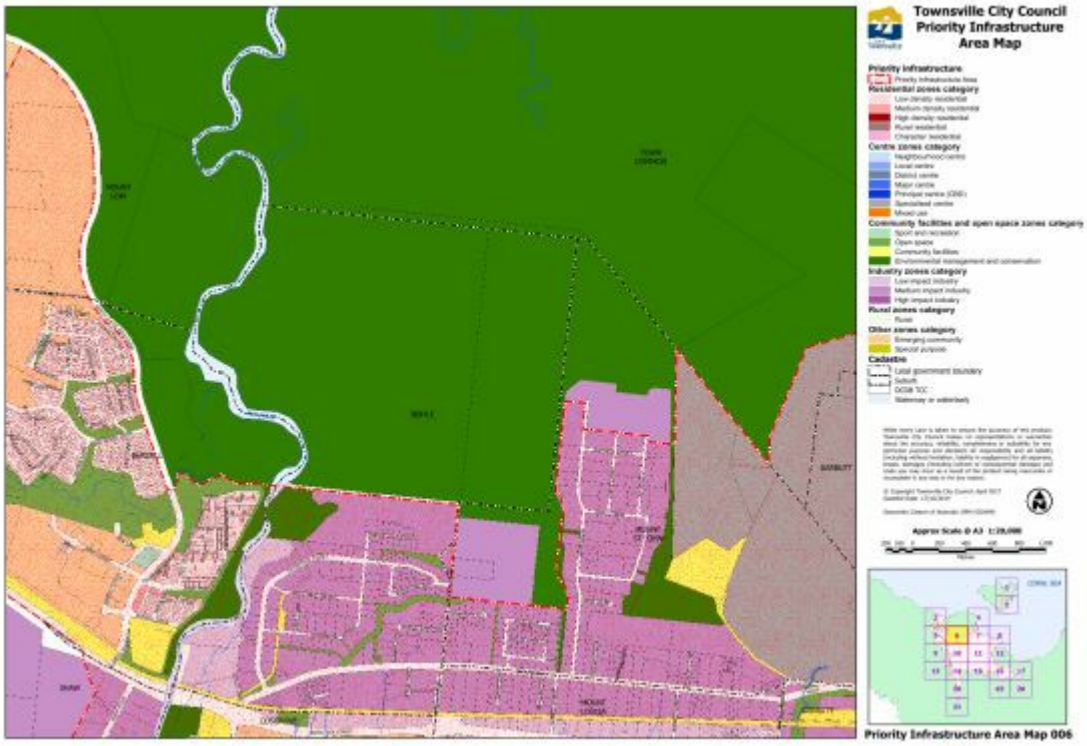

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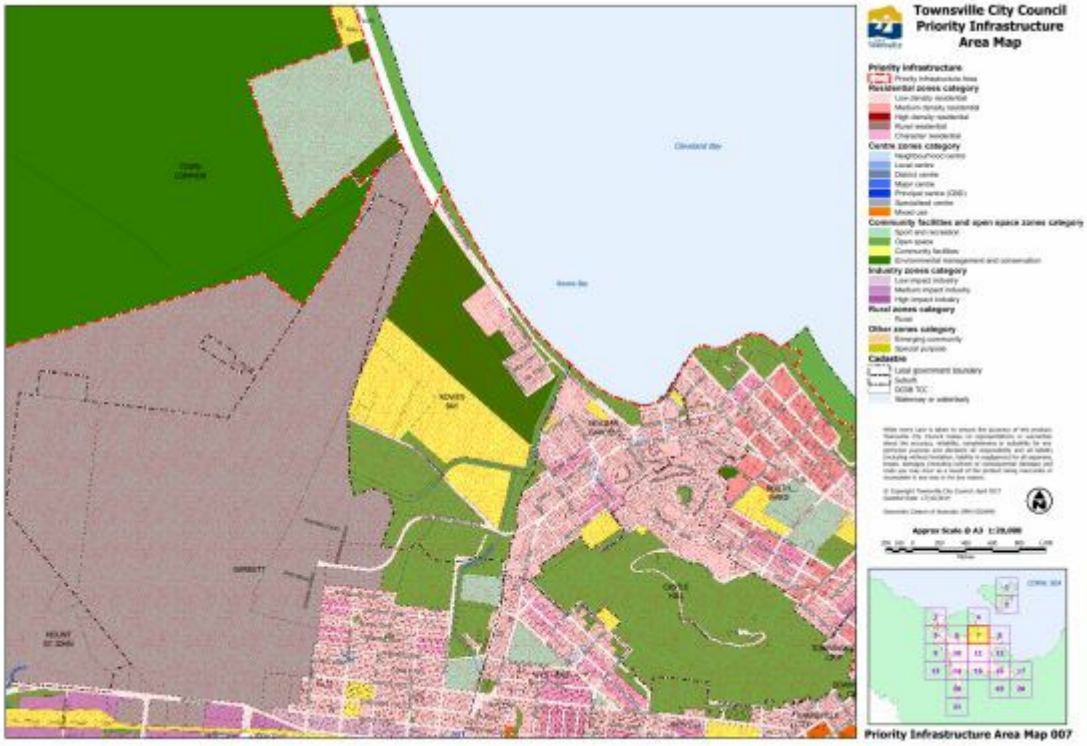

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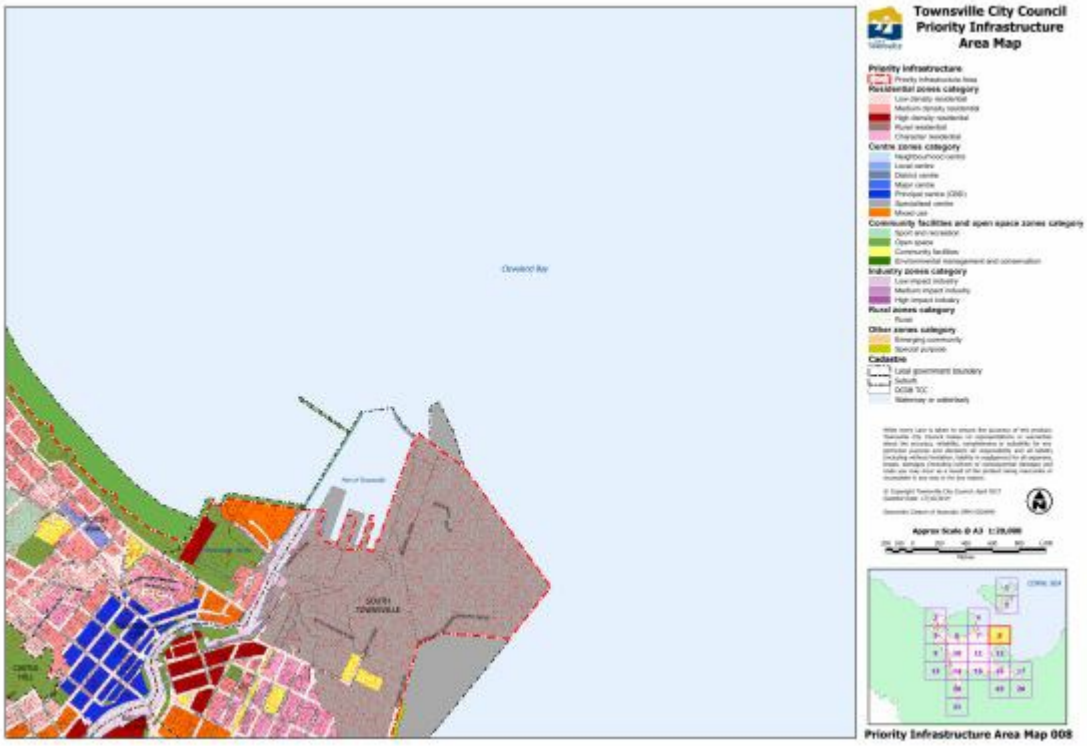

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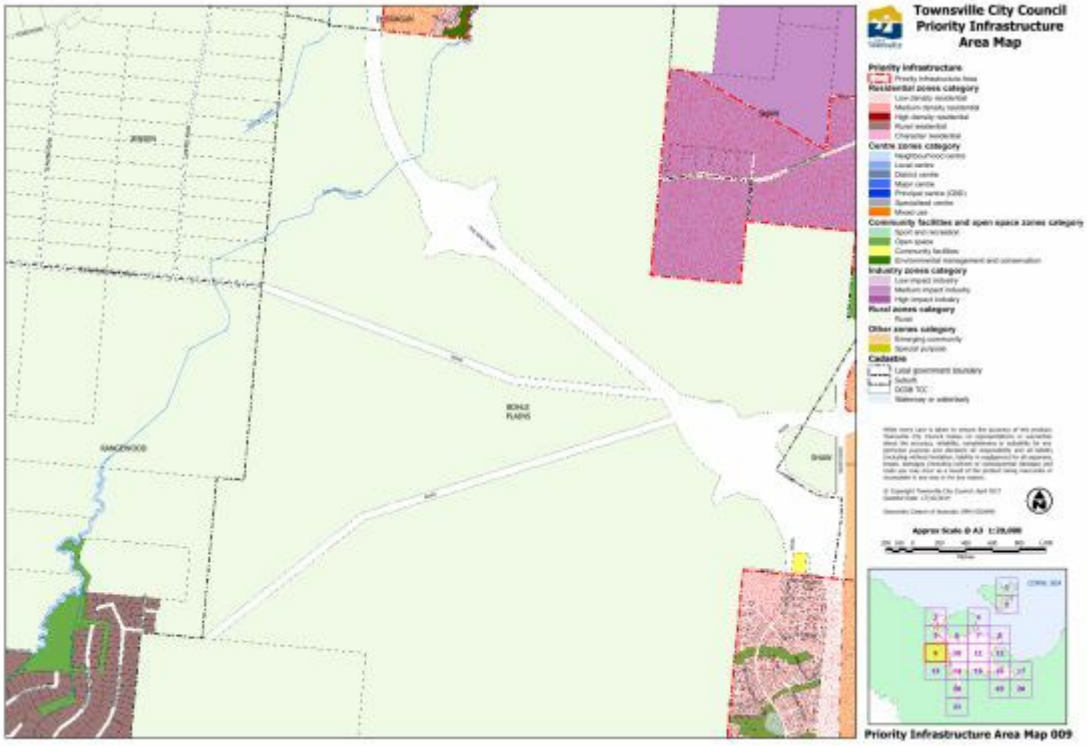

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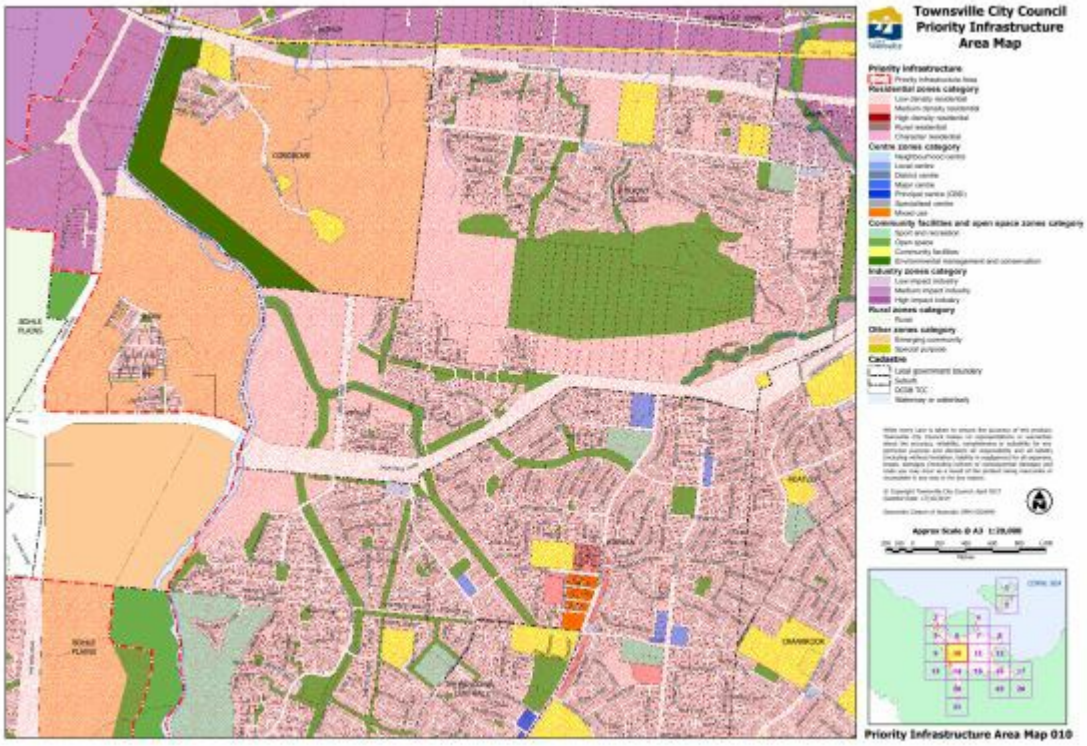

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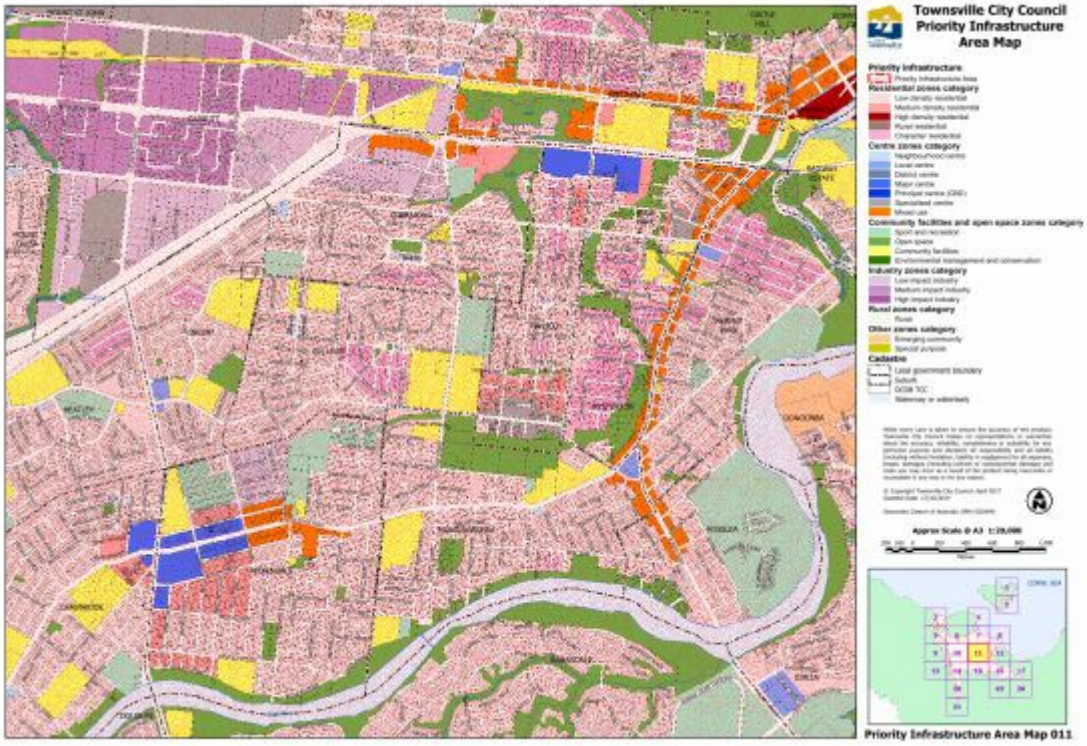

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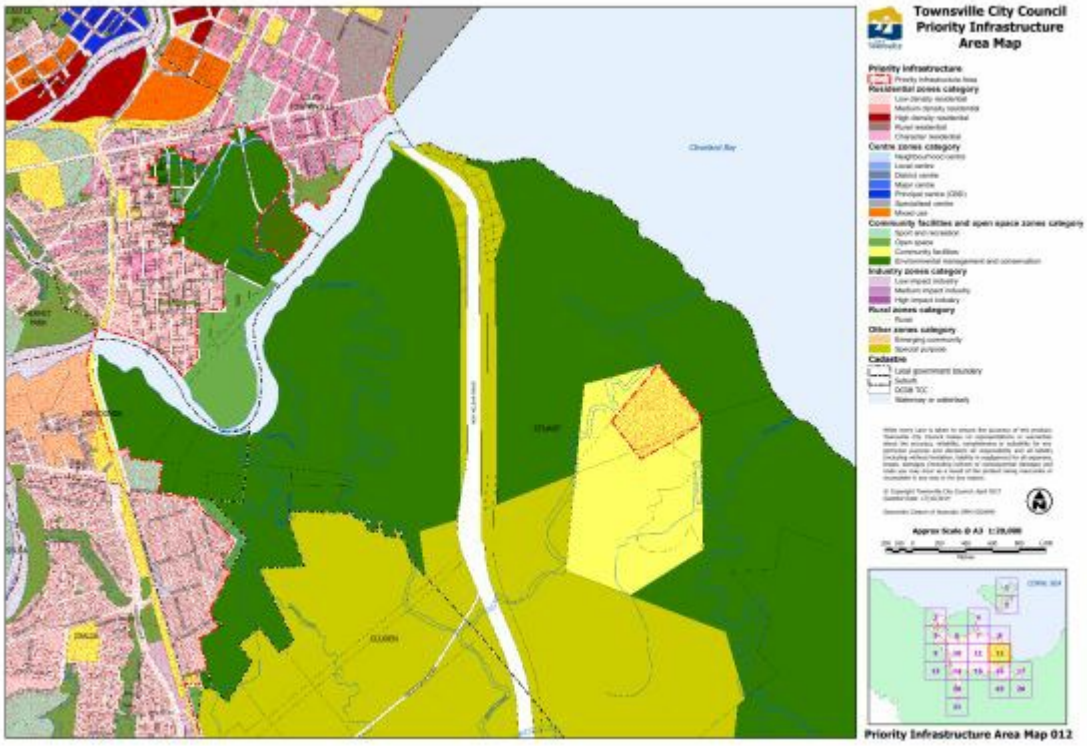

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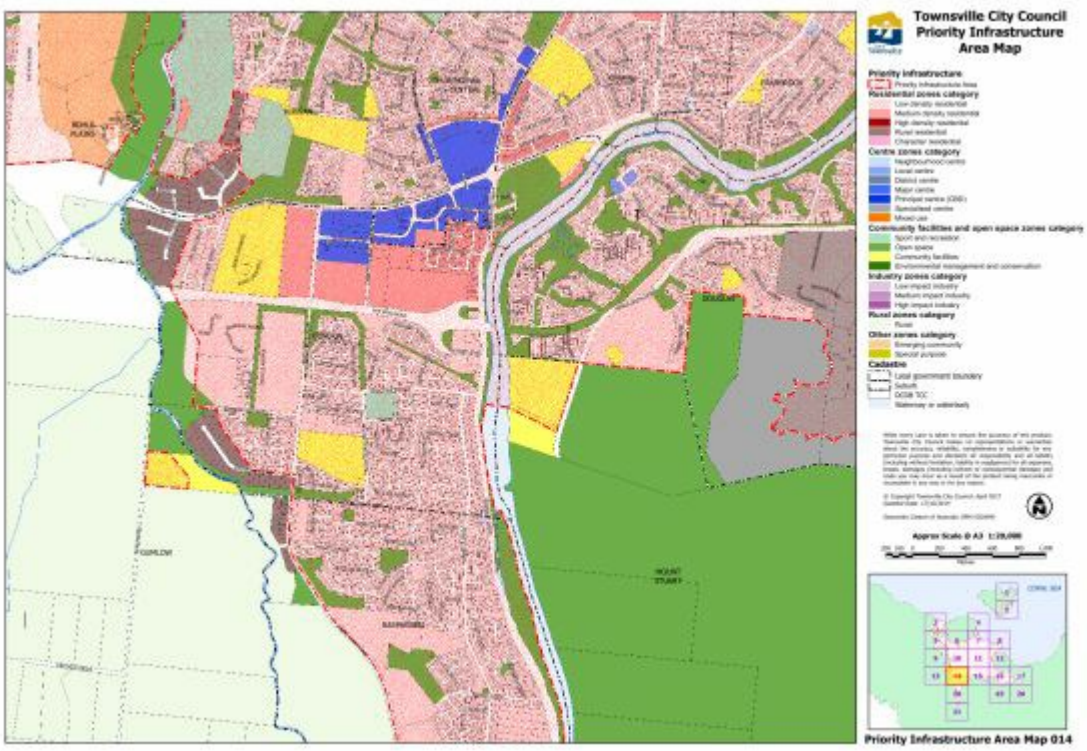

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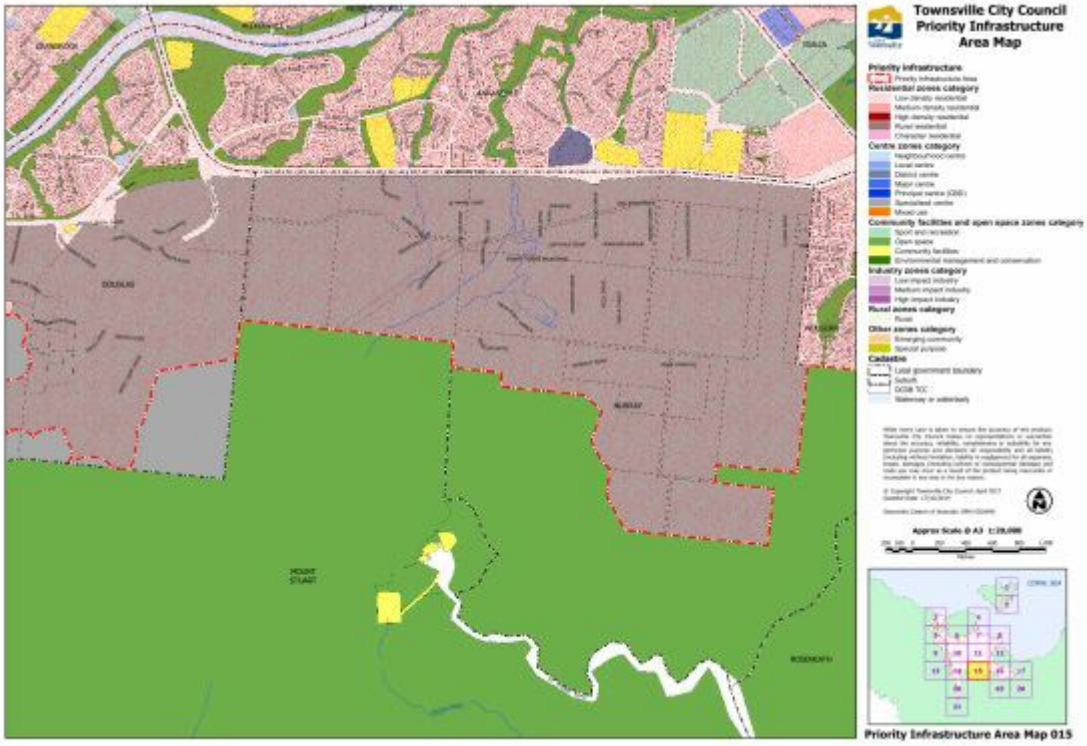

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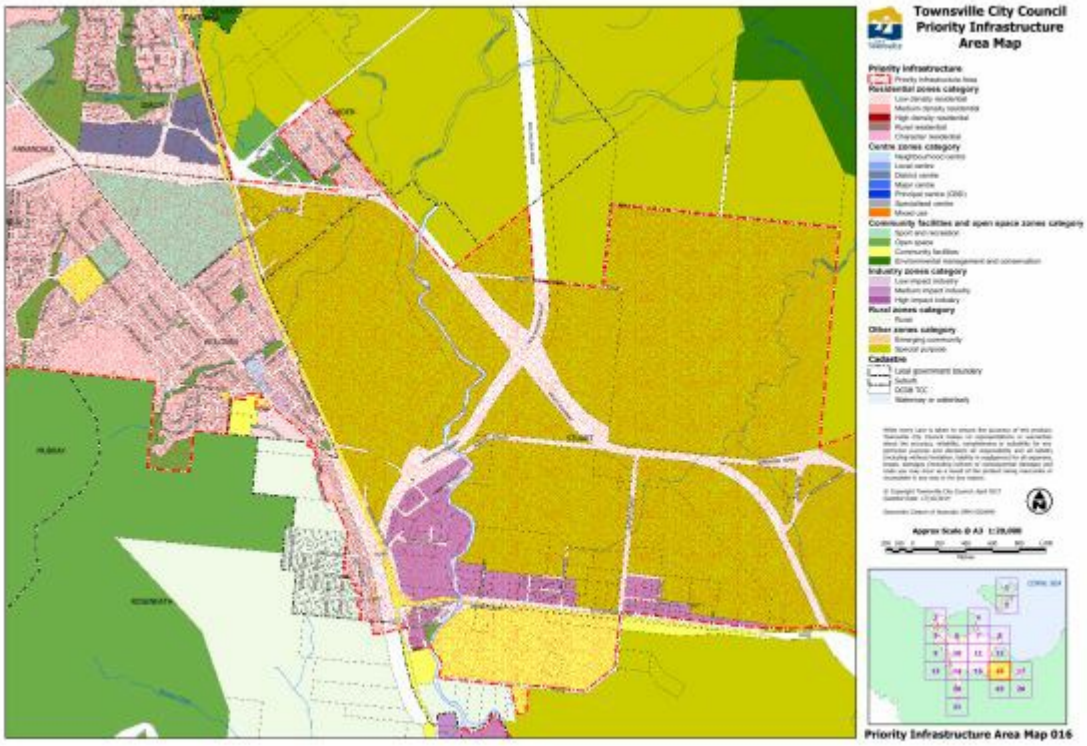

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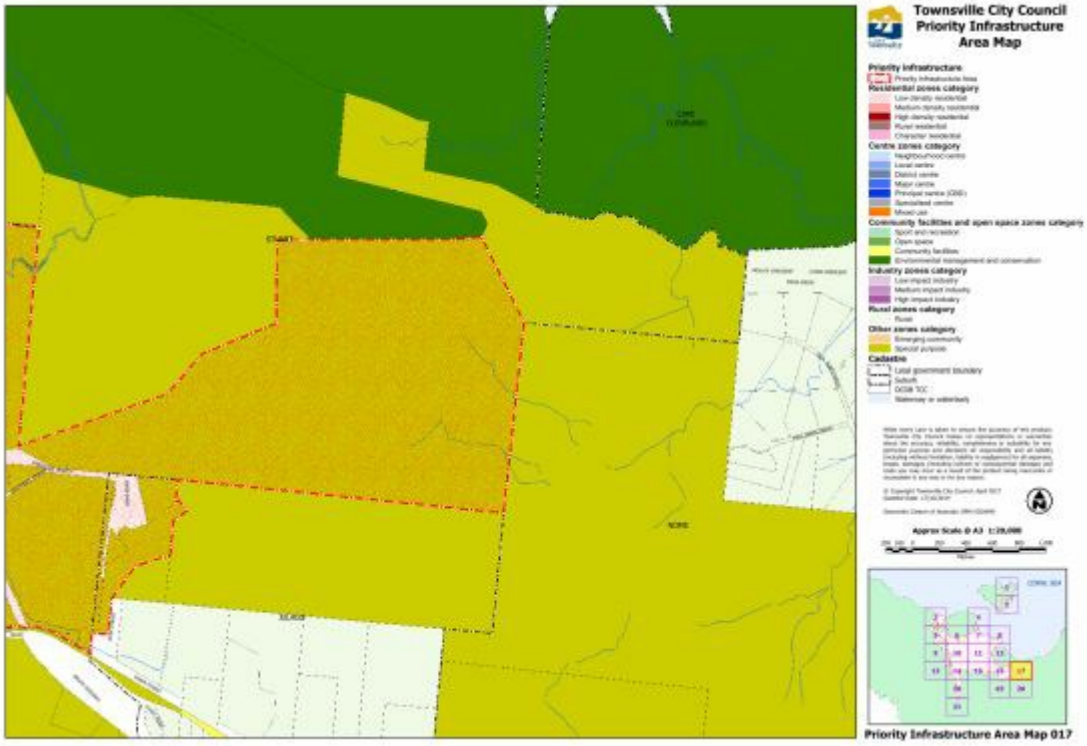

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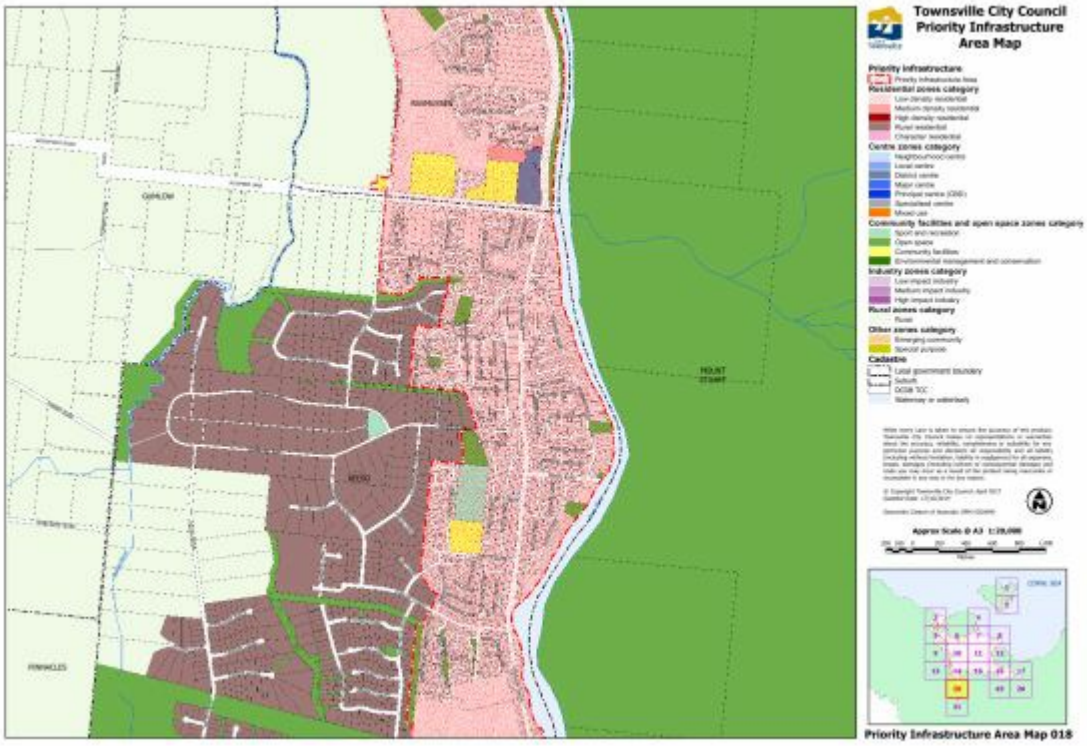

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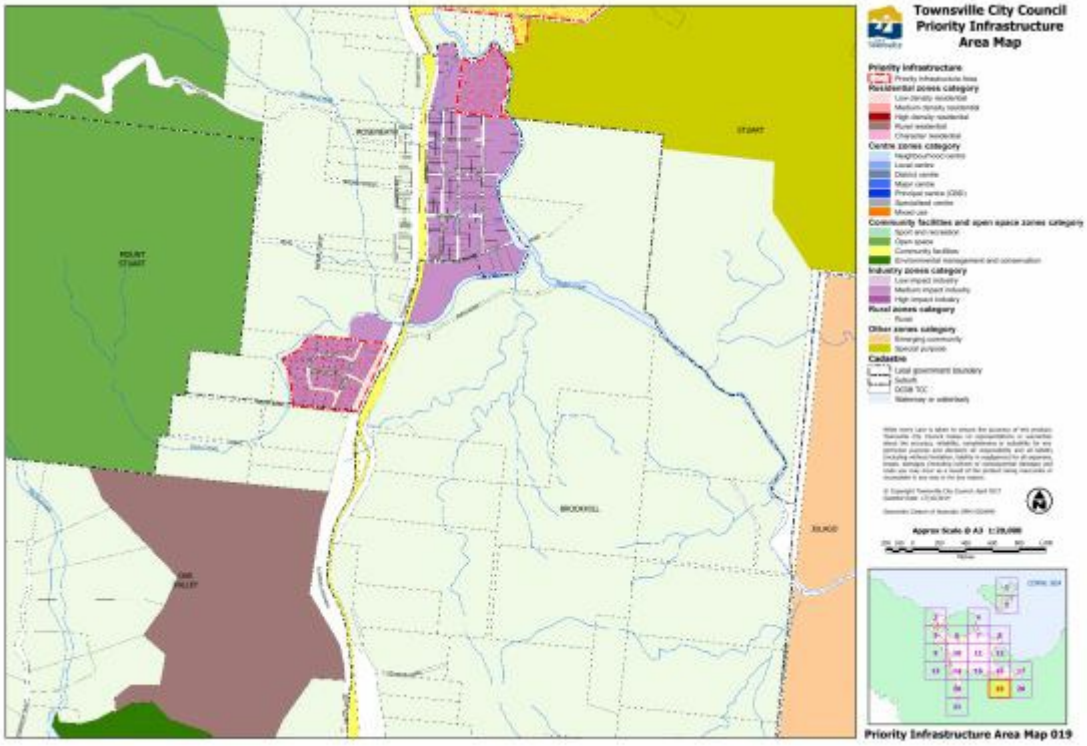

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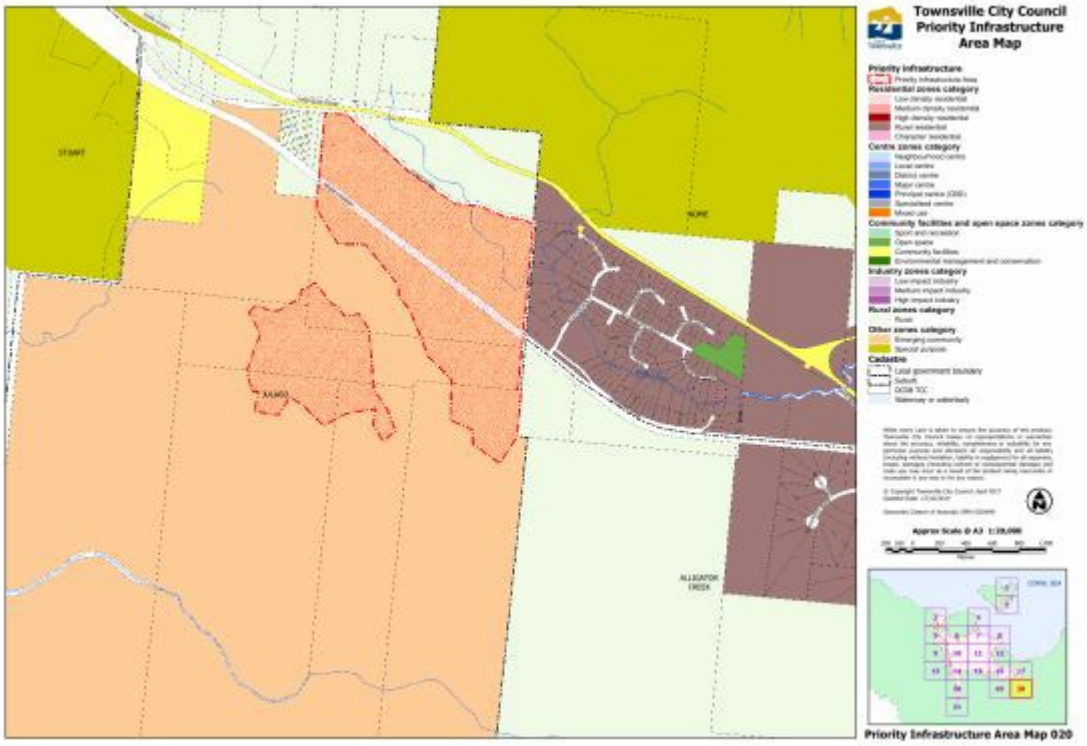

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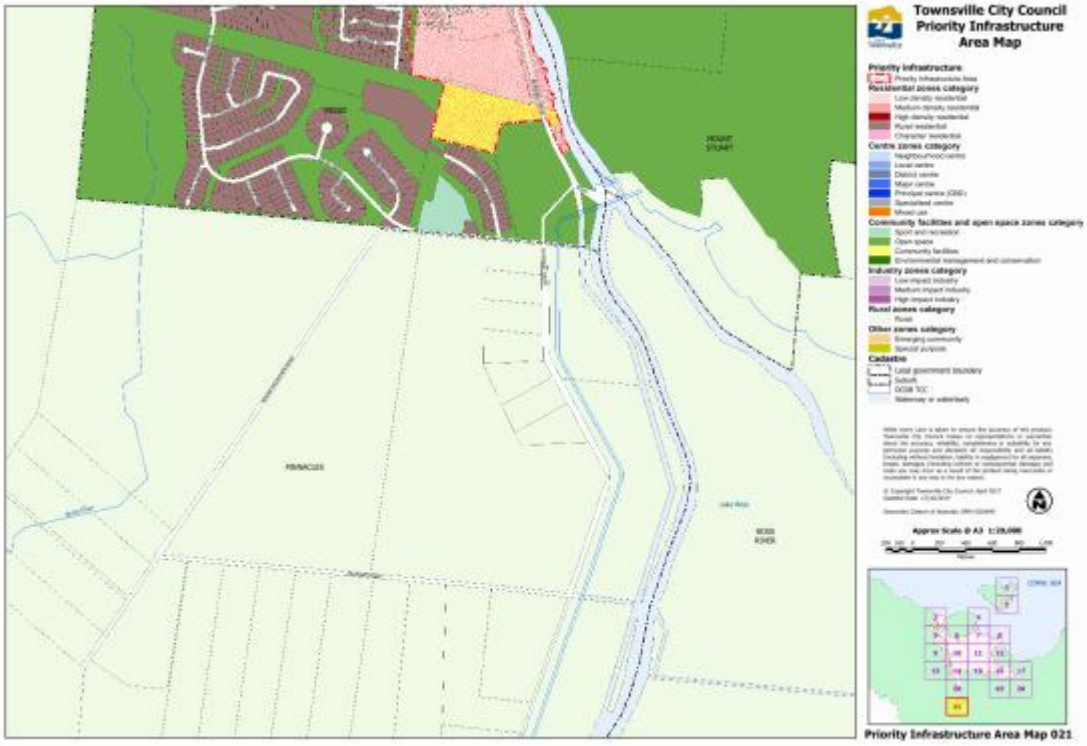

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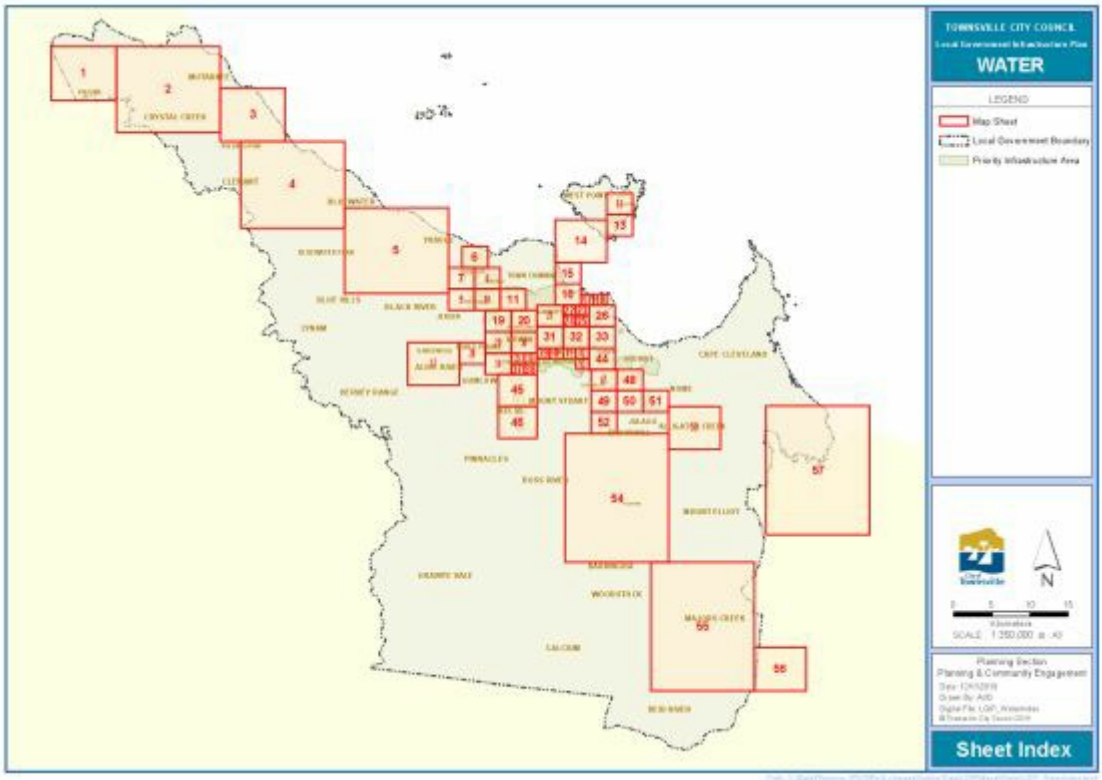
SC3.3.5 - Plans for trunk water supply infrastructure

Editor's note—This document is intended to function in an electronic environment whereupon hyperlinks to detailed PDF maps allow for closer examination of mapping information. The following images are true copies of such maps, but at a coarser scale.

The maps are also loaded in a GIS environment. TownsvilleMaps is the current in-service GIS platform for this purpose, which can be publicly viewed at council, or privately accessed via subscription.



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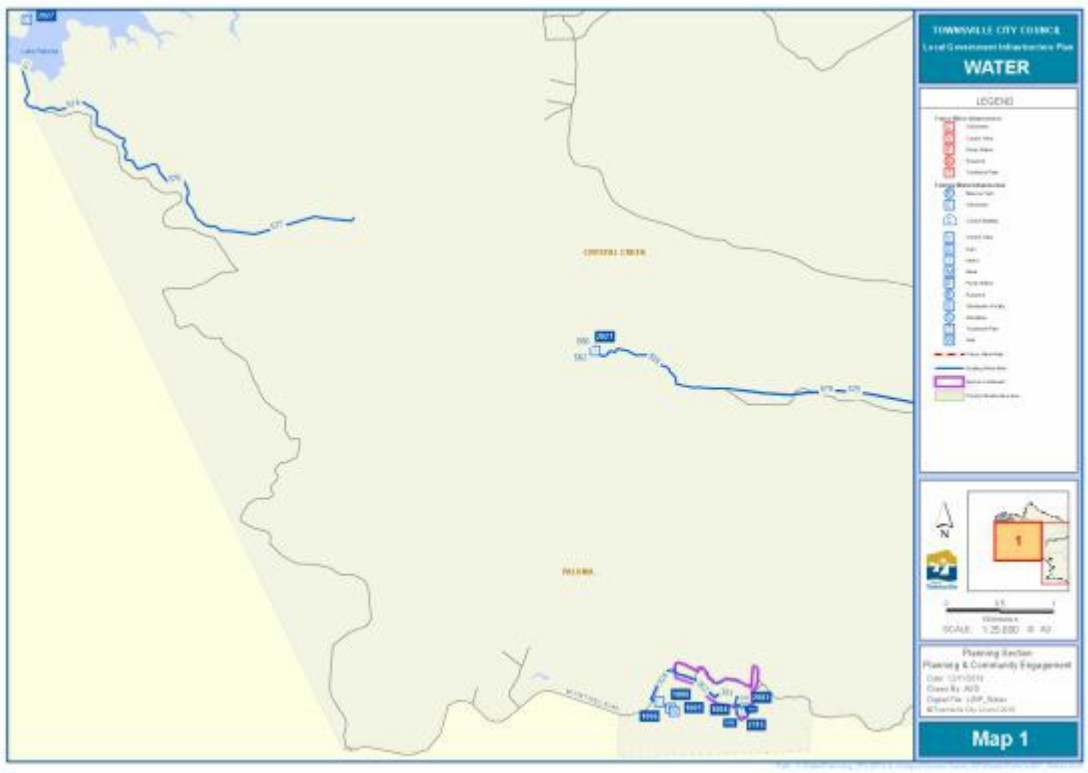

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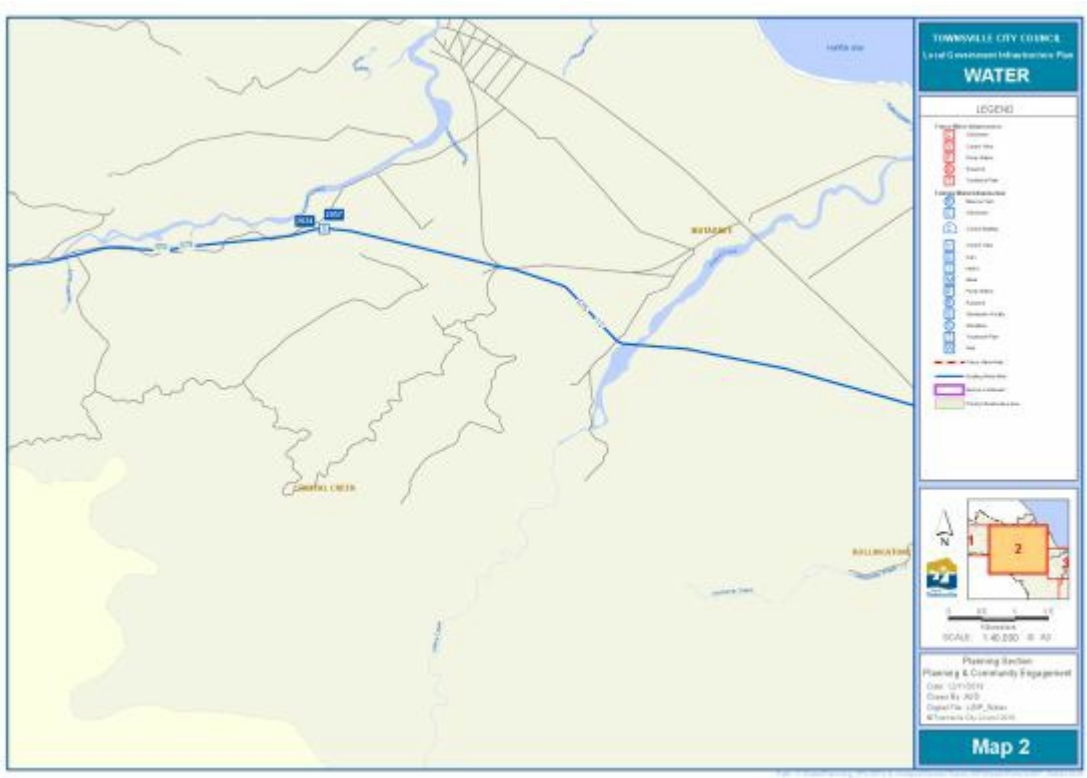

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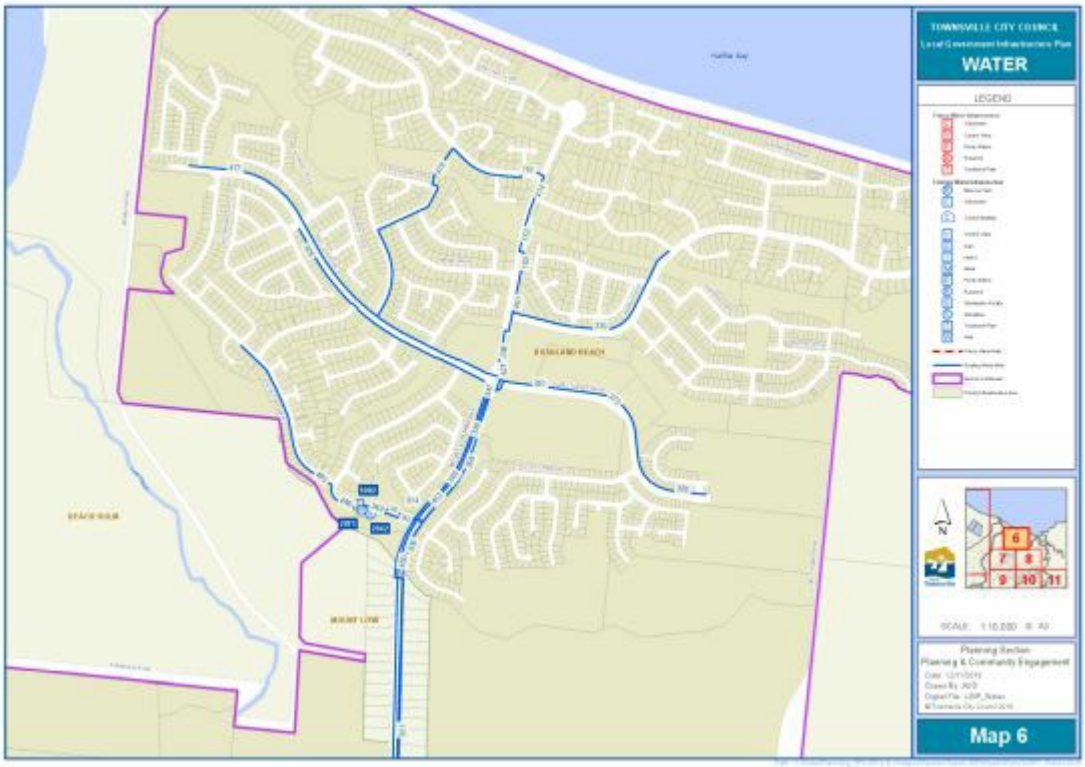

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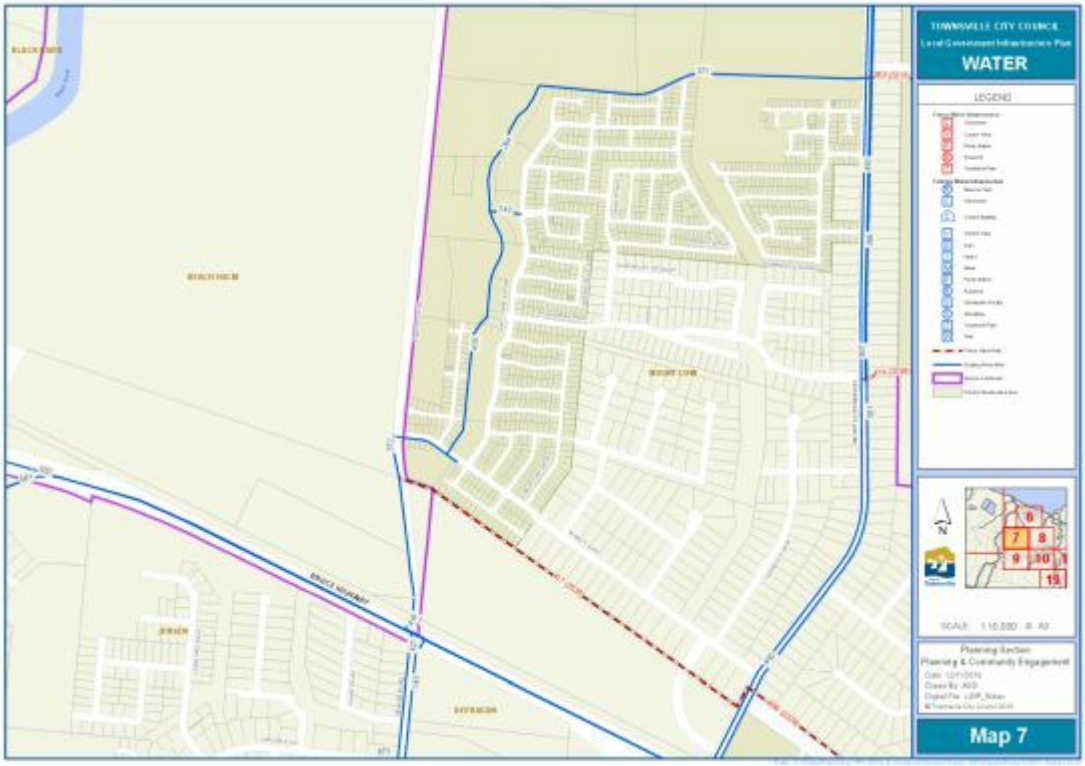

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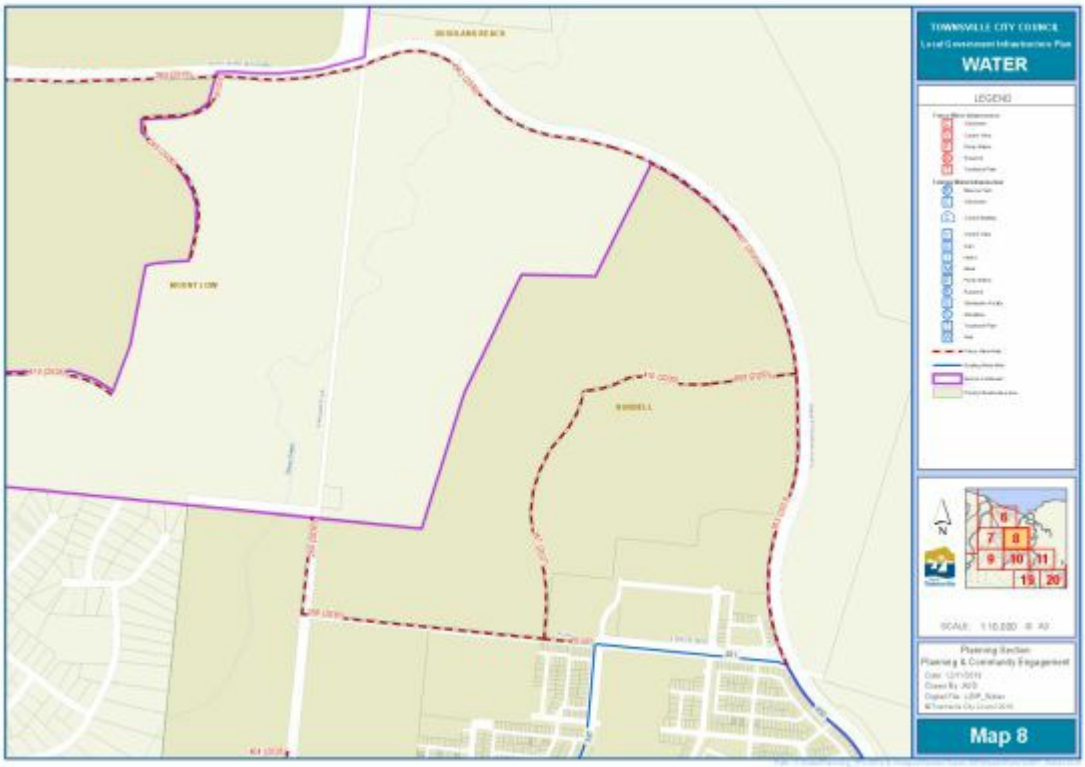

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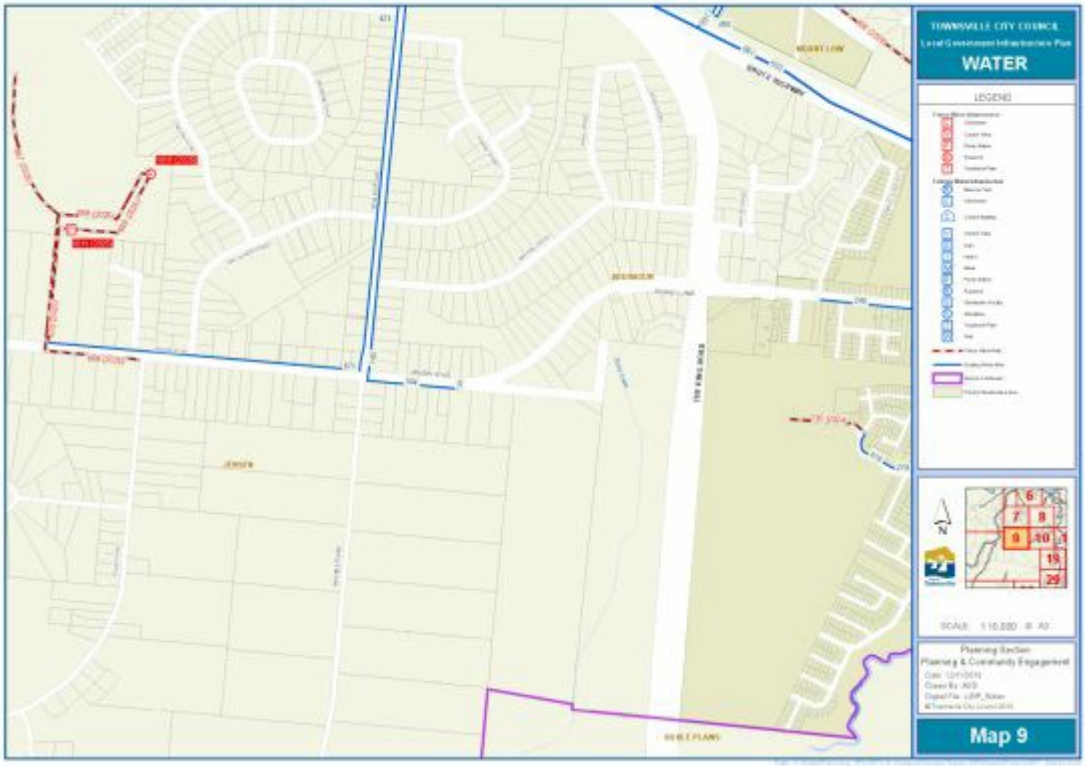

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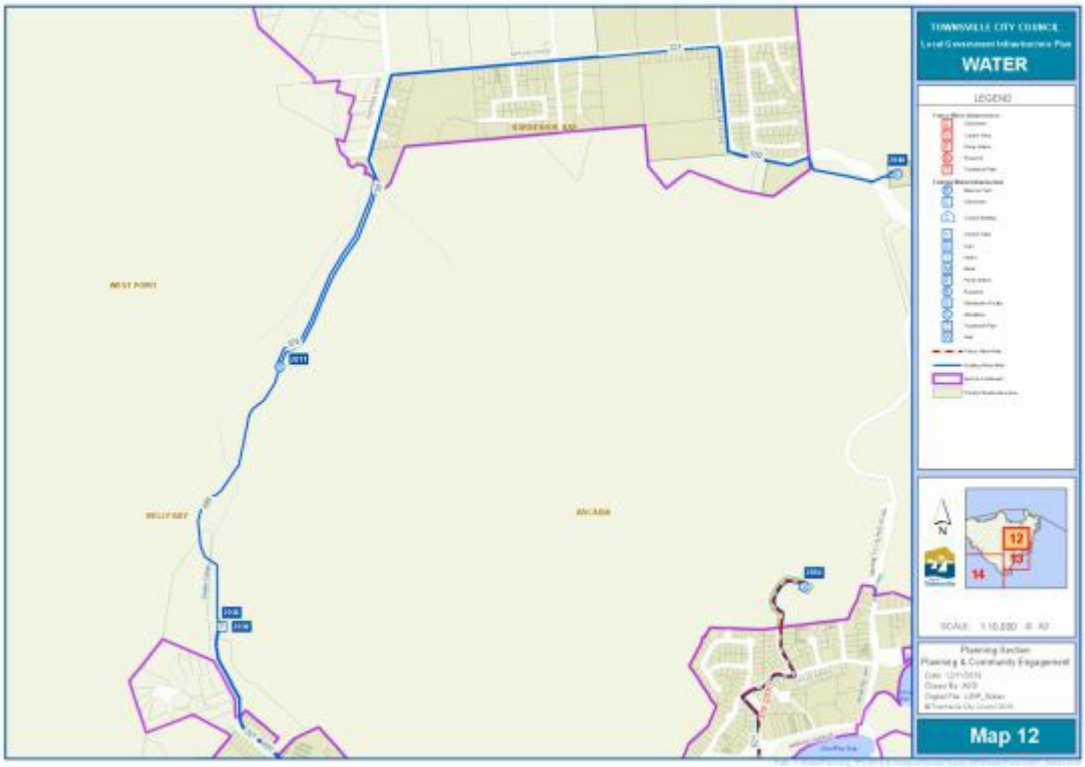

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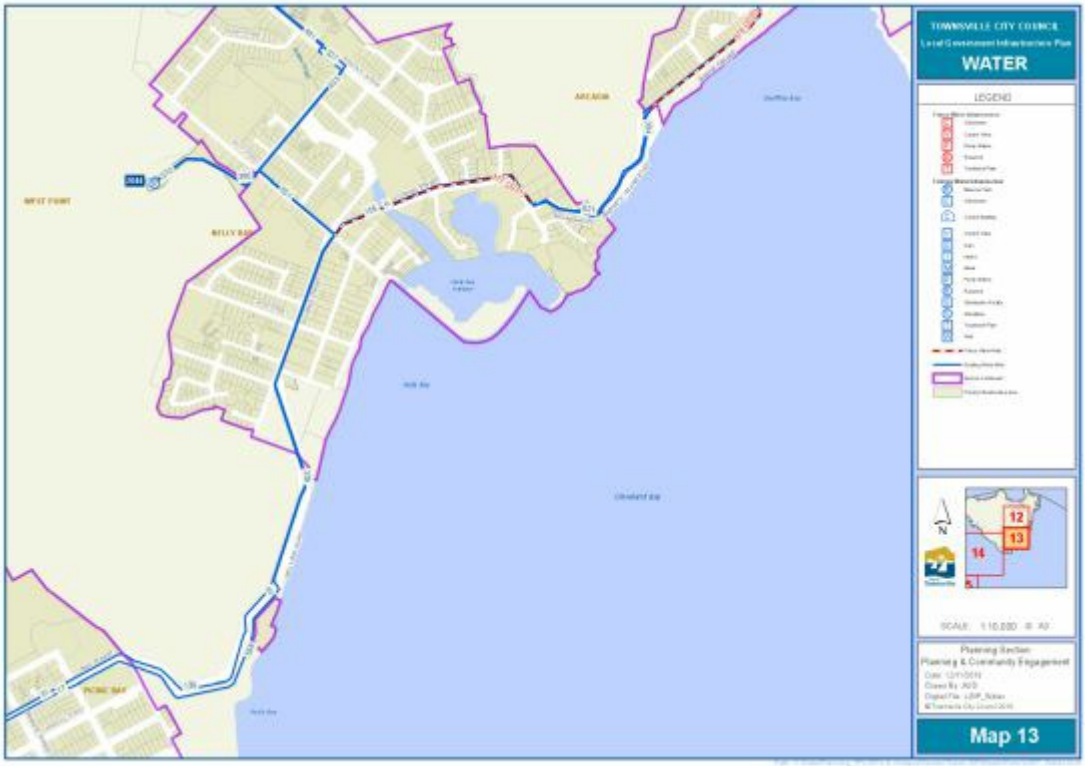

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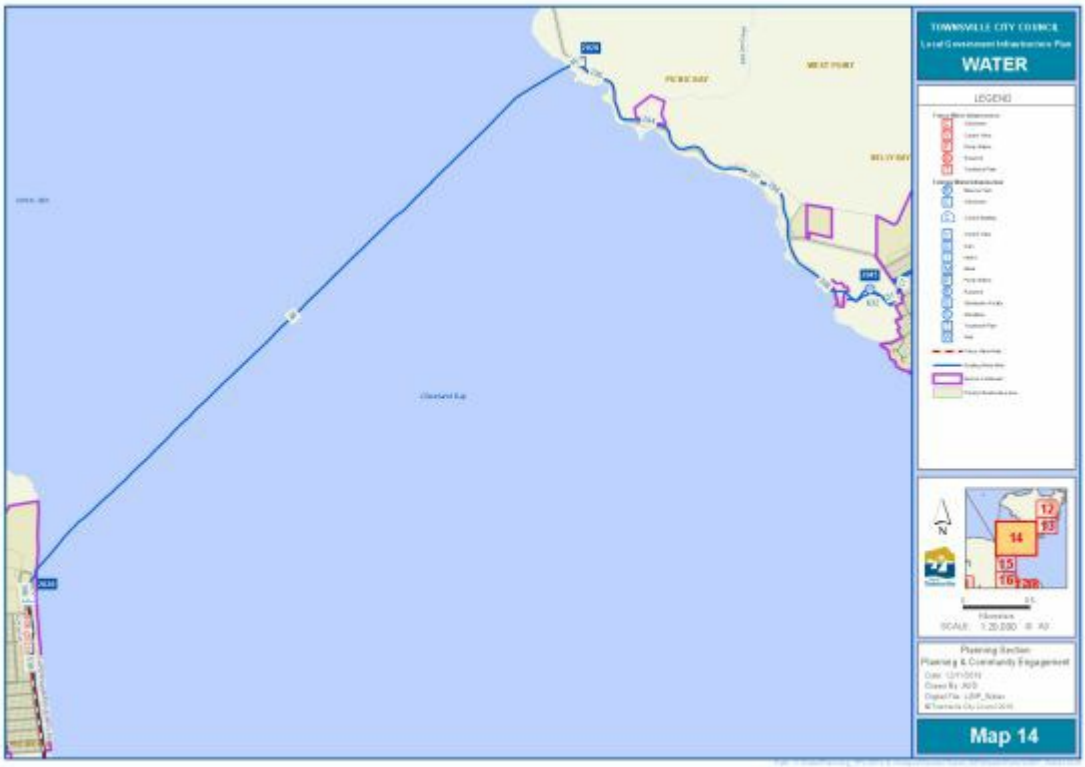

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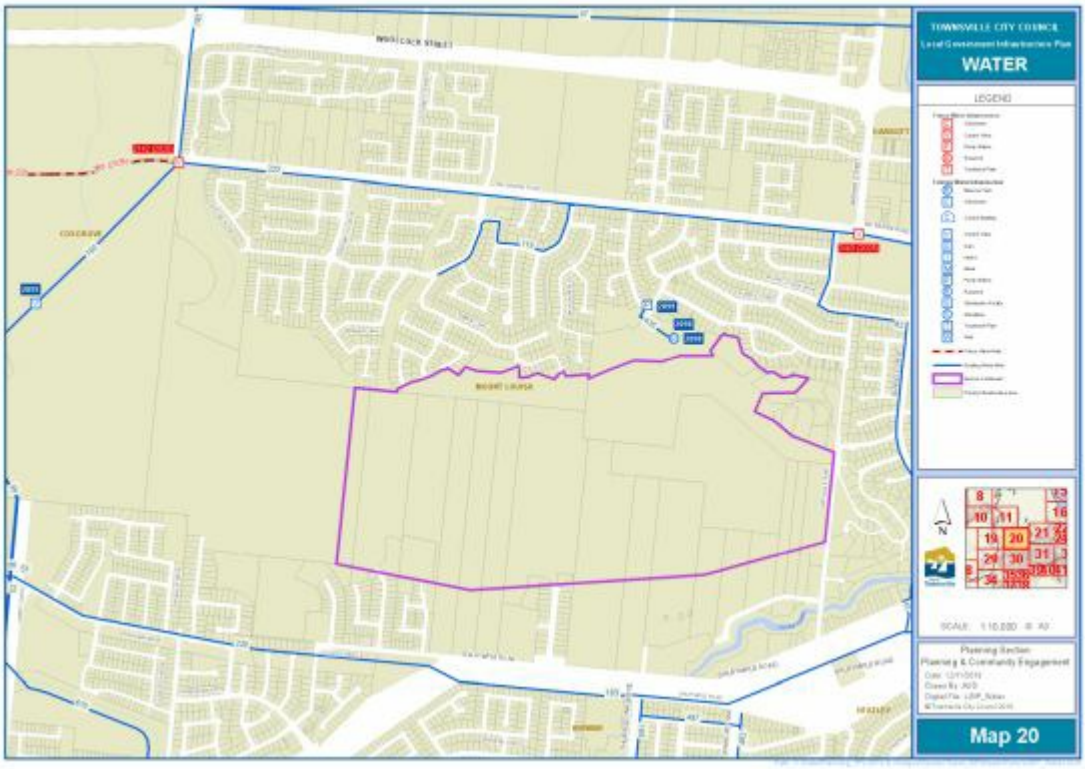

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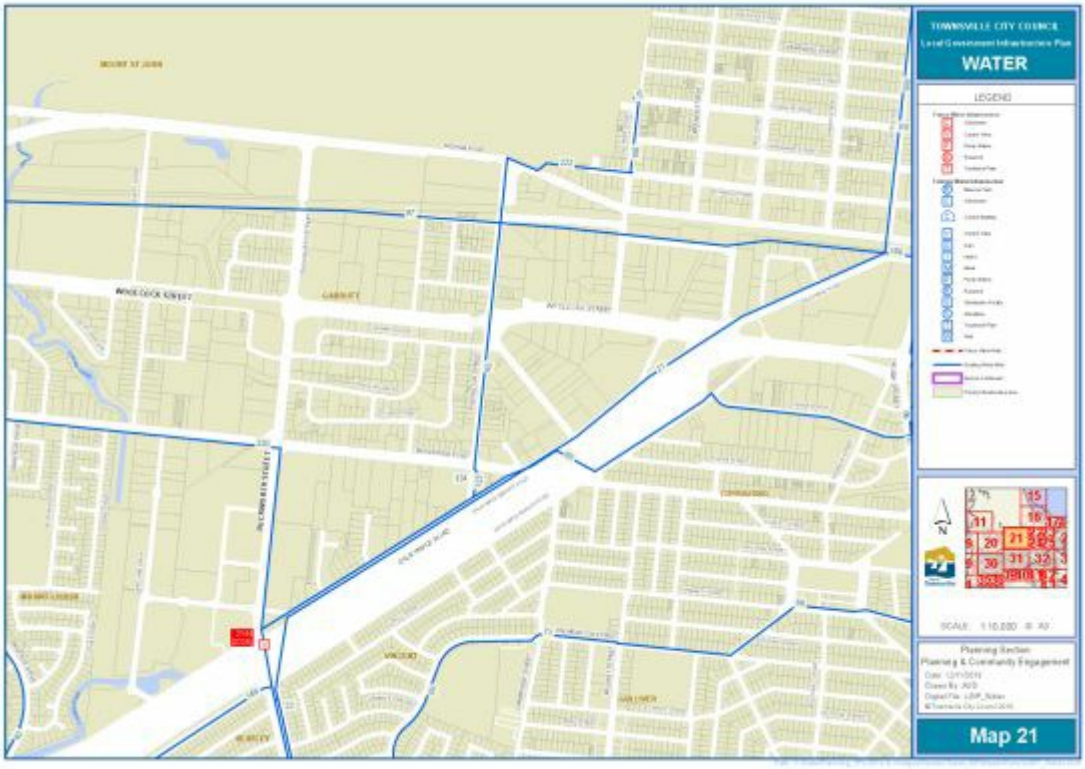

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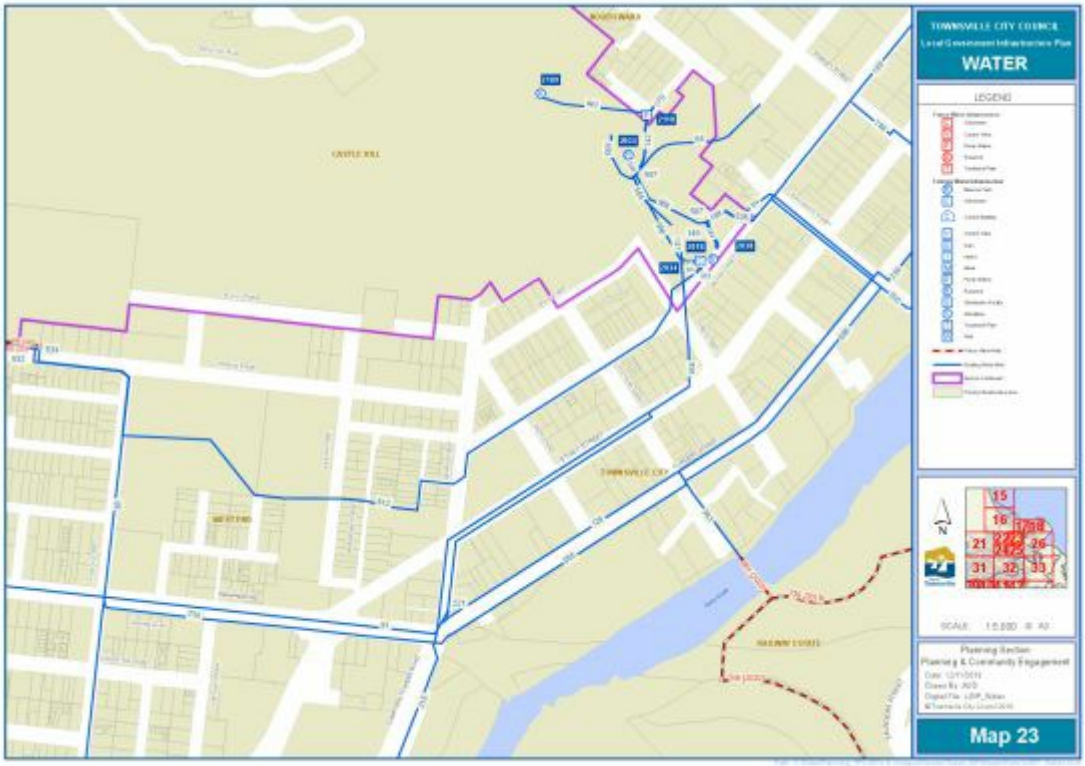

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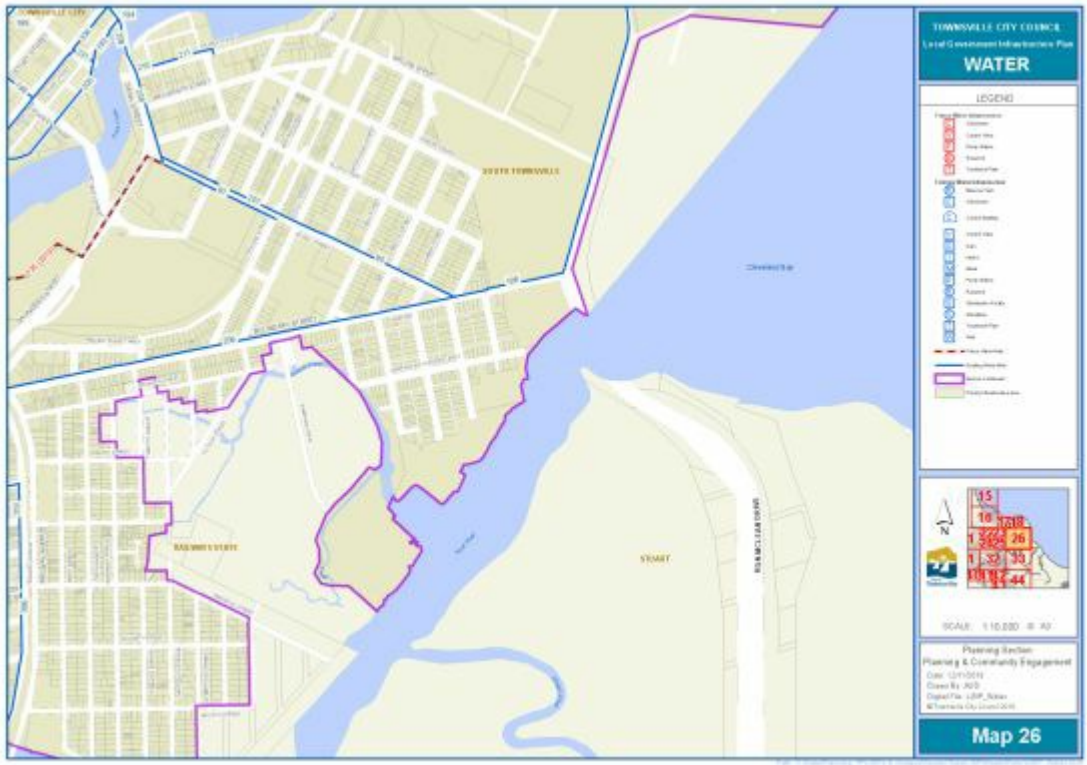

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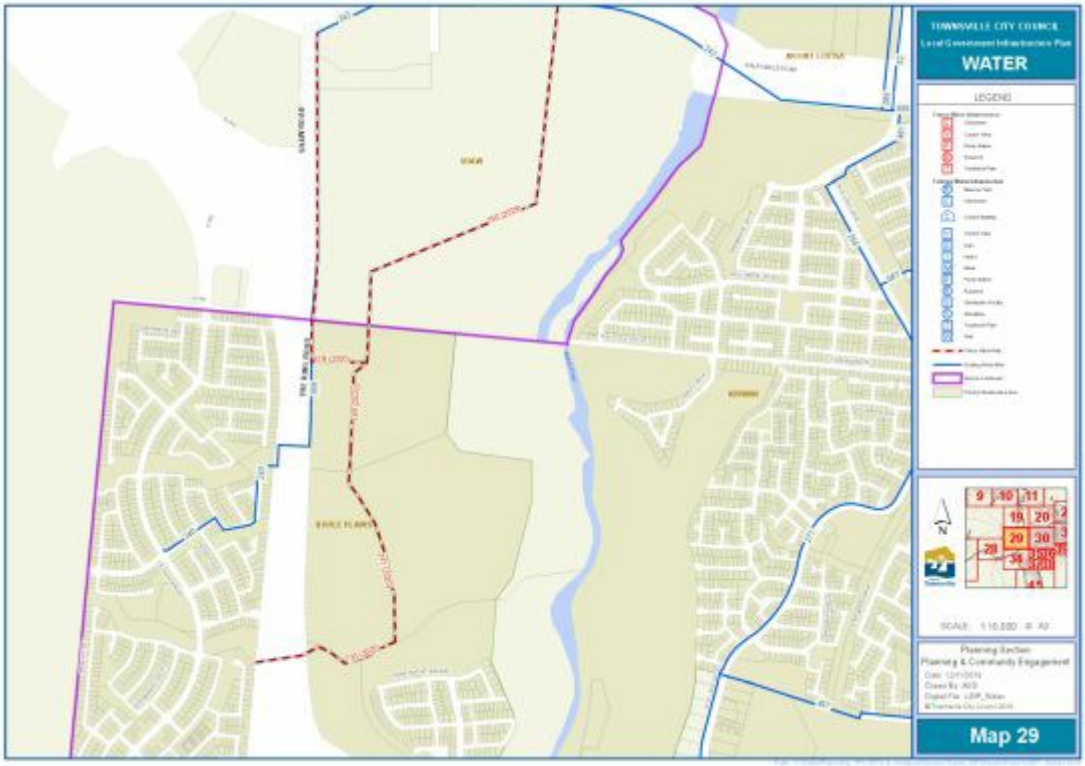

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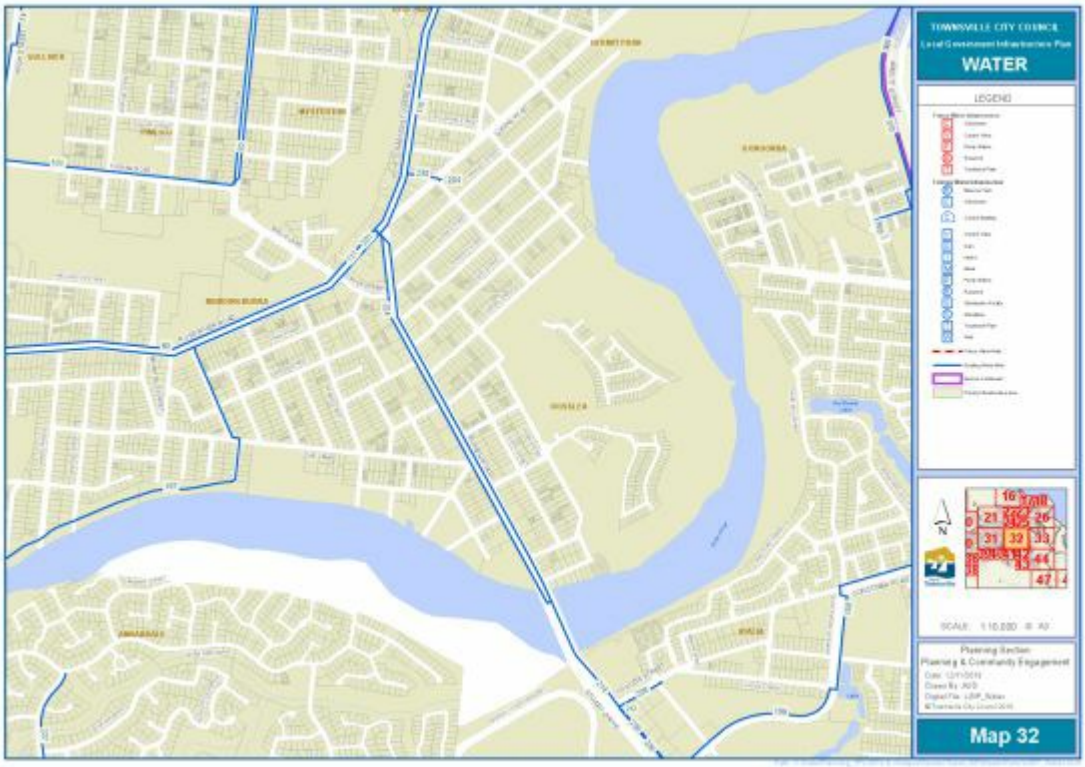

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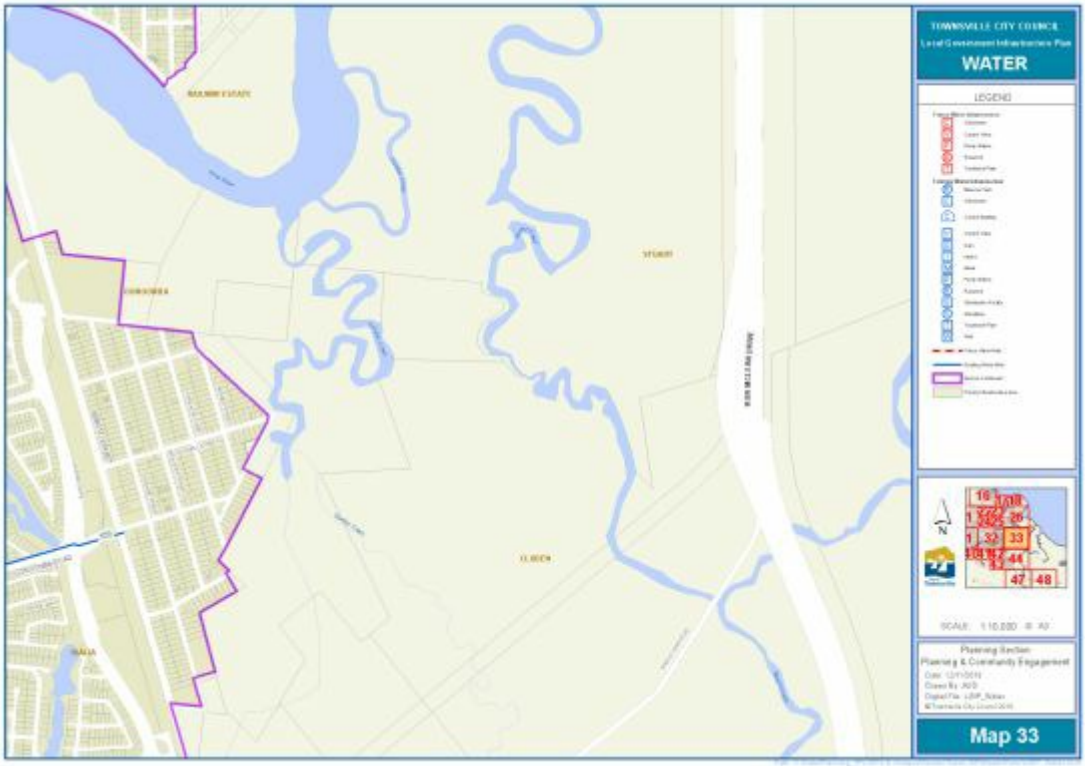

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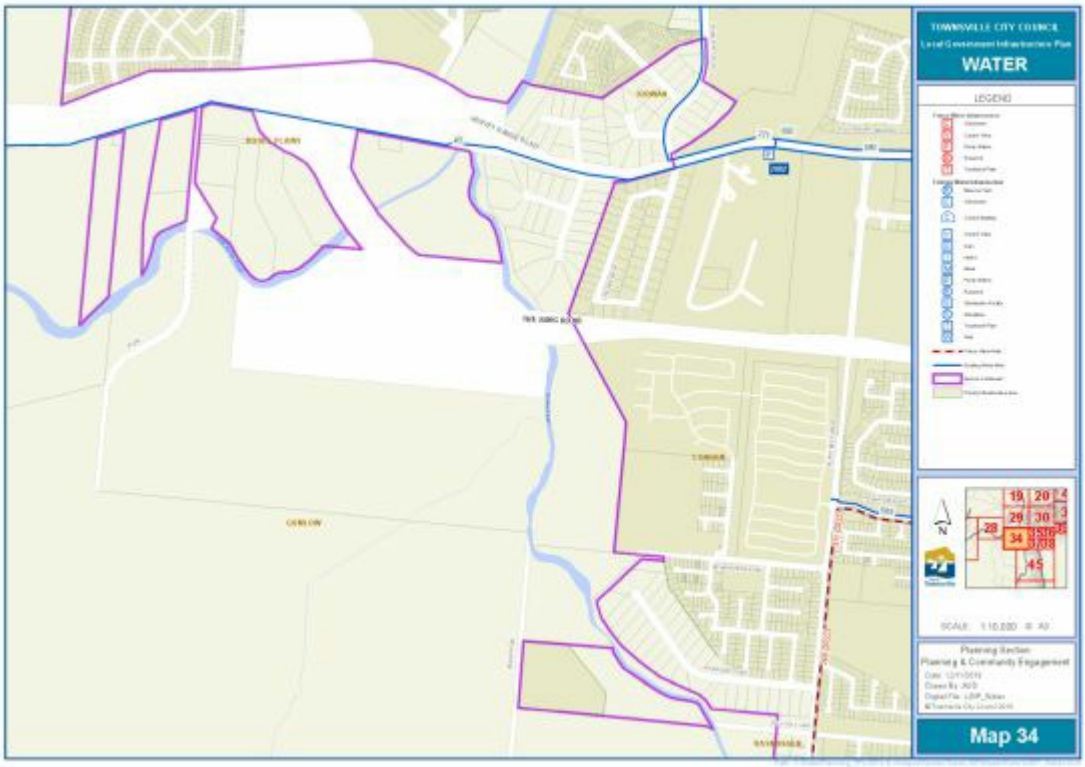

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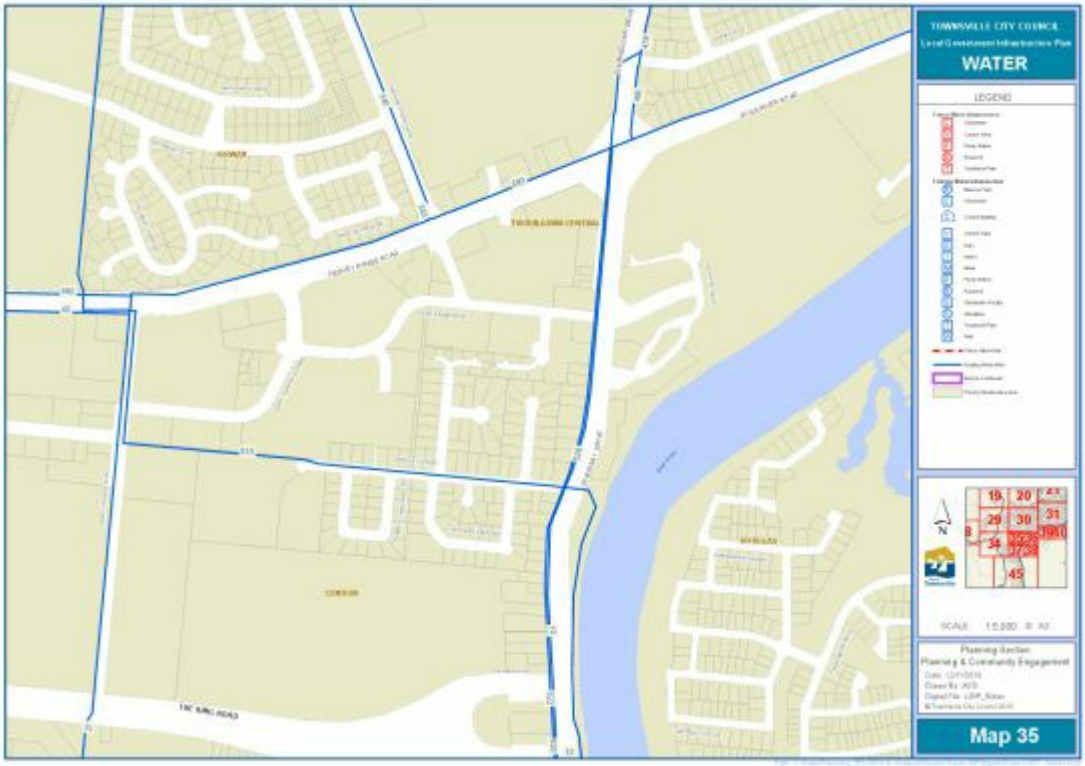

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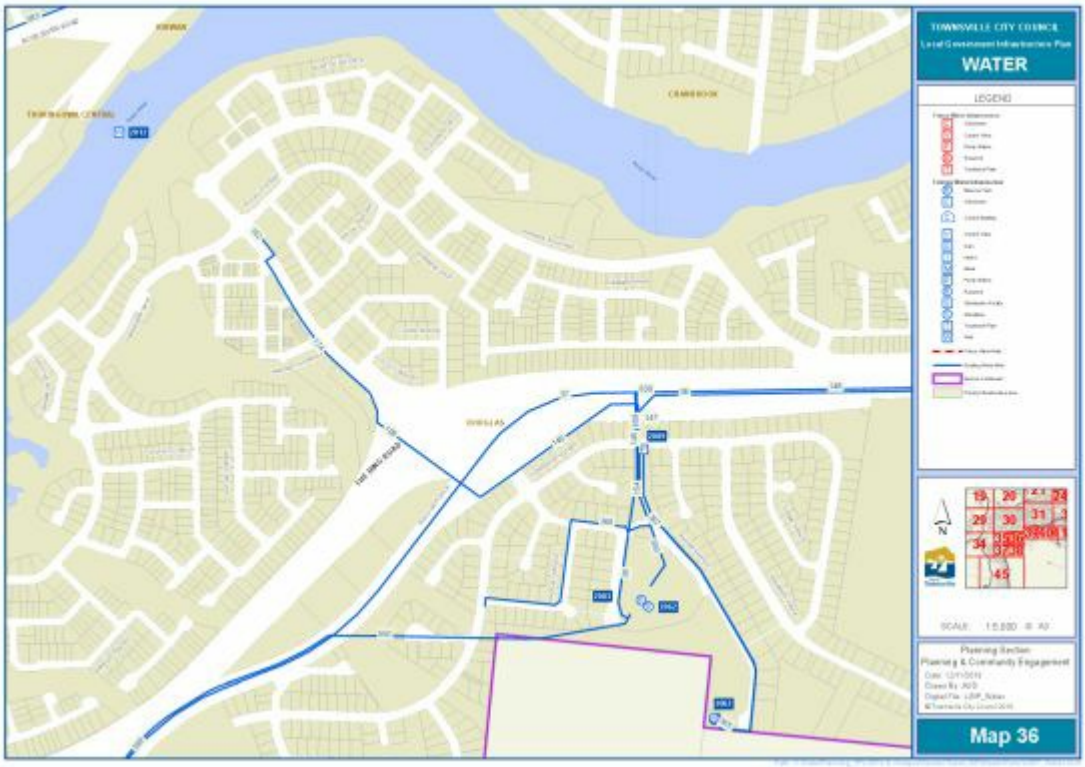

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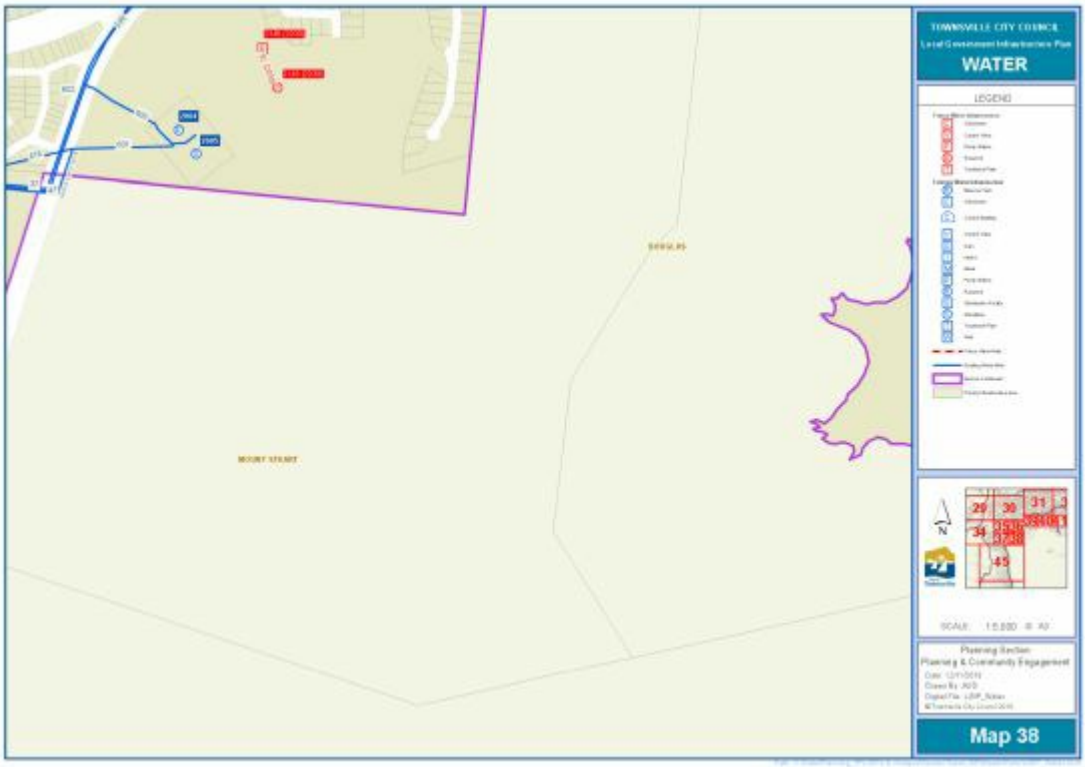

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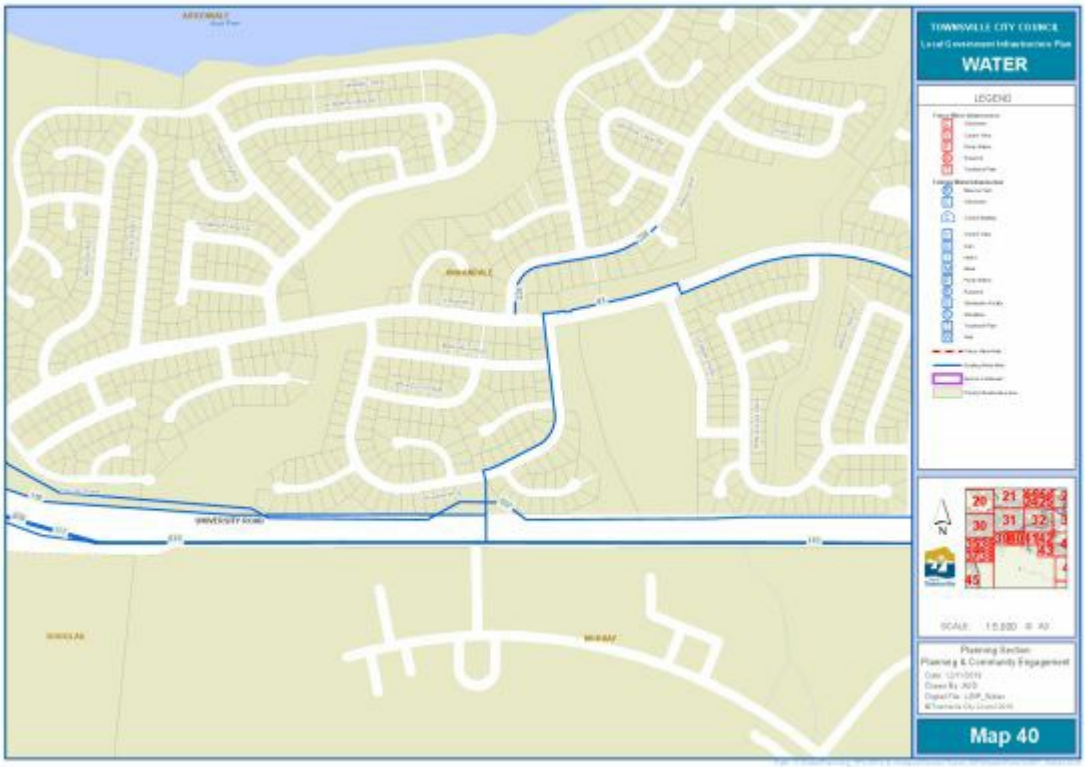

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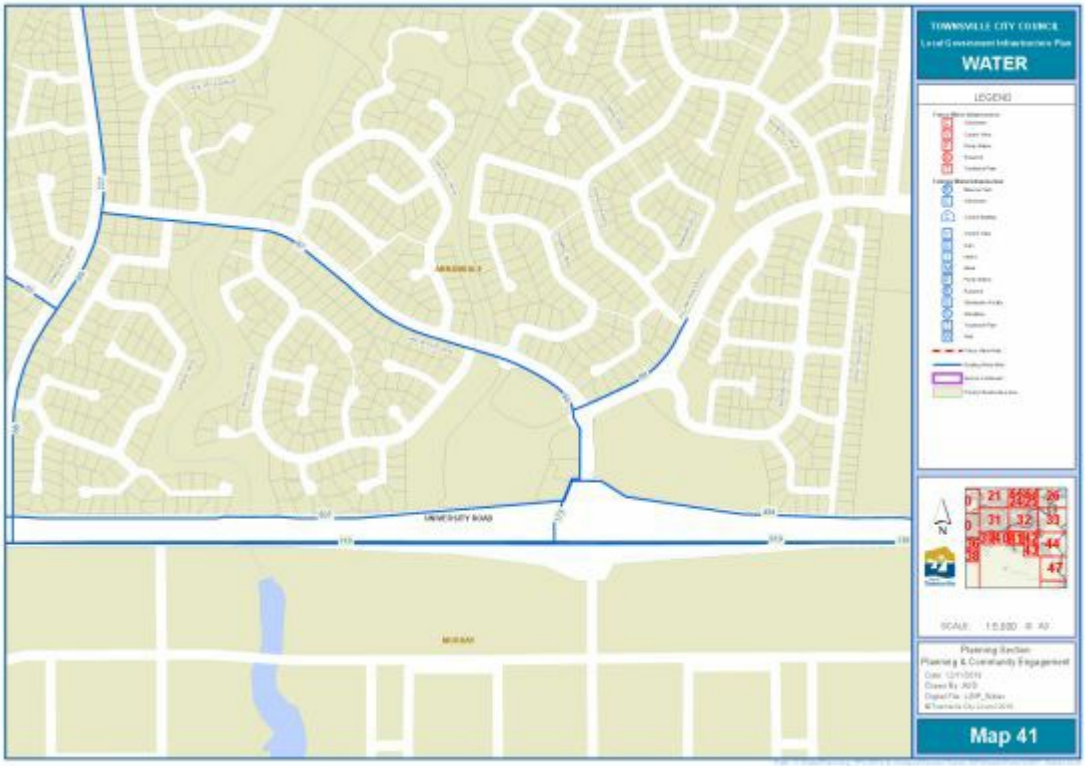

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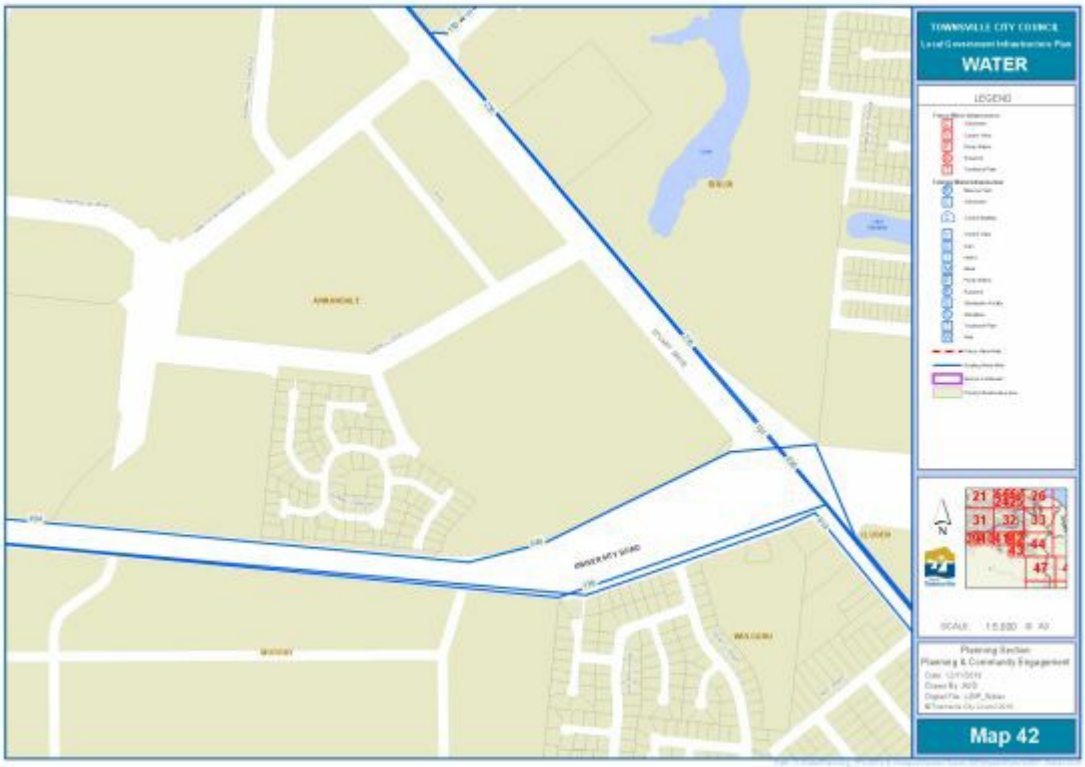

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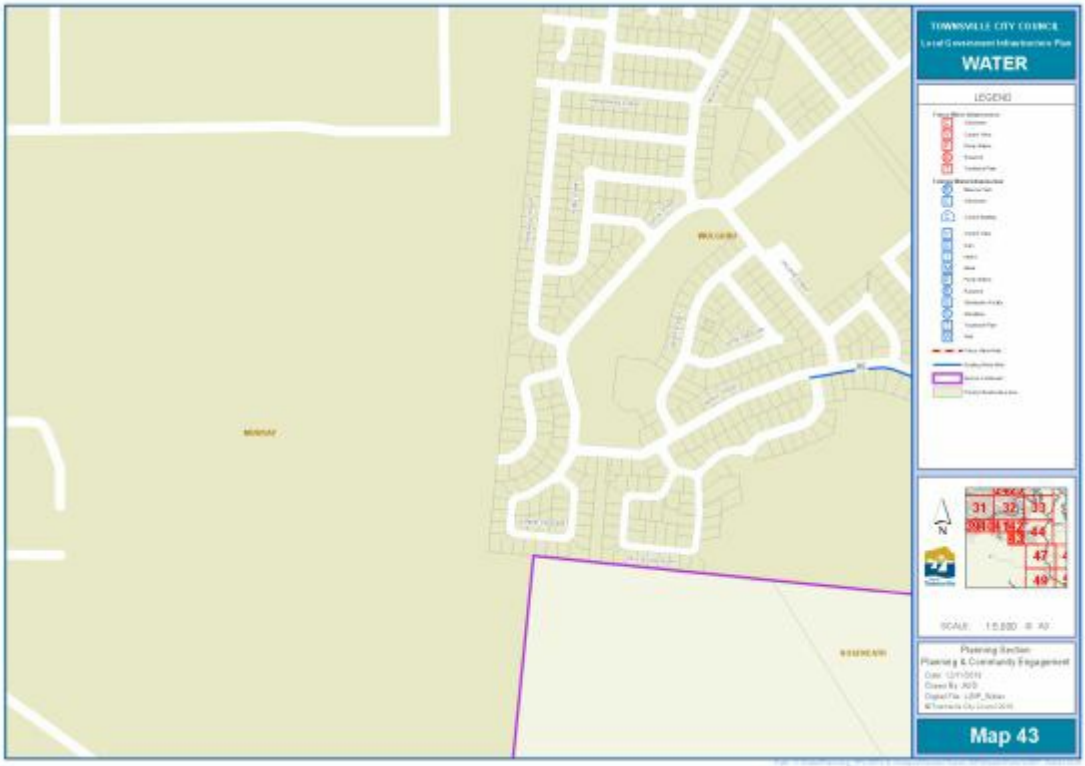

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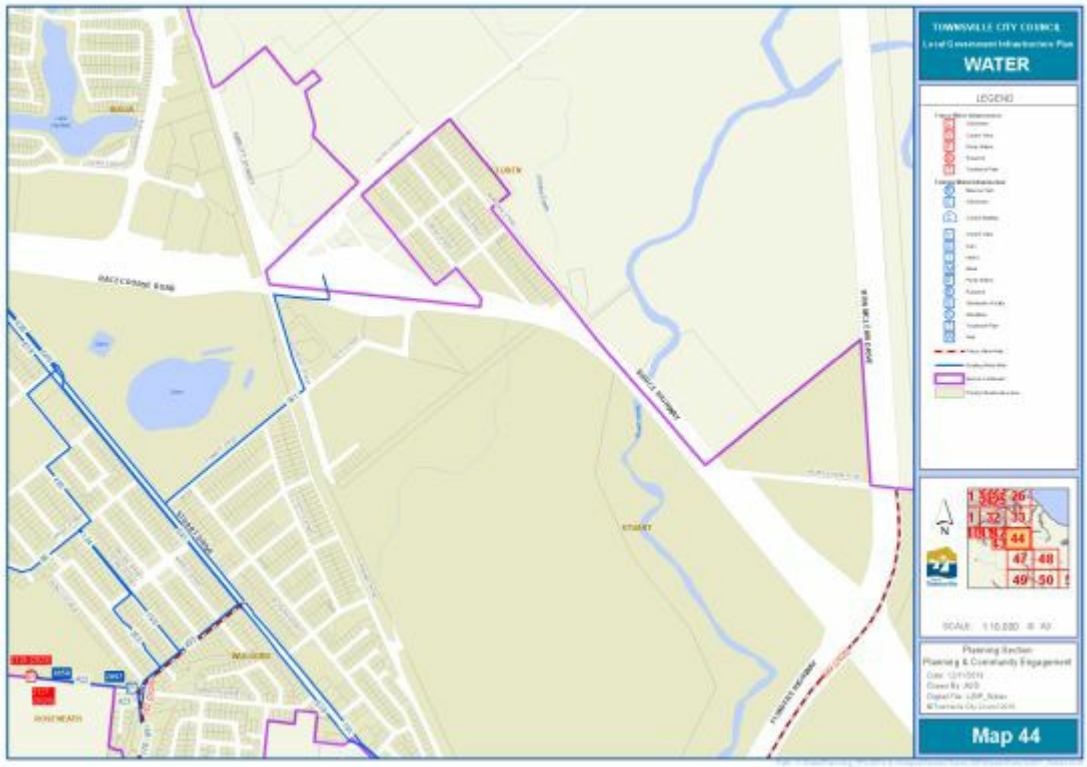

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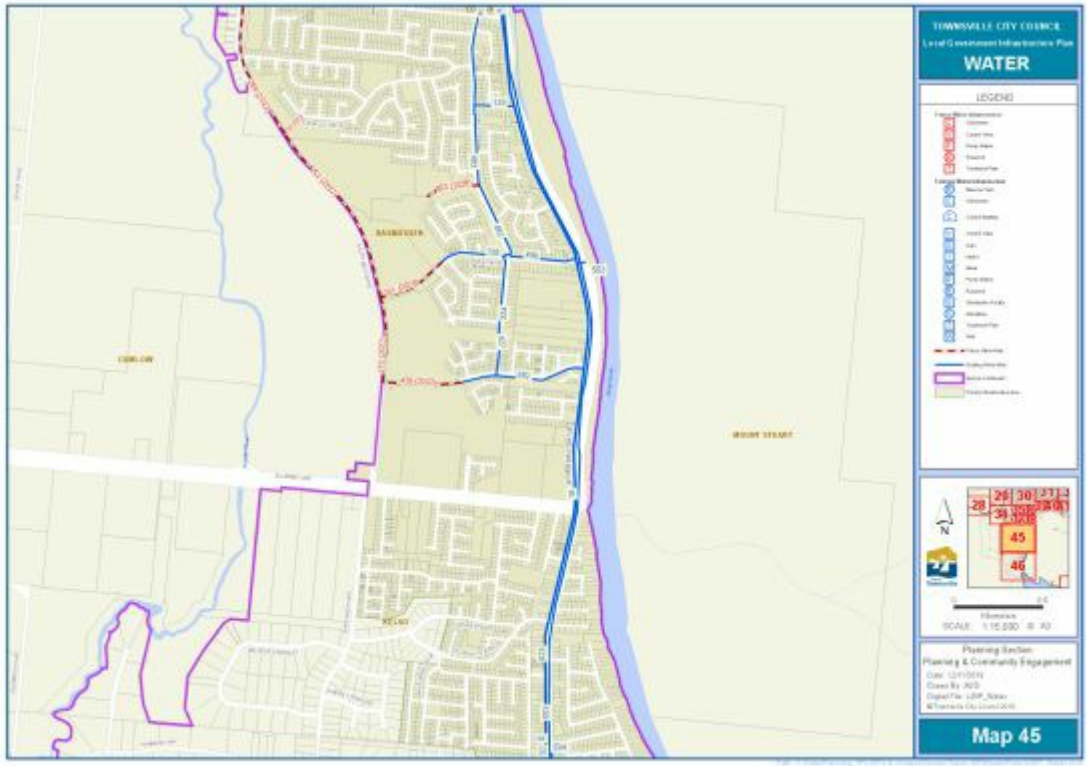

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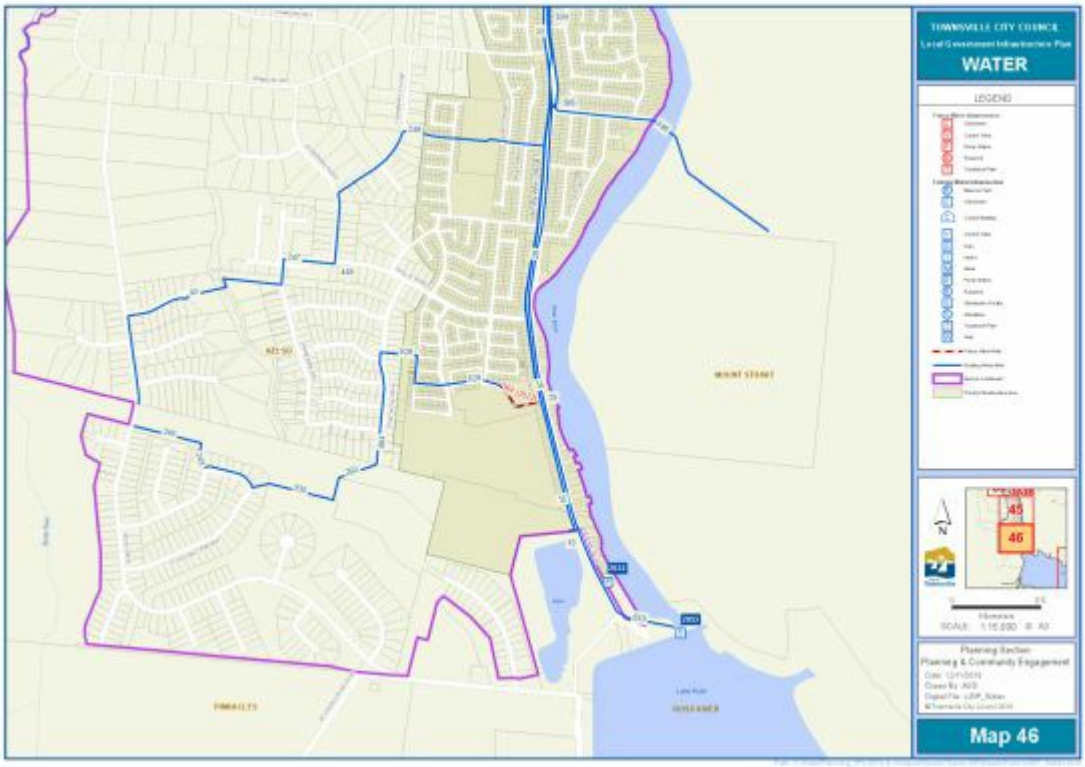

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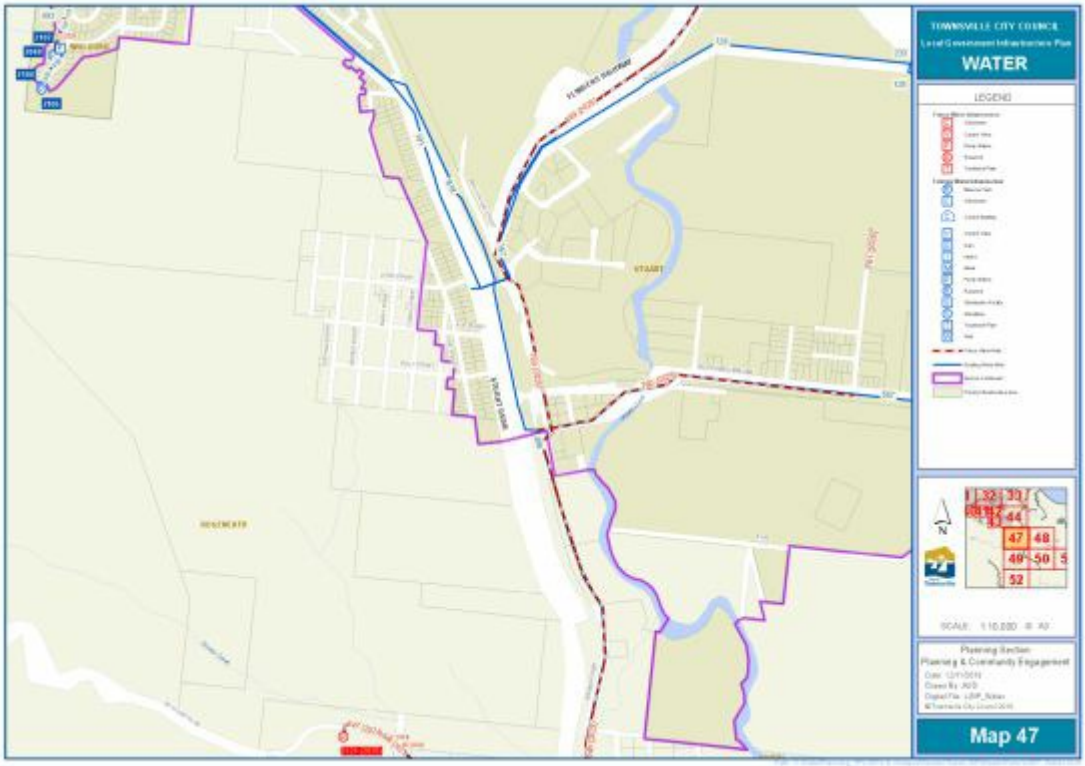

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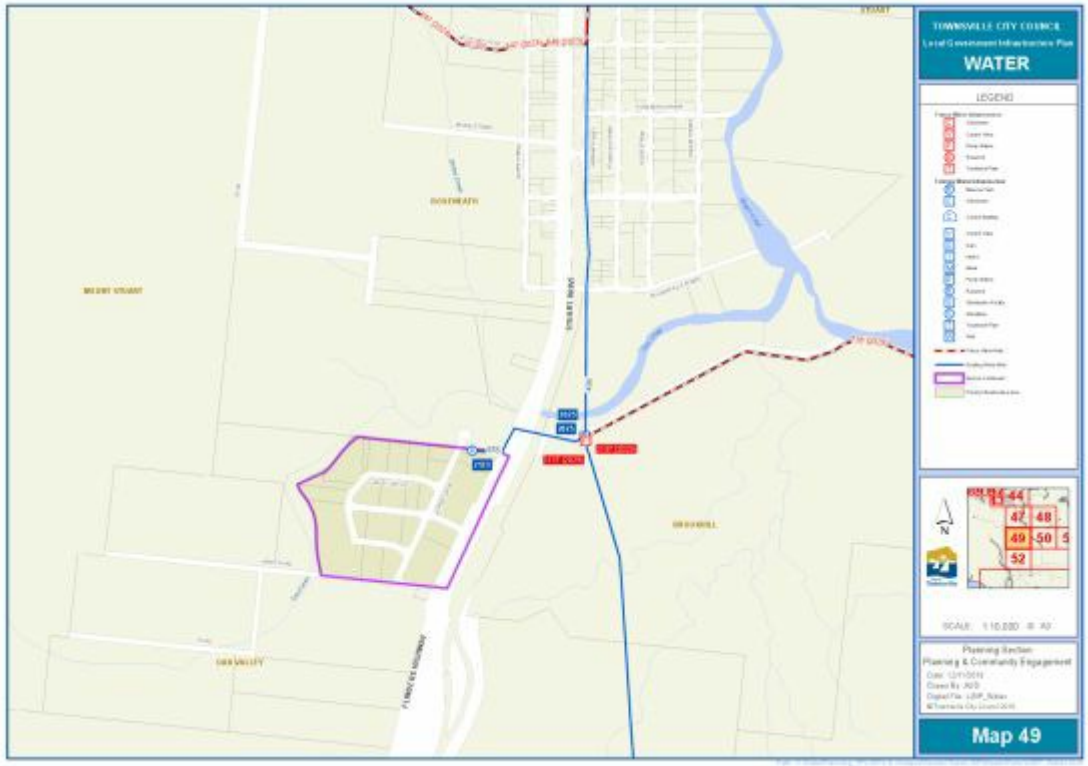

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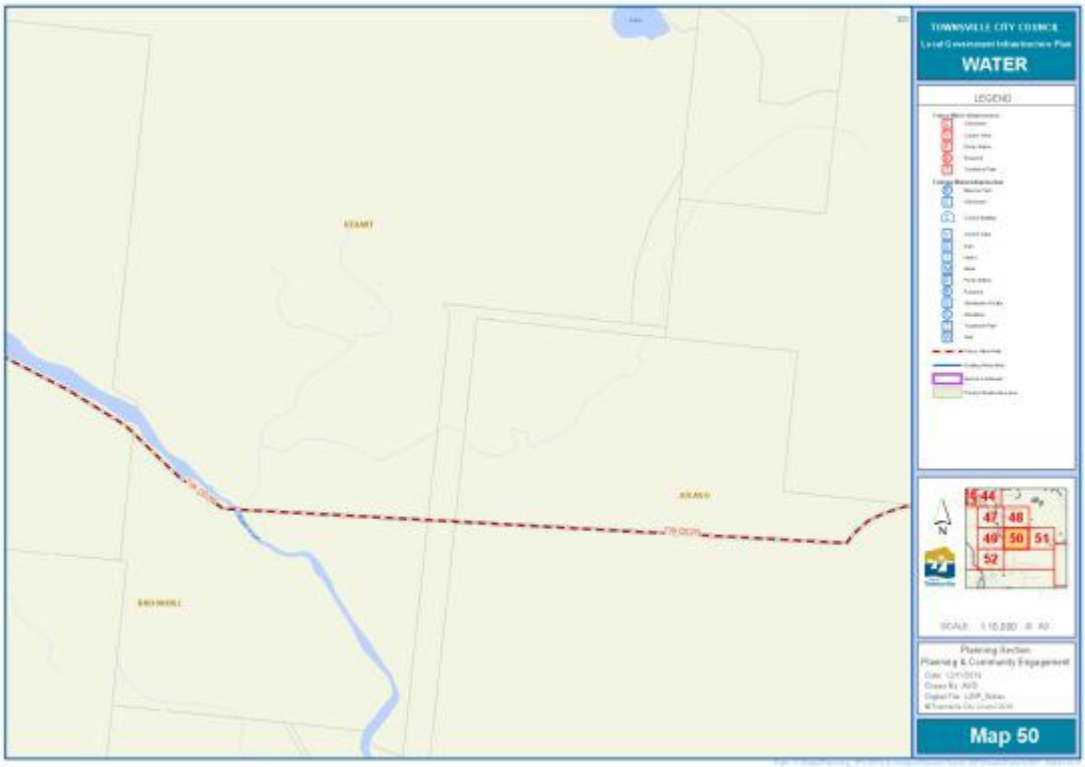

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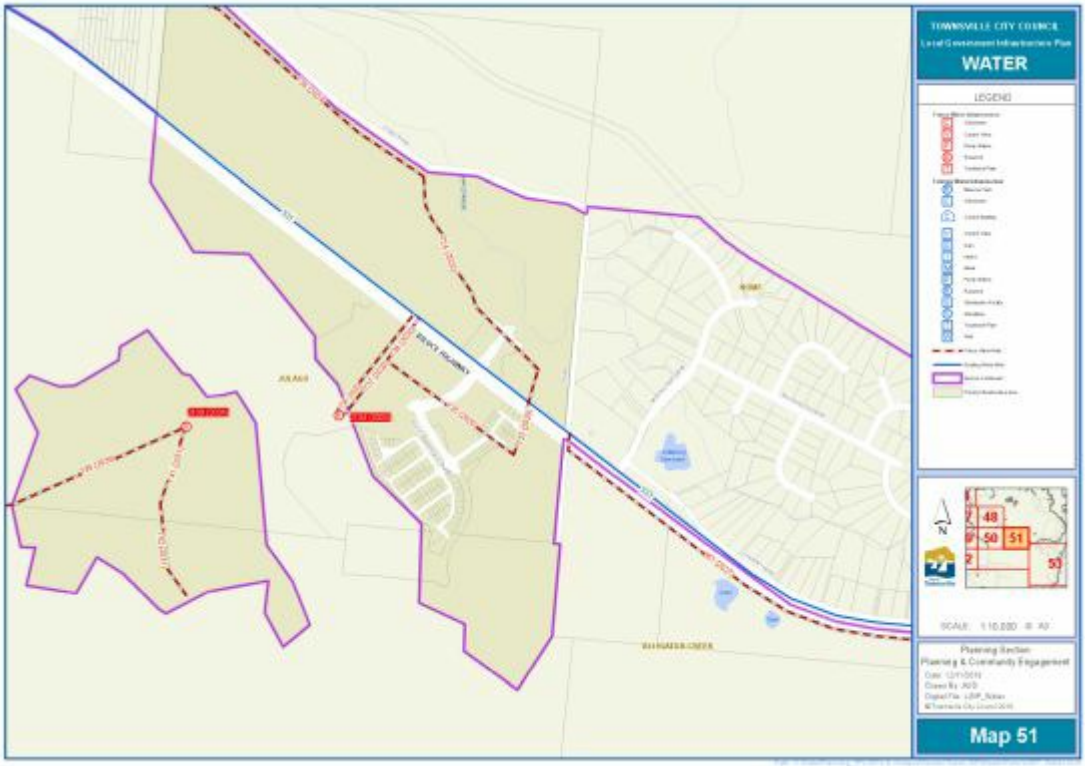

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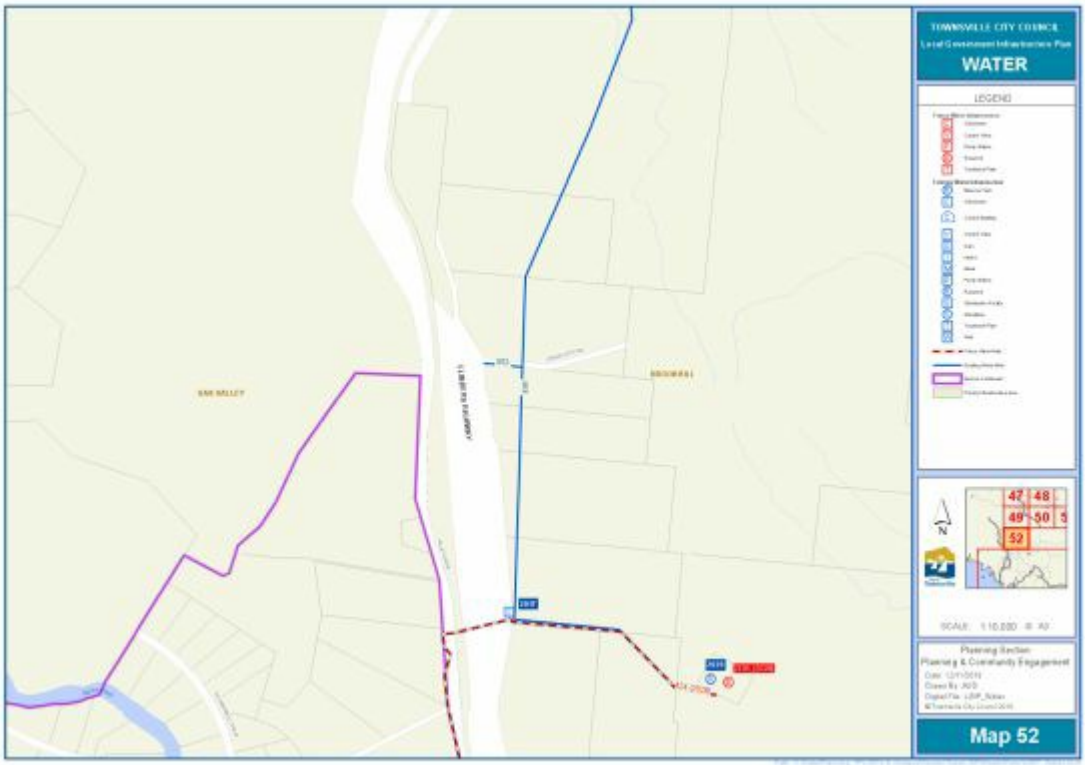

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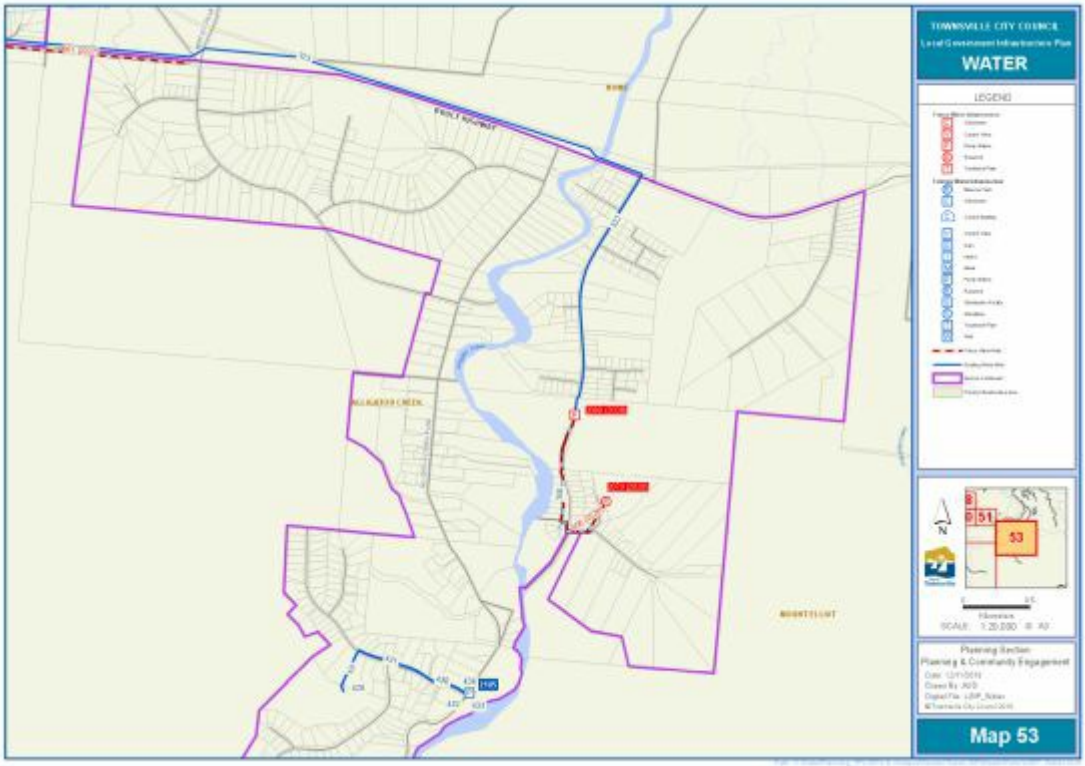

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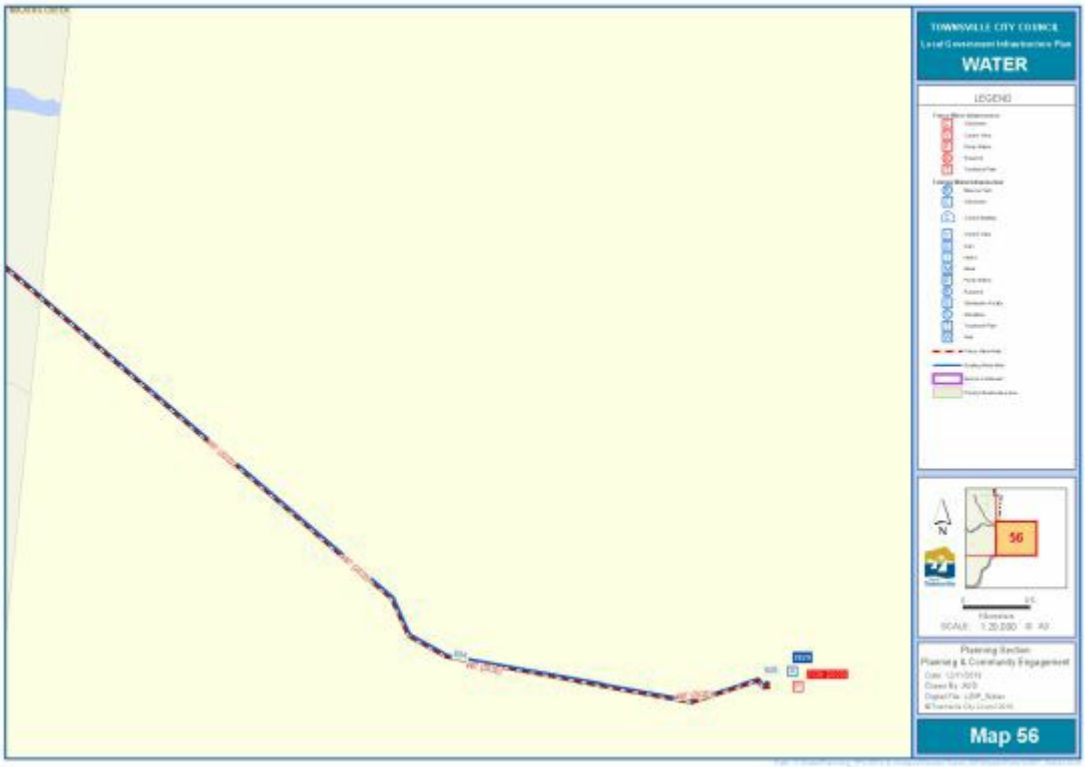

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Table SC3.3.5.1 - Water supply network schedule of future works

Map	Type	ID	Description	Diameter (mm)	Length (m)	Year	Cost ($'19)
3	Reservoir	1012	Reservoir - Rollingstone No. 2 - upgrade	-	-	2030	4,298,190
3	Water Main	268		200	1,962	2031	829,528
3	Water Main	268		200	453	2031	136,805
3	Water Main	276		300	1,249	2030	624,752
3	Water Main	276		300	209	2030	104,542
3	Water Main	276		300	181	2030	107,601
3	Water Main	276		300	197	2030	117,112
3	Water Main	276		300	41	2030	20,508
3	Water Main	276		300	204	2030	127,551
3	Water Main	276		300	73	2030	51,834
5	Water Main	282		200	267	2031	80,633
5	Water Main	282		200	2,802	2031	1,184,677
5	Water Main	283		375	110	2031	110,671
5	Water Main	283		375	80	2031	80,488
5	Water Main	283		375	4,142	2031	3,545,106
5	Water Main	283		375	90	2031	77,030
5	Water Main	283		375	10	2031	11,375
5	Water Main	283		375	86	2031	89,064
5	Water Main	283		375	8	2031	6,847
7	Water Main	414		300	162	2028	94,685
7	Water Main	417		600	133	2028	218,755
7	Water Main	417		600	1,401	2028	2,626,936
8	Water Main	255		500	366	2030	587,954
8	Water Main	255		500	83	2030	114,943
8	Water Main	256		250	912	2030	469,600
8	Water Main	257		375	992	2030	849,045
8	Water Main	292		300	53	2029	26,511
8	Water Main	292		300	361	2029	225,716
8	Water Main	293		300	875	2026	511,415
8	Water Main	299		300	95	2026	55,525
8	Water Main	303		600	1,122	2023	1,716,686
8	Water Main	362		450	69	2027	73,084
8	Water Main	362		450	601	2027	636,576
8	Water Main	362		450	755	2027	799,692
8	Water Main	362		450	181	2027	222,388
8	Water Main	363		375	952	2019	857,321
8	Water Main	402		300	192	2030	120,048
8	Water Main	403		500	516	2030	828,919
8	Water Main	407		500	1,158	2030	1,603,663
8	Water Main	409		375	331	2026	264,824
8	Water Main	410		375	480	2026	384,035
8	Water Main	414		300	739	2028	345,541
9	Pump Station	1011	Pump Station	-	-	2025	74,373
9	Reservoir	1010	Reservoir	-	-	2025	1,011,278
9	Water Main	667		300	174	2025	117,033
9	Water Main	667		300	293	2025	197,073
9	Water Main	667		300	10	2025	7,779
9	Water Main	667		300	42	2025	28,249
9	Water Main	667		300	51	2025	29,808

Map	Type	ID	Description	Diameter (mm)	Length (m)	Year	Cost ($'19)
9	Water Main	667		300	13	2025	8,744
9	Water Main	668		300	21	2025	16,335
9	Water Main	668		300	18	2025	14,001
9	Water Main	668		300	23	2025	17,891
9	Water Main	668		300	4	2025	3,111
9	Water Main	668		300	28	2025	18,833
9	Water Main	668		300	3	2025	2,018
9	Water Main	668		300	96	2025	74,674
9	Water Main	668		300	26	2025	17,488
9	Water Main	668		300	-	2025	-
9	Water Main	668		300	20	2025	13,452
9	Water Main	668		300	971	2025	567,525
9	Water Main	668		300	20	2025	11,689
9	Water Main	668		300	90	2025	60,534
9	Water Main	669		250	11	2025	6,172
9	Water Main	669		250	69	2025	45,646
9	Water Main	669		250	22	2025	14,554
9	Water Main	669		250	9	2025	5,954
9	Water Main	669		250	53	2025	35,062
9	Water Main	669		250	11	2025	6,172
9	Water Main	669		250	15	2025	8,416
9	Water Main	669		250	2	2025	1,122
9	Water Main	669		250	74	2025	41,521
9	Water Main	669		250	10	2025	5,611
9	Water Main	669		250	138	2025	66,424
9	Water Main	669		250	7	2025	3,369
9	Water Main	669		250	5	2025	2,805
9	Water Main	670		250	478	2025	230,076
9	Water Main	730		300	292	2031	182,574
10	Control Valve	1725	Control Valve	-	-	2023	276,610
10	Control Valve	1726	Control Valve	-	-	2023	276,610
10	Reservoir	2093	Reservoir	-	-	2024	10,824,024
10	Water Main	259		250	346	2028	166,541
10	Water Main	272		250	53	2028	25,511
10	Water Main	272		250	488	2028	234,890
10	Water Main	272		250	16	2028	7,701
10	Water Main	392		600	20	2023	39,121
10	Water Main	392		600	44	2023	94,017
10	Water Main	392		600	30	2023	53,549
10	Water Main	392		600	570	2023	994,209
10	Water Main	392		600	12	2023	26,043
10	Water Main	392		600	36	2023	78,128
10	Water Main	392		600	20	2023	30,600
10	Water Main	392		600	80	2023	156,482
10	Water Main	392		600	131	2023	233,830
10	Water Main	392		600	7	2023	12,495
10	Water Main	392		600	30	2023	53,549
10	Water Main	392		600	13	2023	25,428
10	Water Main	392		600	40	2023	78,241
10	Water Main	392		600	36	2023	55,081
10	Water Main	392		600	70	2023	136,922
10	Water Main	393		900	11	2023	40,195

Map	Type	ID	Description	Diameter (mm)	Length (m)	Year	Cost ($'19)
10	Water Main	393		900	10	2023	33,577
10	Water Main	393		900	30	2023	100,732
10	Water Main	393		900	30	2023	100,732
10	Water Main	393		900	101	2023	356,092
10	Water Main	393		900	4	2023	11,962
10	Water Main	393		900	5	2023	14,952
10	Water Main	393		900	689	2023	2,060,378
10	Water Main	393		900	7	2023	23,926
10	Water Main	393		900	22	2023	75,197
10	Water Main	393		900	8	2023	29,233
10	Water Main	393		900	45	2023	164,433
10	Water Main	393		900	50	2023	156,085
10	Water Main	393		900	10	2023	31,217
10	Water Main	393		900	34	2023	106,138
10	Water Main	393		900	24	2023	80,585
10	Water Main	393		900	101	2023	315,292
10	Water Main	393		900	17	2023	53,069
10	Water Main	393		900	66	2023	177,807
10	Water Main	393		900	11	2023	37,599
10	Water Main	393		900	80	2023	268,618
10	Water Main	394		300	110	2023	59,807
10	Water Main	395		250	654	2028	314,791
10	Water Main	396		750	834	2023	2,043,259
10	Water Main	398		200	364	2028	143,861
10	Water Main	404		500	459	2026	689,264
10	Water Main	405		825	1,087	2024	3,148,669
10	Water Main	406		600	2,032	2028	3,810,088
10	Water Main	639		300	315	2028	184,110
10	Water Main	640		600	670	2023	1,168,632
12	Water Main	378		200	77	2031	46,144
12	Water Main	378		200	119	2031	83,524
12	Water Main	378		200	10	2031	5,993
12	Water Main	378		200	40	2031	23,971
12	Water Main	378		200	50	2031	29,964
12	Water Main	378		200	2	2031	1,045
12	Water Main	378		200	1,180	2031	616,498
12	Water Main	378		200	10	2031	5,993
12	Water Main	378		200	20	2031	14,038
13	Water Main	377		200	824	2031	430,504
18	Water Main	316		450	350	2019	235,965
18	Water Main	316		450	13	2019	19,854
18	Water Main	745		450	842	2019	681,196
19	Water Main	281		250	256	2029	146,981
19	Water Main	281		250	110	2029	79,065
19	Water Main	387		300	332	2021	499,752
19	Water Main	387		300	85	2021	53,183
19	Water Main	388		300	604	2026	328,393
20	Control Valve	2142	0	-	-	2025	123
20	Control Valve	2143	0	-	-	2025	123
20	Water Main	389		375	274	2026	144,206
20	Water Main	389		375	20	2026	15,423
20	Water Main	389		375	17	2026	18,845

Map	Type	ID	Description	Diameter (mm)	Length (m)	Year	Cost ($'19)
20	Water Main	389		375	50	2026	55,425
20	Water Main	389		375	210	2026	232,786
21	Control Valve	2144	0	-	-	2025	123
22	Reservoir	2076	Reservoir - West End (duplicate)	-	-	2020	6,229,261
22	Water Main	663		500	82	2020	110,902
22	Water Main	663		500	38	2020	65,621
22	Water Main	663		500	52	2020	97,546
22	Water Main	664		750	7	2020	13,859
22	Water Main	664		750	7	2020	5,537
22	Water Main	664		750	9	2020	18,728
22	Water Main	664		750	11	2020	27,612
22	Water Main	664		750	14	2020	35,142
22	Water Main	664		750	21	2020	57,837
22	Water Main	664		750	25	2020	68,854
22	Water Main	664		750	28	2020	70,284
22	Water Main	664		750	43	2020	118,429
22	Water Main	664		750	57	2020	118,611
22	Water Main	664		750	98	2020	245,994
23	Water Main	318		500	536	2020	1,262,942
23	Water Main	383		600	65	2020	32,230
23	Water Main	383		600	176	2020	114,063
23	Water Main	383		600	32	2020	55,815
23	Water Main	735		300	1,170	2019	895,665
26	Water Main	641		300	543	2029	817,366
26	Water Main	641		300	22	2029	18,372
26	Water Main	642		300	694	2029	1,765,062
27	Pump Station	2163	0	-	-	2024	1,346,483
27	Water Main	643	Mt Margaret system transfer main	300	2,782	2024	2,070,515
27	Water Main	644	Mt Margaret system transfer main	450	2,214	2024	1,200,857
27	Water Main	645	Mt Margaret system transfer main	375	1,194	2024	888,640
29	Water Main	241		300	970	2020	318,411
29	Water Main	418	Shaw Rd distribution main	375	1,499	2020	1,199,310
29	Water Main	733		200	573	2020	267,923
29	Water Main	749		300	487	2028	453,065
29	Water Main	750		375	1,618	2028	851,552
31	Control Valve	2145	0	-	-	2025	123
37	Pump Station	2146	0	-	-	2021	114
37	Treatment Plant	2147	Douglas Water Treatment Plant (upgrade)	-	-	2021	13,830,508
37	Water Main	311		500	1,426	2022	5,191,409
37	Water Main	751		600	138	2022	31,377
37	Water Main	758		750	100	2021	503,220
38	Pump Station	2148	0	-	-	2030	265,085

Map	Type	ID	Description	Diameter (mm)	Length (m)	Year	Cost ($'19)
38	Reservoir	2149	0	-	-	2030	1,325,424
38	Water Main	752		300	79	2030	196,965
39	Pump Station	2129	Booster Pump	-	-	2026	2,973,559
44	Pump Station	2127	Pump Station	-	-	2029	260,626
44	Reservoir	2126	Reservoir	-	-	2029	445,342
44	Water Main	649		300	61	2023	92,605
44	Water Main	649		300	948	2023	1,167,577
44	Water Main	753		375	766	2030	1,132,682
44	Water Main	762		375	910	2029	2,451,581
45	Water Main	251		300	406	2024	652,479
45	Water Main	252		450	1,090	2022	549,961
45	Water Main	269		500	1,483	2022	748,249
45	Water Main	270		375	446	2022	401,644
45	Water Main	426		300	475	2022	763,368
45	Water Main	653		300	304	2028	165,284
46	Water Main	304		300	275	2022	441,950
47	Reservoir	2121	Reservoir	-	-	2024	5,947,119
47	Water Main	647		450	15	2024	35,123
47	Water Main	647		450	5	2024	11,708
47	Water Main	647		450	8	2024	27,520
47	Water Main	647		450	50	2024	164,966
47	Water Main	647		450	16	2024	45,892
47	Water Main	647		450	39	2024	149,549
47	Water Main	647		450	9	2024	31,898
47	Water Main	647		450	28	2024	87,503
47	Water Main	648		450	16	2024	54,457
47	Water Main	648		450	3	2024	3,739
47	Water Main	648		450	31	2024	38,641
47	Water Main	648		450	604	2024	639,753
47	Water Main	648		450	28	2024	29,657
47	Water Main	648	Bal. of WM along Flinders Hwy	450	1,524	2024	1,614,212
47	Water Main	648		450	29	2024	39,648
47	Water Main	648		450	8	2024	9,972
47	Water Main	648		450	78	2024	97,225
47	Water Main	648		450	26	2024	40,416
47	Water Main	649		300	446	2023	472,401
47	Water Main	649		300	57	2023	98,045
47	Water Main	649		300	29	2023	38,396
47	Water Main	649		300	42	2023	59,309
47	Water Main	649		300	440	2023	601,554
47	Water Main	649	Bal. of WM along Flinders Hwy	300	471	2023	786,354
47	Water Main	759		375	709	2024	750,969
47	Water Main	760		375	1,689	2025	2,584,209
47	Water Main	761		300	284	2025	1,429,144
48	Pump Station	2162	New Julago pump station	-	-	2020	1,252,542
49	Pump Station	2137	Booster Pump Station	-	-	2029	131
50	Water Main	739	Rocky Springs	375	5,840	2029	21,715,896
51	Reservoir	2134	Rocky Springs	-	-	2020	3,398,011

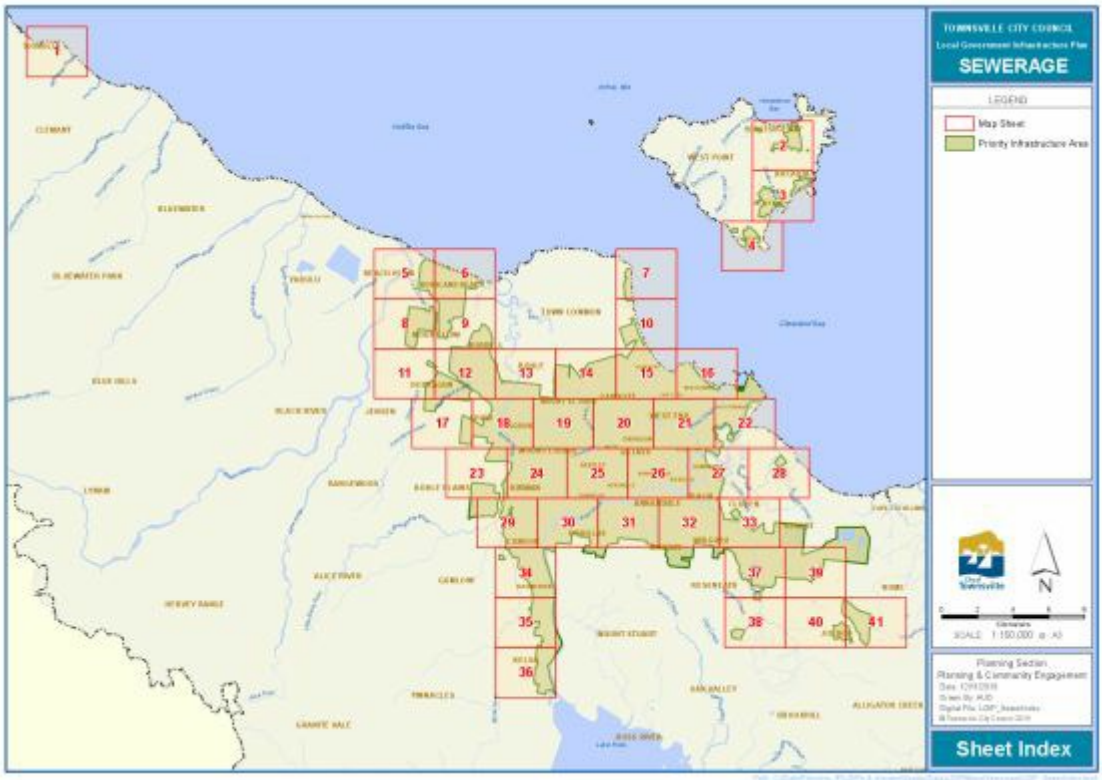
Map	Type	ID	Description	Diameter (mm)	Length (m)	Year	Cost ($'19)
51	Reservoir	2139	Rocky Springs	-	-	2031	5,275,979
51	Water Main	661		300	2,962	2027	972,302
51	Water Main	723	Rocky Springs	375	316	2020	501,722
51	Water Main	724	Rocky Springs	200	592	2022	1,037,606
51	Water Main	725	Rocky Springs	375	197	2020	312,782
51	Water Main	726	Rocky Springs	150	1,148	2024	2,156,880
51	Water Main	736	Rocky Springs	450	479	2020	660,273
51	Water Main	737	Rocky Springs	500	277	2020	444,978
51	Water Main	738	Rocky Springs	450	201	2020	315,794
51	Water Main	741	Rocky Springs	500	950	2031	1,526,098
51	Water Main	742	Rocky Springs	500	469	2031	334,900
52	Reservoir	2136	Reservoir	-	-	2028	123
53	Pump Station	2080	Ailligator Creek Pump Station	-	-	2025	182,722
53	Reservoir	2079	Alligator Creek Reservoir	-	-	2025	3,440,345
53	Water Main	356		150	1	2025	325
53	Water Main	356		150	213	2025	37,955
53	Water Main	356		150	49	2025	15,902
53	Water Main	356		150	44	2025	14,279
53	Water Main	356		150	132	2025	31,500
53	Water Main	356		150	26	2025	6,204
53	Water Main	356		150	10	2025	1,782
53	Water Main	356		150	22	2025	5,250
53	Water Main	356		150	66	2025	15,750
53	Water Main	356		150	21	2025	5,011
53	Water Main	356		150	30	2025	7,159
53	Water Main	356		150	23	2025	39,411
53	Water Main	356		150	10	2025	4,570
53	Water Main	356		150	727	2025	218,947
54	Treatment Plant	2151	Southern Water Treatment Plant	-	-	2028	1,238,983
54	Water Main	487	Haughton - RRD pipeline	1,800	64	2020	26,877
54	Water Main	754	SWTP to RRD intake	900	3,000	2028	15,096,588
55	Water Main	487	Haughton - RRD pipeline	1,800	32	2020	148,910
55	Water Main	487	Haughton - RRD pipeline	1,800	2,661	2020	7,168,853
55	Water Main	487	Haughton - RRD pipeline	1,800	1,385	2020	4,949,462
55	Water Main	487	Haughton - RRD pipeline	1,800	5,691	2020	17,860,611
55	Water Main	487	Haughton - RRD pipeline	1,800	142	2020	714,572
55	Water Main	487	Haughton - RRD pipeline	1,800	4,709	2020	15,223,508
55	Water Main	487	Haughton - RRD pipeline	1,800	36	2020	104,260
55	Water Main	487	Haughton - RRD pipeline	1,800	423	2020	1,511,641

Map	Type	ID	Description	Diameter (mm)	Length (m)	Year	Cost ($'19)
55	Water Main	487	Haughton - RRD pipeline	1,800	13,945	2020	37,568,454
56	Pump Station	2128	Pump Station	-	-	2020	5,421,559
56	Water Main	487	Haughton - RRD pipeline	1,800	6,575	2020	17,713,344

SC3.3.6 - Plans for trunk sewerage infrastructure

Editor's note— This document is intended to function in an electronic environment whereupon hyperlinks to detailed PDF maps allow for closer examination of mapping information. The following images are true copies of such maps, but at a coarser scale.

The maps are also loaded in a GIS environment. TownsvilleMaps is the current in-service GIS platform for this purpose, which can be publicly viewed at council, or privately accessed via subscription.



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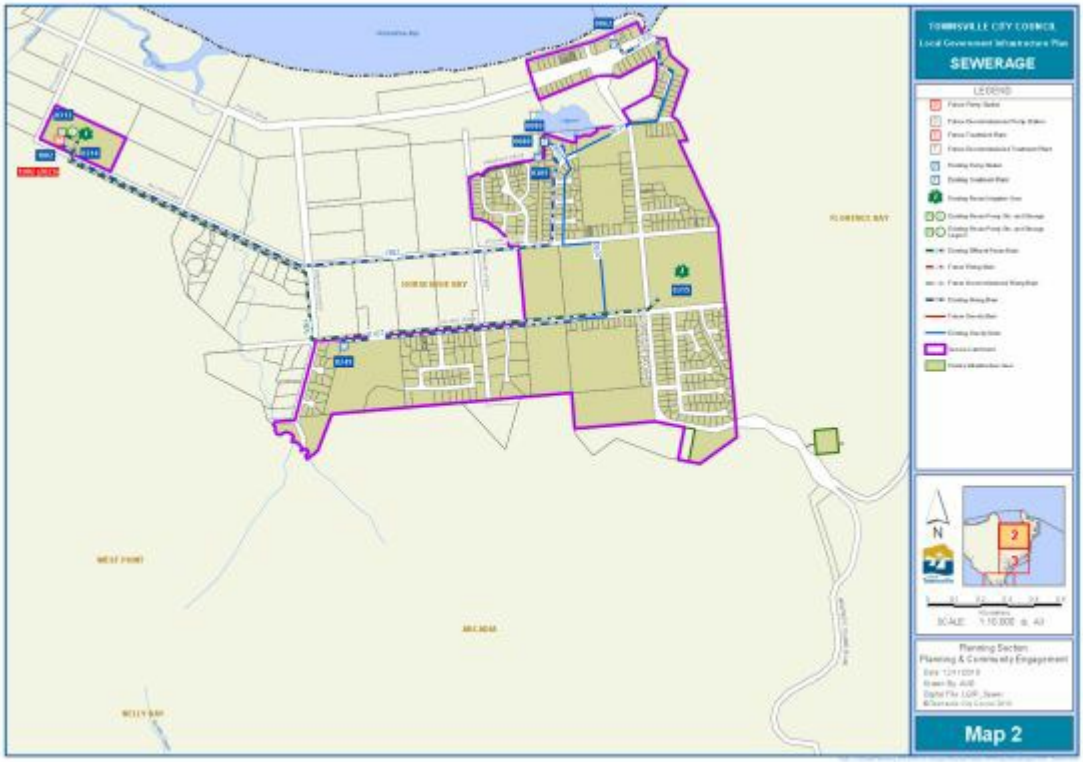

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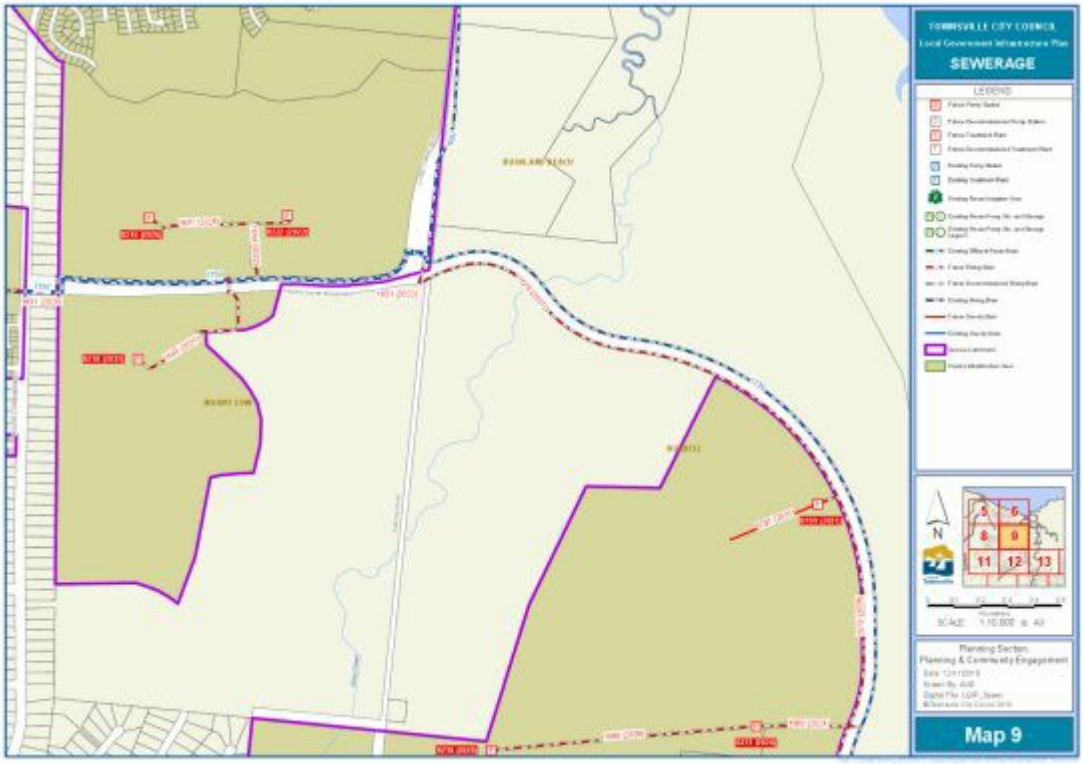

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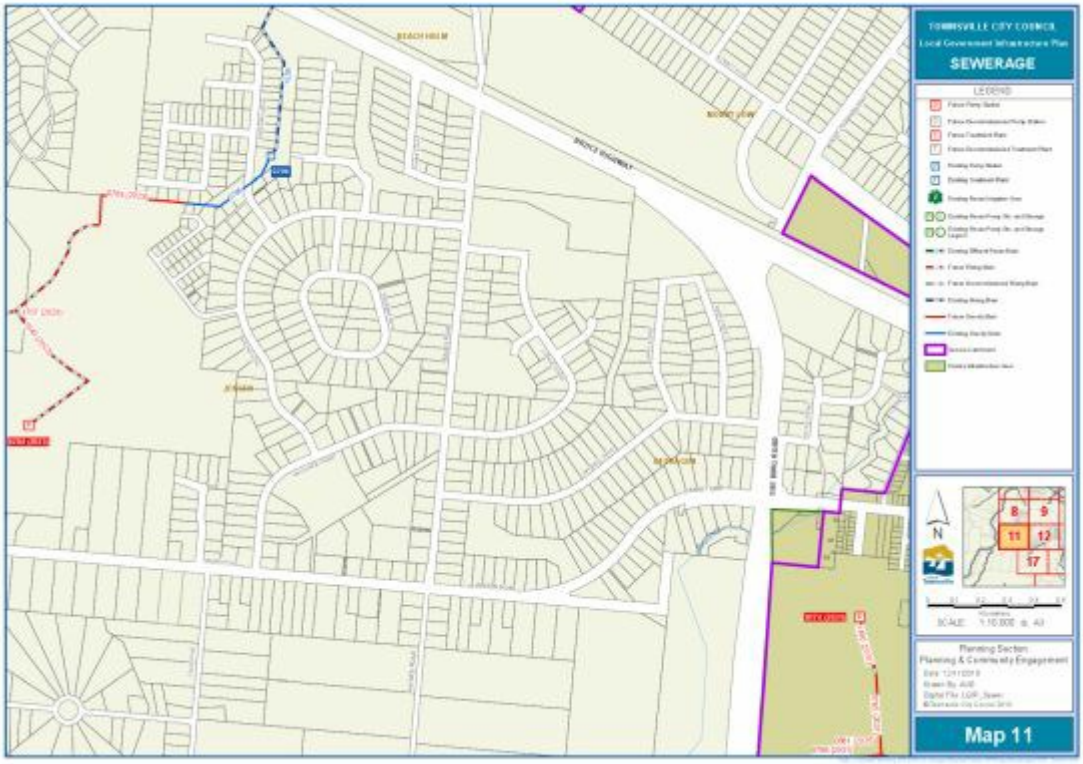

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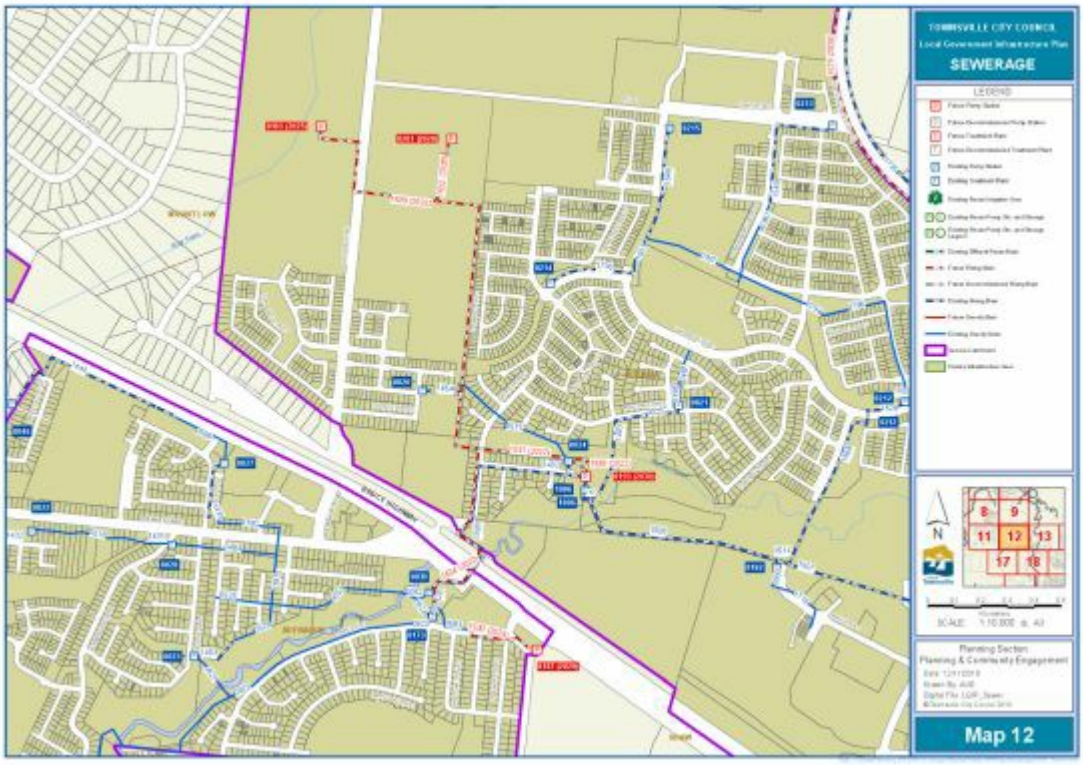

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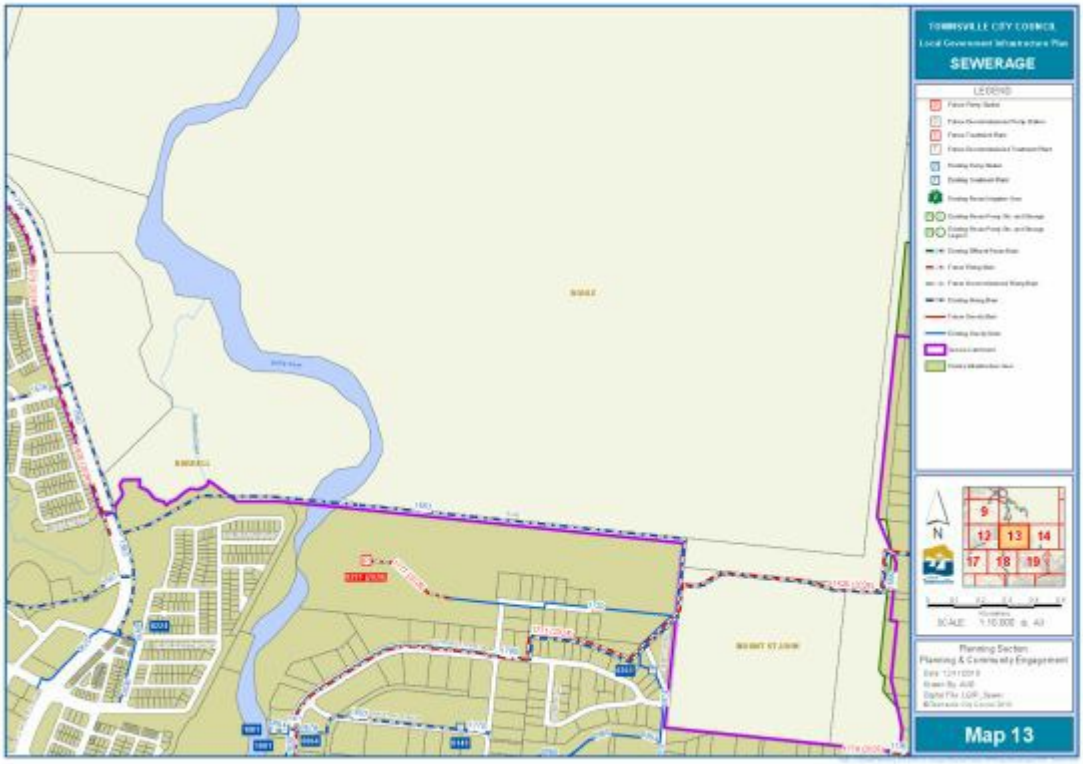

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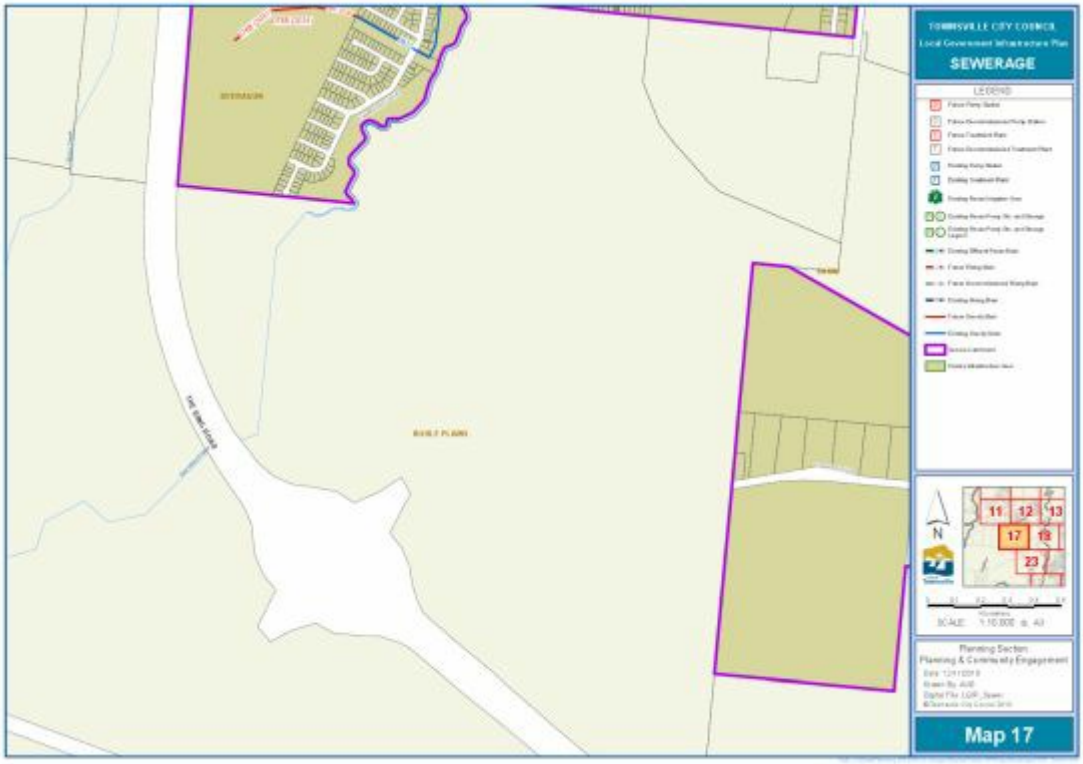

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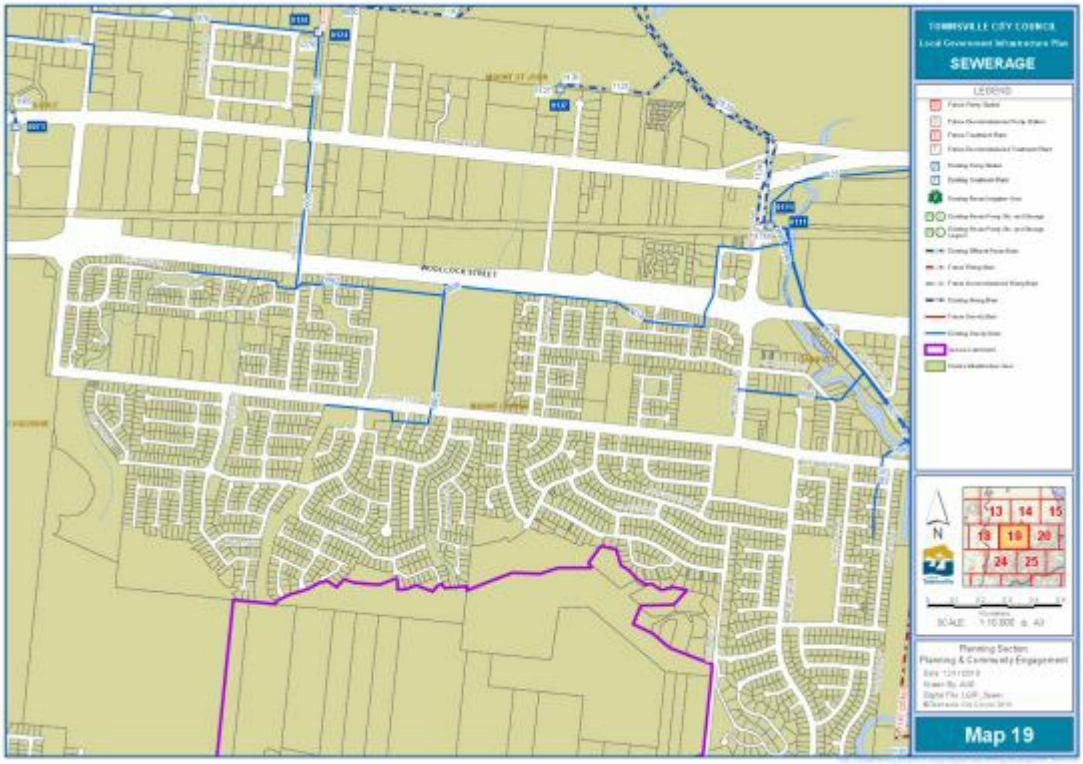

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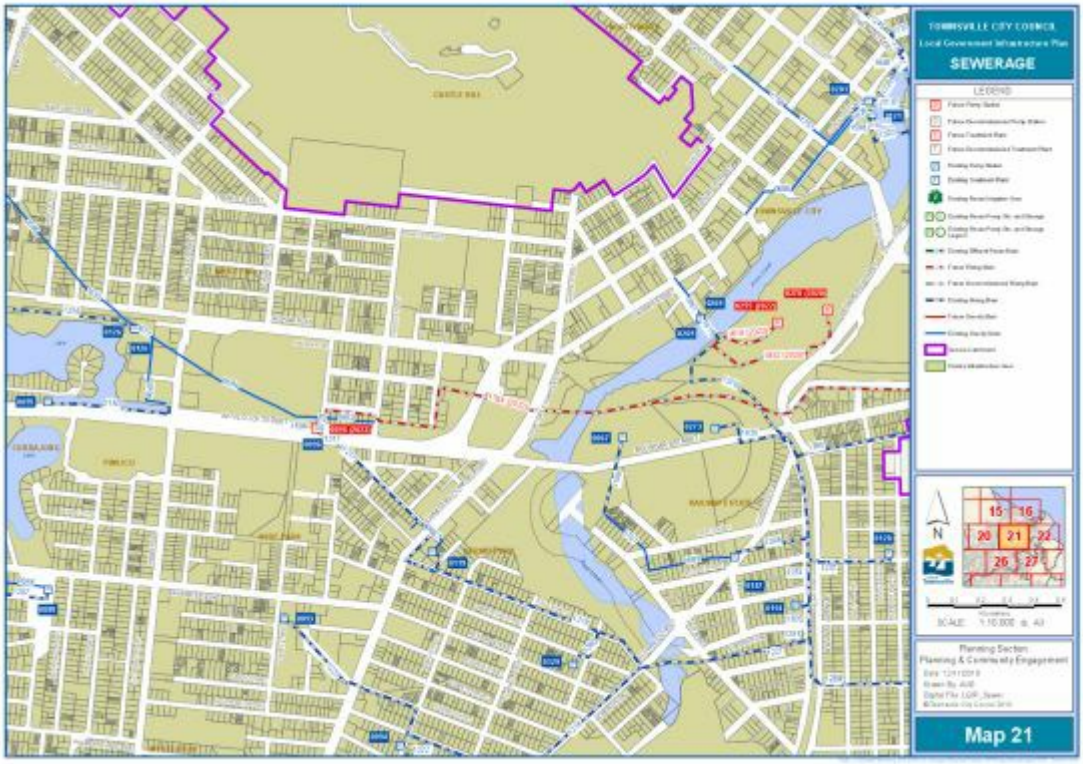

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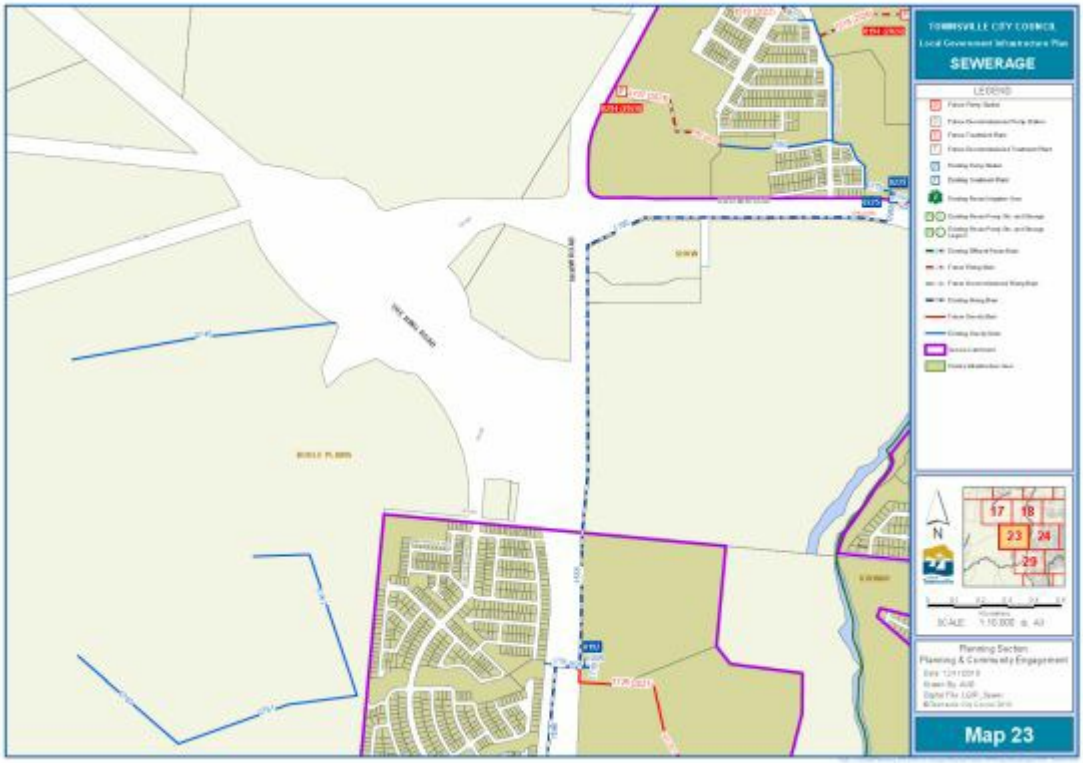

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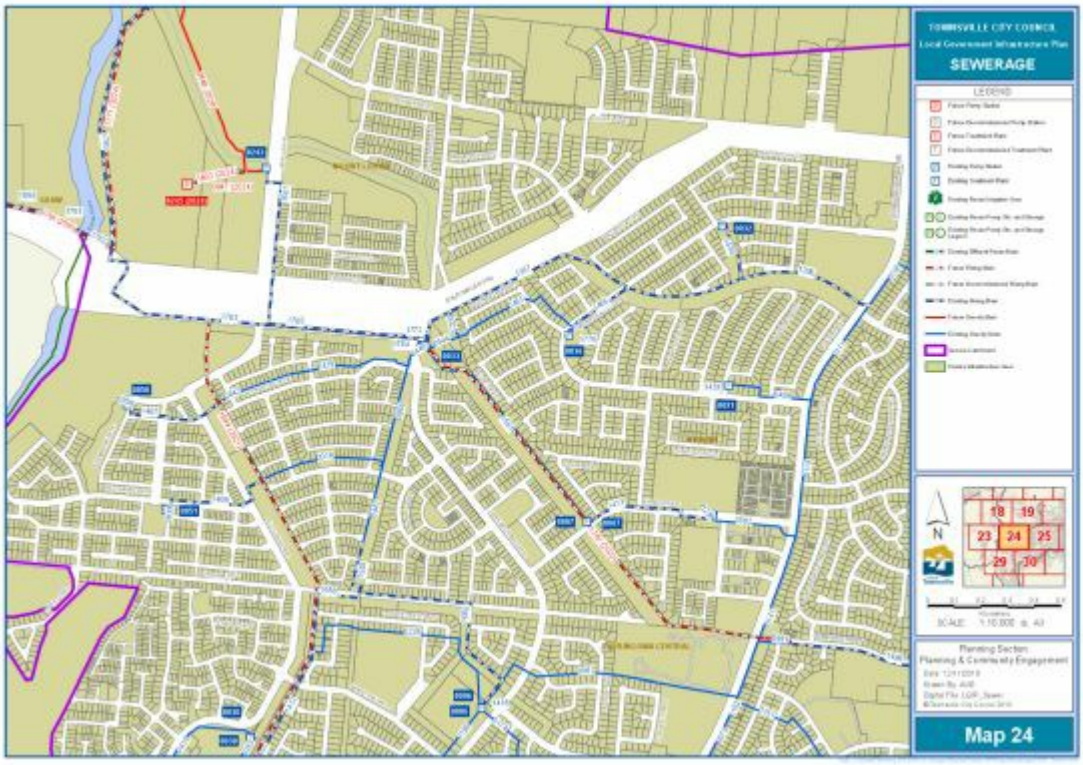

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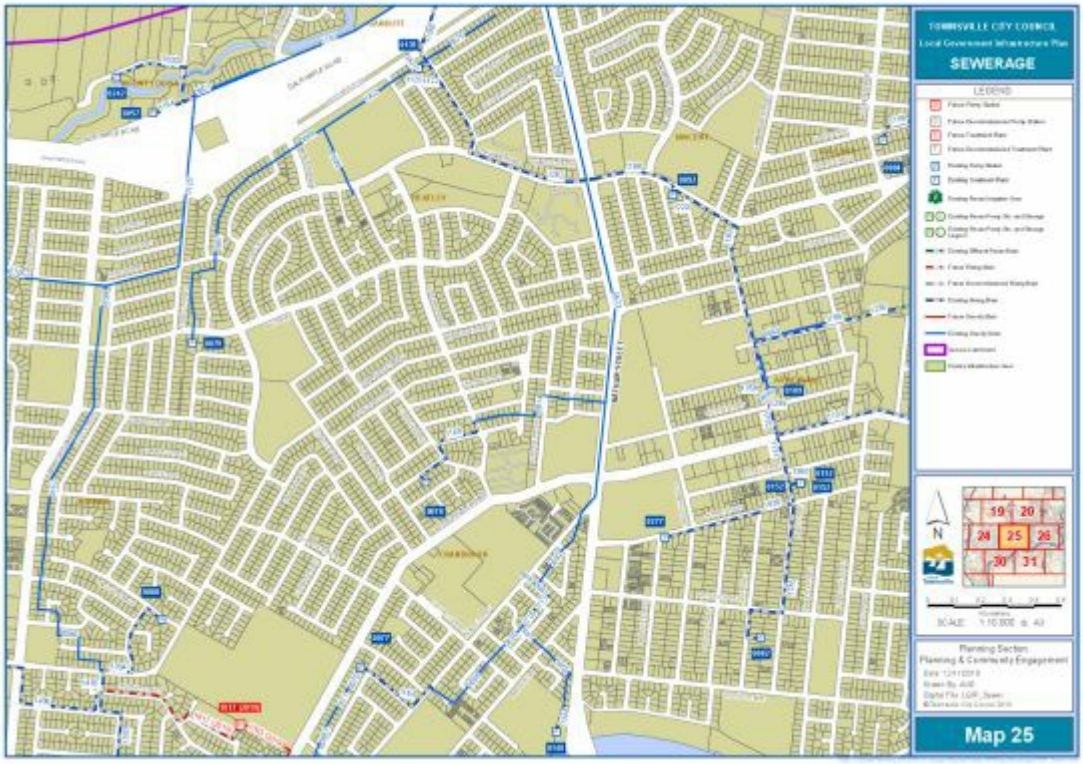

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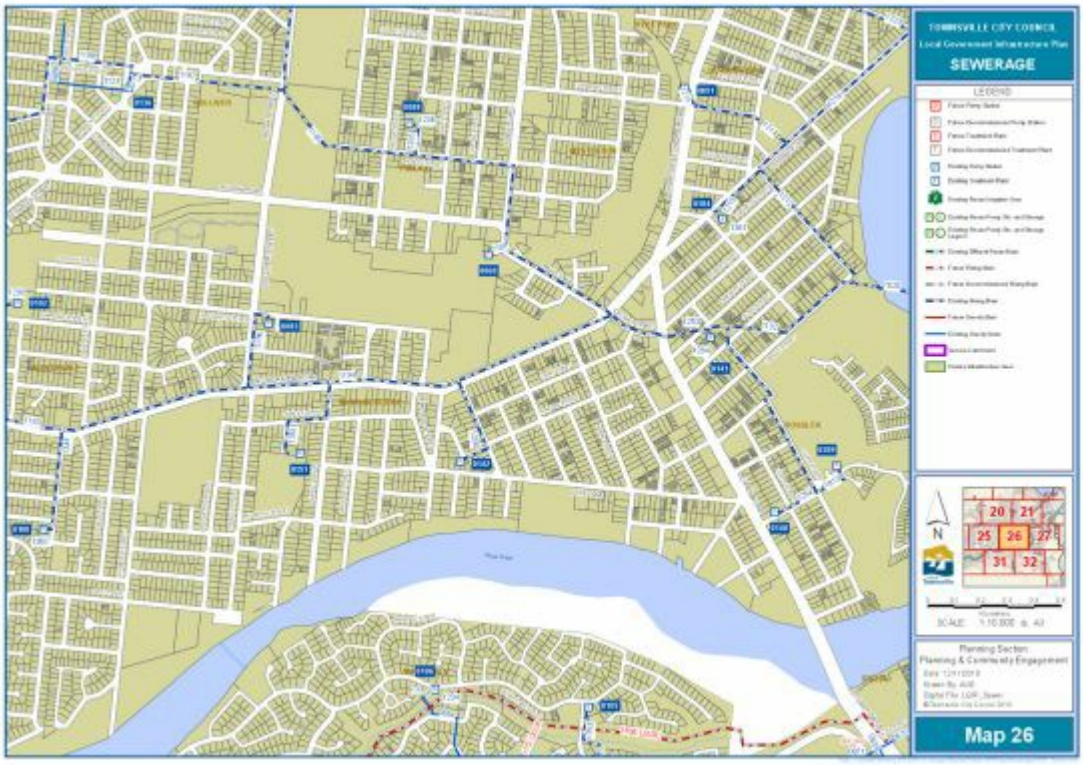

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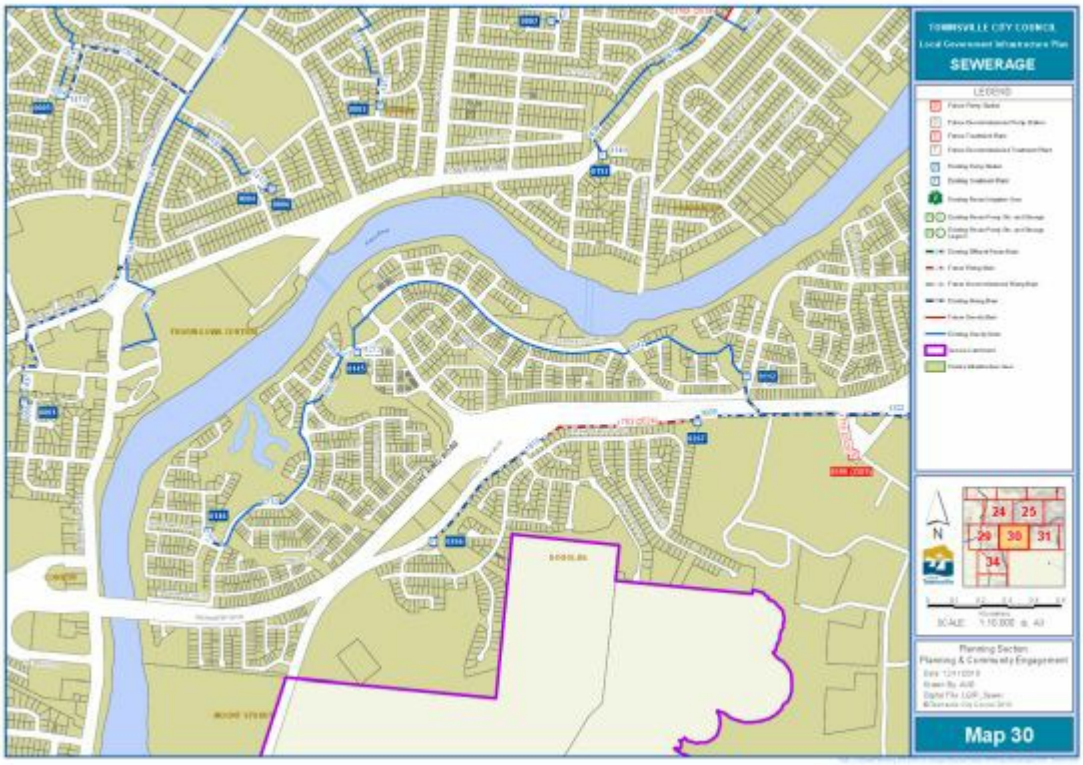

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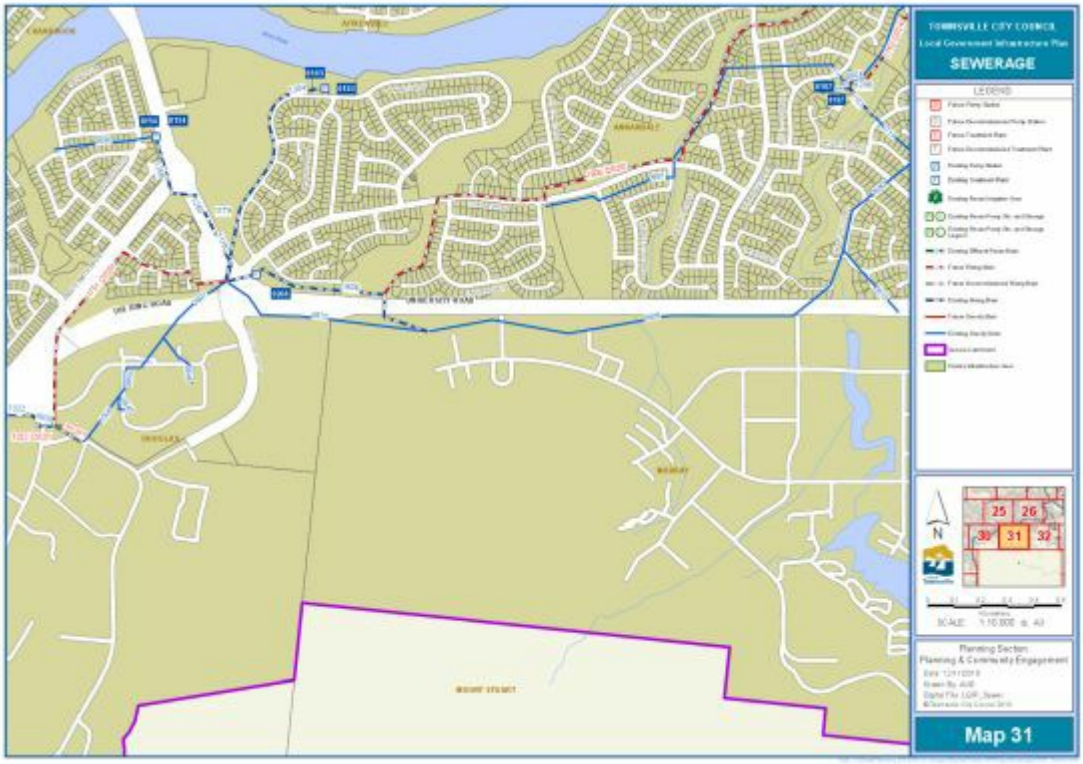

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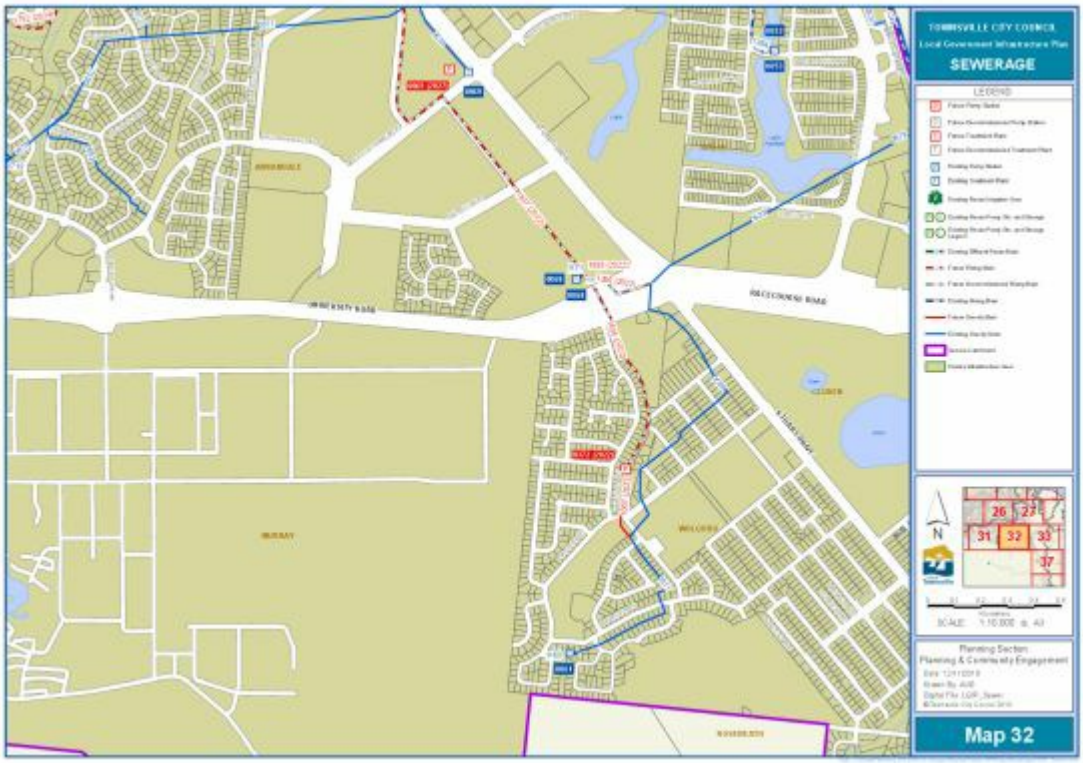

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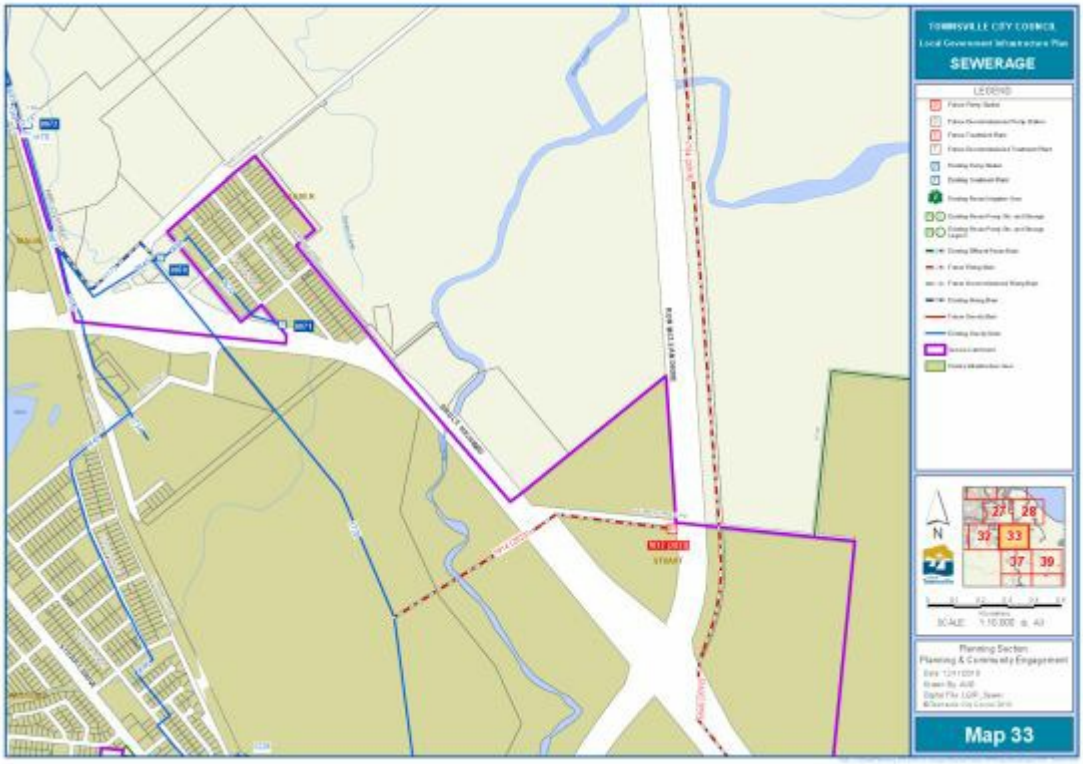

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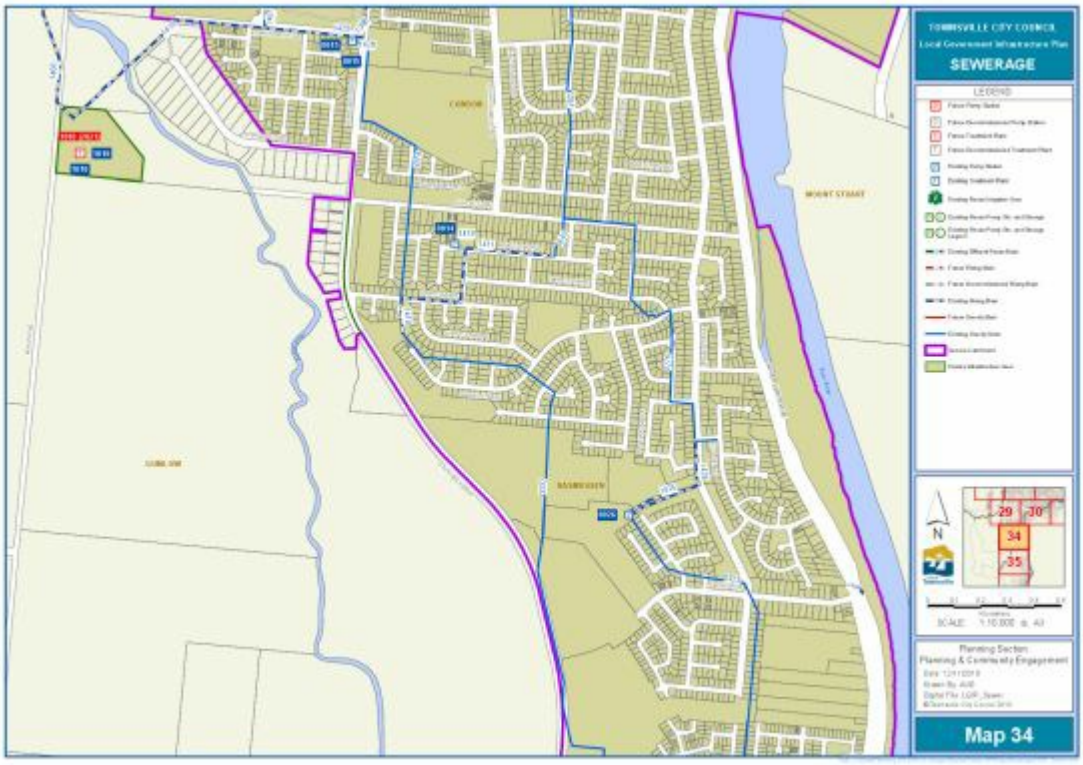

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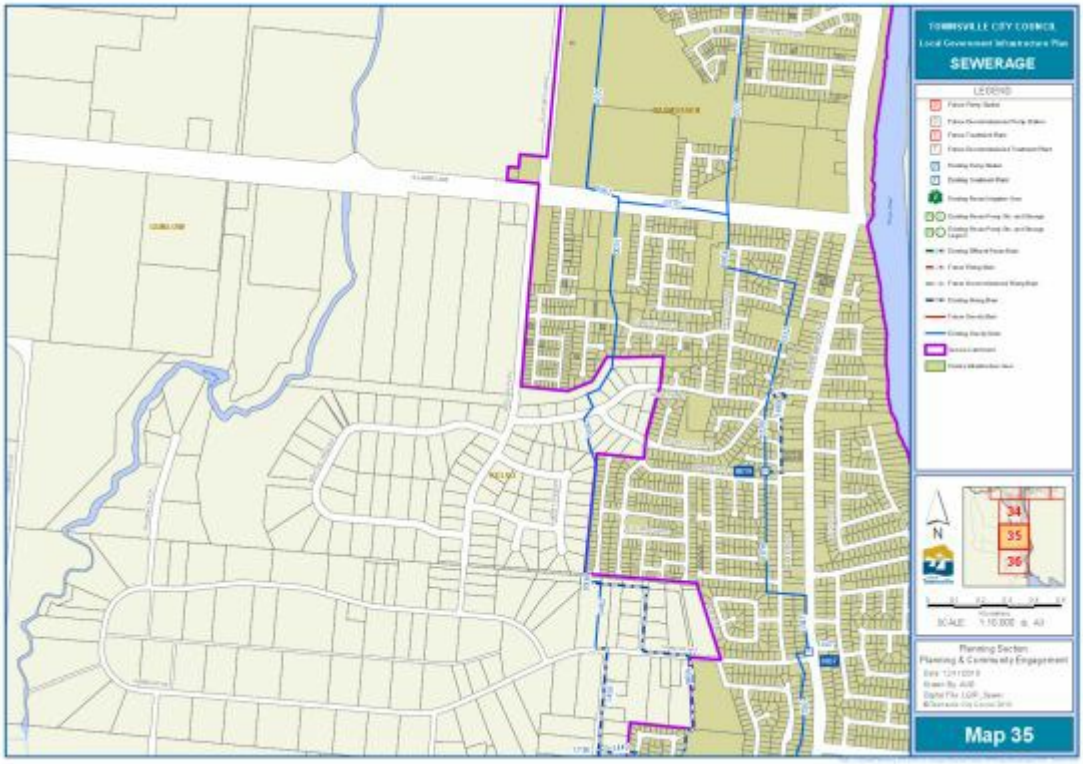

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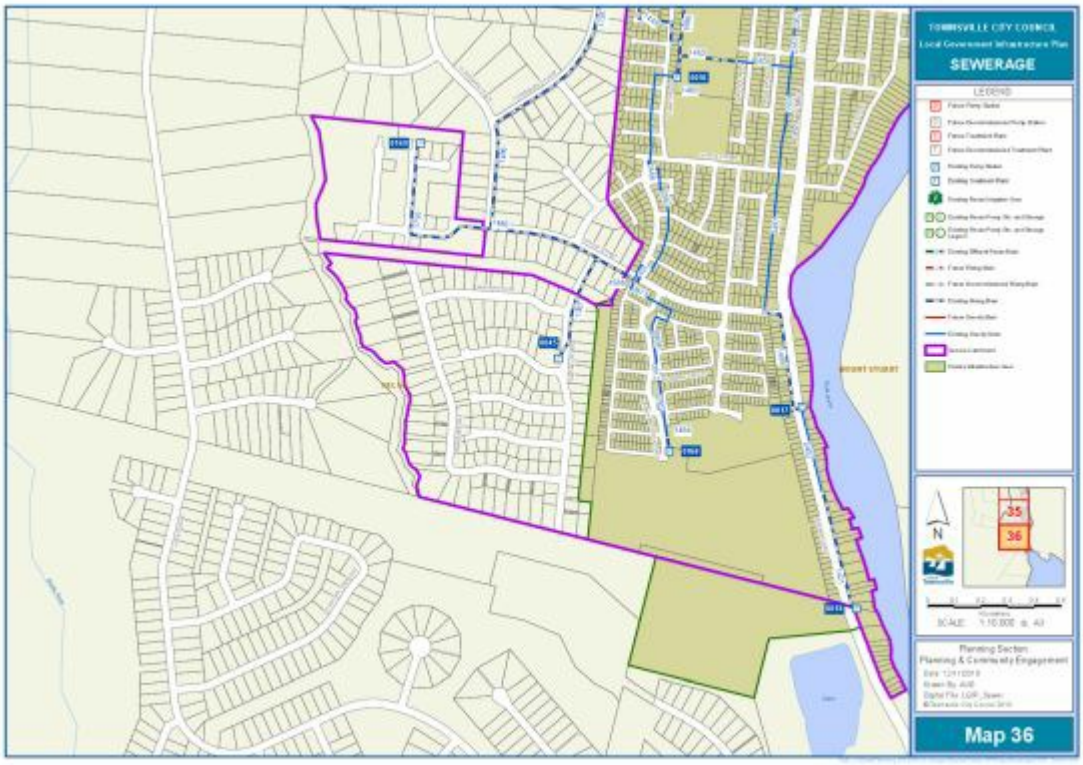

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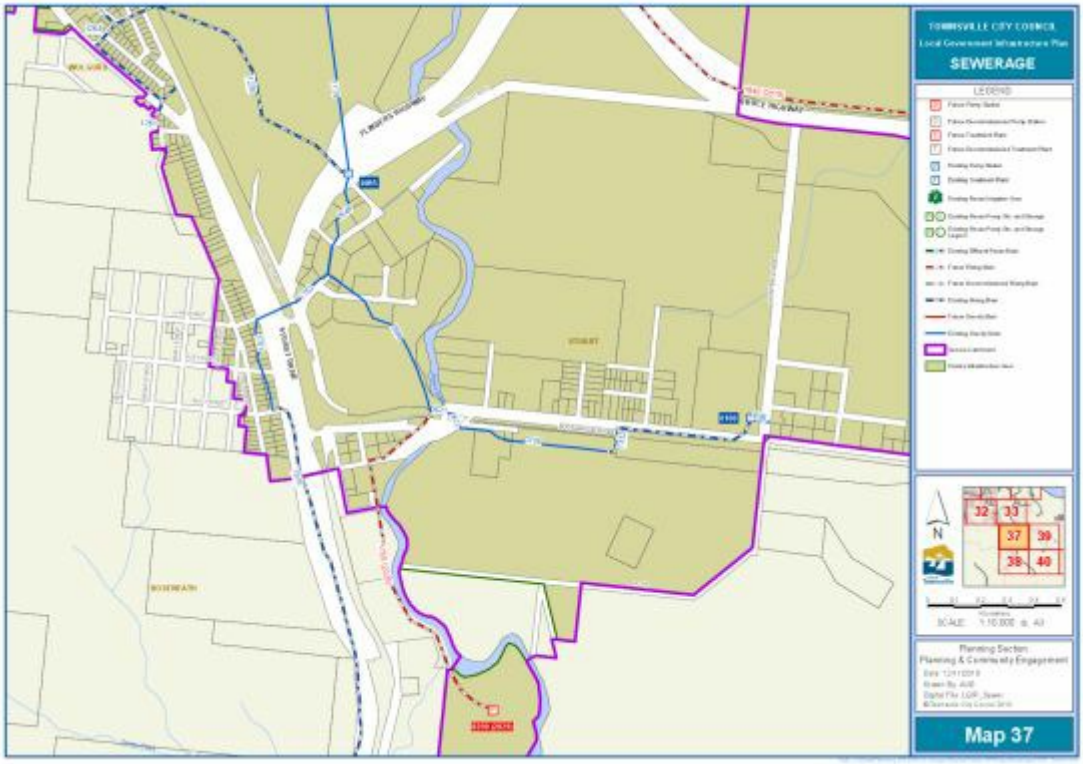

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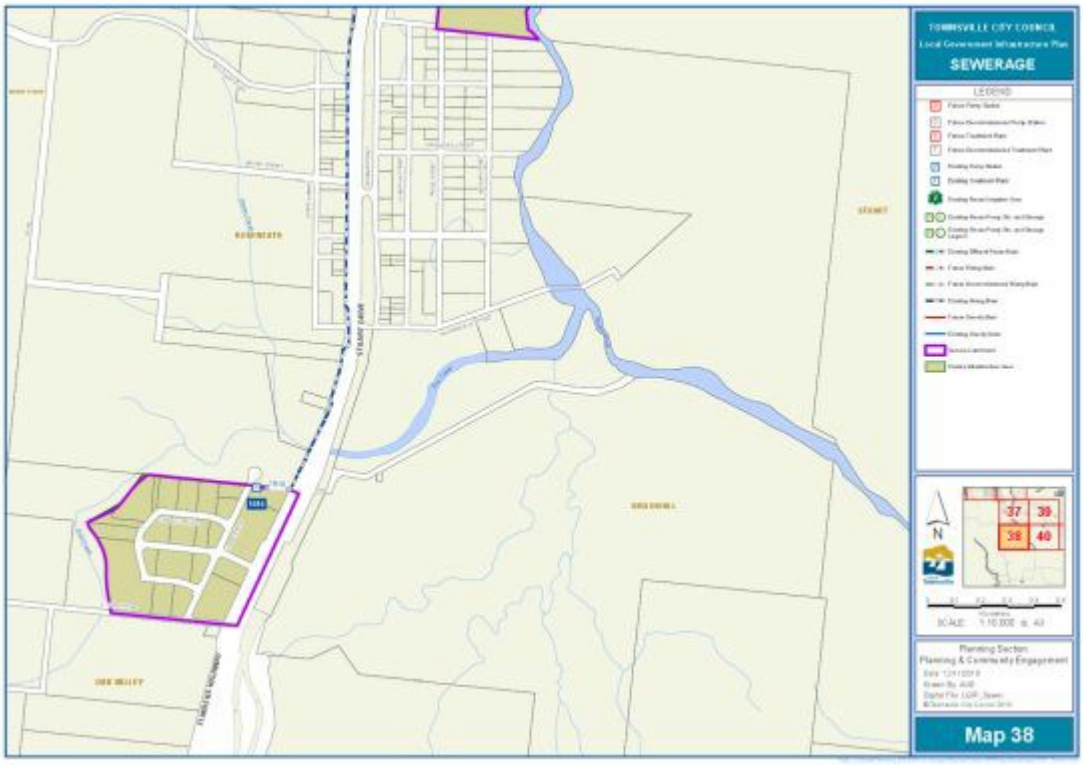

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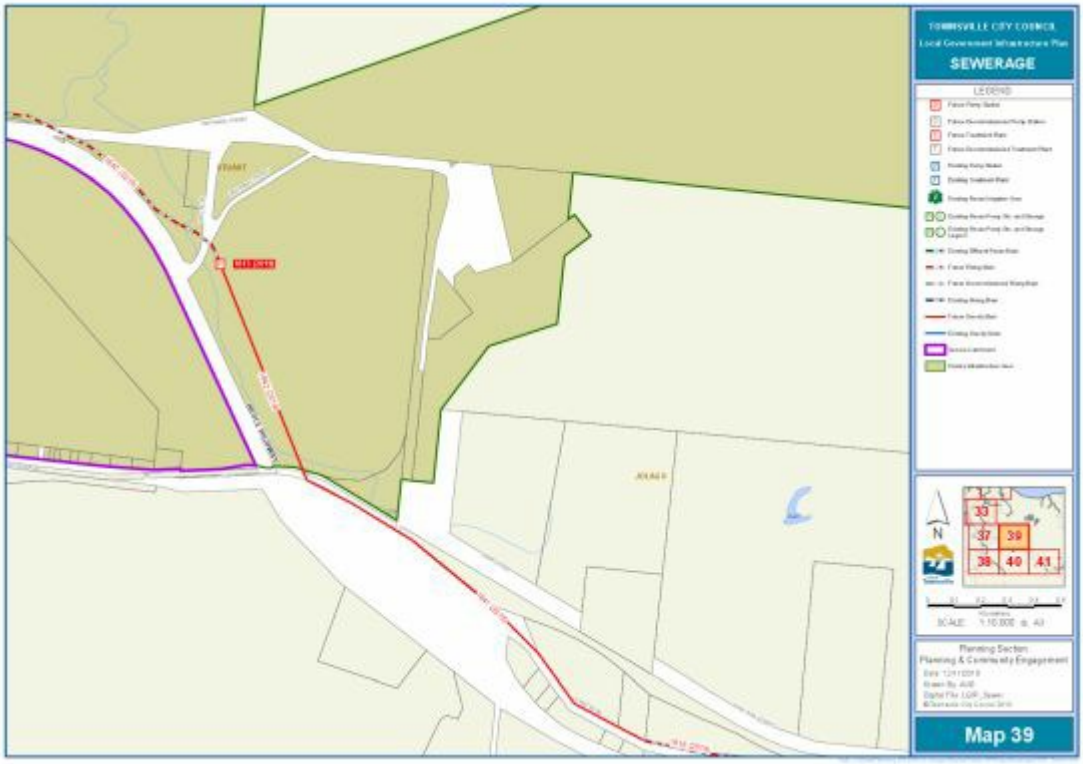

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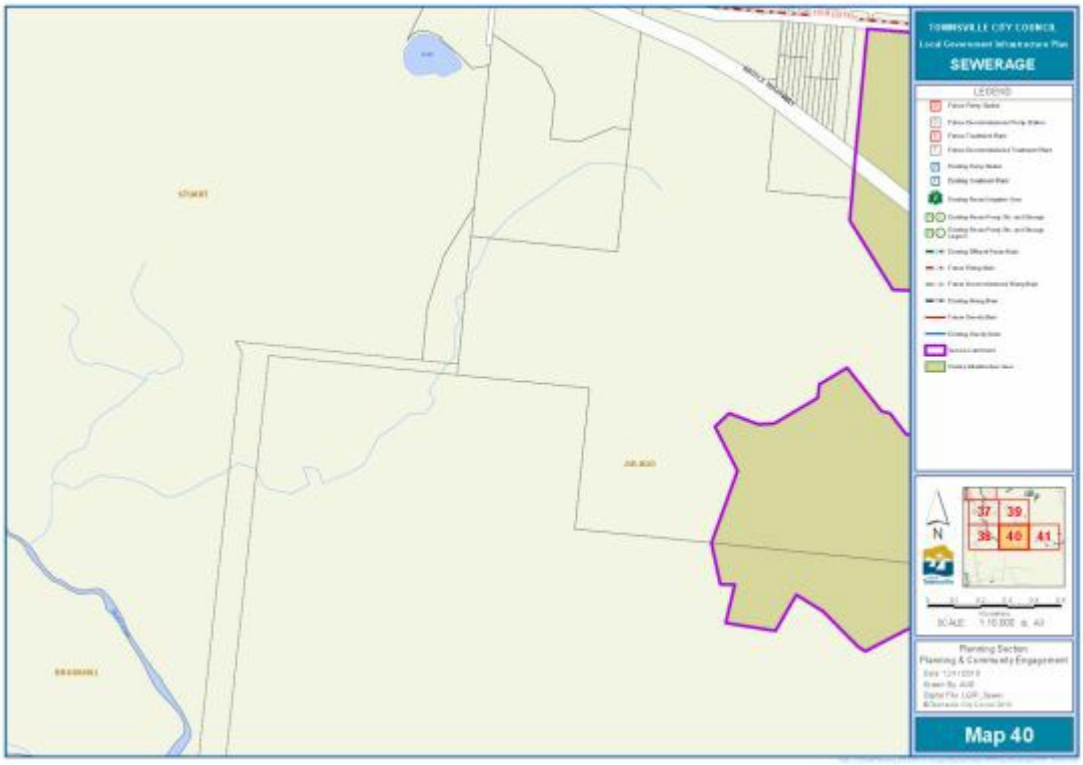

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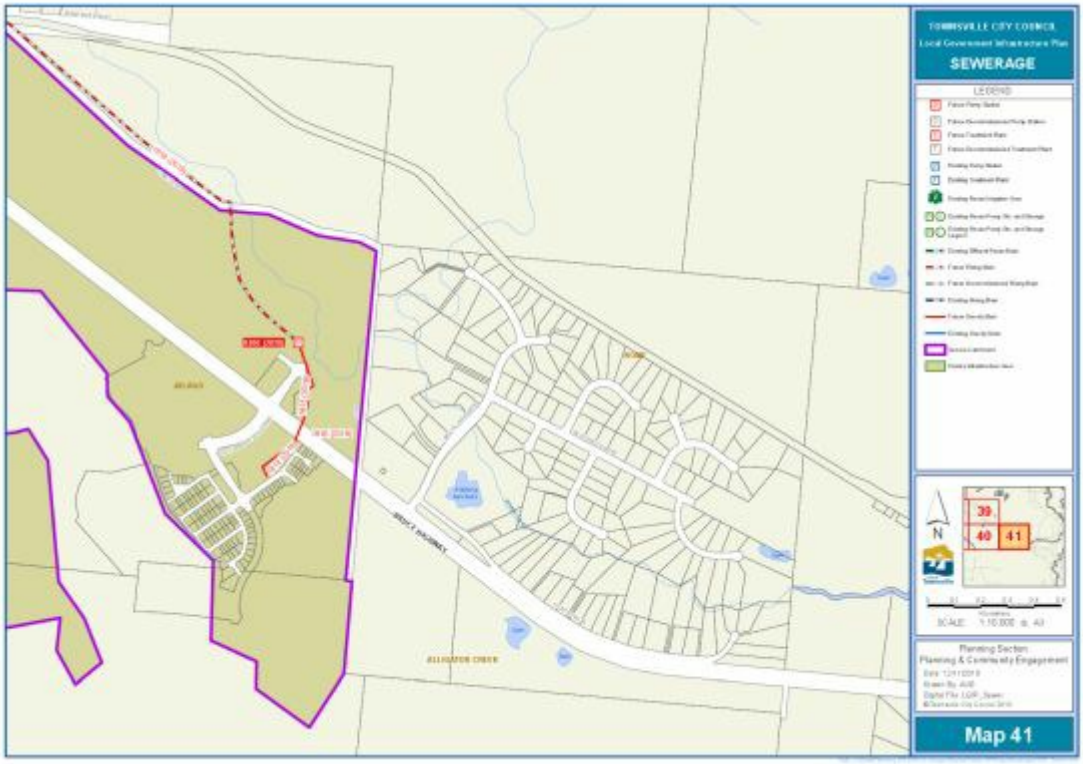

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Table SC3.3.6.1 - Sewerage network schedule of future works

Map	Type	ID	Description	Diameter (mm)	Length (m)	Year	Cost ($'19)
2	Treatment Plant	1002	Horseshoe Bay - STP upgrade	0	1	2023	3,210,682
6	Pump Station	44	P/S WB7	Type 3	1	2029	812,485
6	Pump Station	165	P/S WB10	Type 2	1	2024	595,549
6	Rising Main	1481		100	425	2024	71,353
8	Pump Station	198	P/S ML21	Type 4	1	2020	994,669
8	Pump Station	202	P/S ML15	Type 1	1	2026	595,549
8	Rising Main	1687		150	578	2026	174,904
9	Gravity Main	797		300	353	2031	280,411
9	Pump Station	199	P/S ML8	Type 4	1	2031	1,143,870
9	Pump Station	210	P/S ML5	Type 2	1	2028	595,549
9	Pump Station	211	P/S ML6	Type 2	1	2024	595,549
9	Pump Station	216	P/S ML16	Type 2	1	2026	595,549
9	Pump Station	218	P/S ML12	Type 2	1	2031	637,099
9	Pump Station	222	P/S ML13	Type 4	1	2022	994,669
9	Rising Main	1545		150	620	2031	128,655
9	Rising Main	1578		450	1,911	2031	2,073,307
9	Rising Main	1688	PS ML5 to PS ML6	150	997	2028	193,393
9	Rising Main	1689		200	393	2024	101,557
9	Rising Main	1691		100	386	2026	39,039
9	Rising Main	1821		375	85	2022	58,560
9	Rising Main	1831		375	1,220	2020	1,025,424
9	Rising Main	1544a		150	171	2022	30,856
9	Rising Main	1544b		250	202	2022	63,356
11	Gravity Main	765		225	298	2031	189,807
11	Pump Station	174	P/S WD8	Type 2	1	2031	637,099
11	Pump Station	204	P/S J3	Type 2	1	2023	917,424
11	Pump Station	205	P/S J2	Type 2	1	2029	1,055,037
11	Rising Main	1490		150	225	2031	72,734
11	Rising Main	1540	From P/S J3	100	721	2023	112,635
11	Rising Main	1707	From P/S J2	100	562	2029	101,013
12	Pump Station	183	P/S BU09	Type 2	1	2025	595,549
12	Pump Station	187	P/S S1P3A	Type 2	1	2029	637,099
12	Pump Station	193	P/S BU07	Type 3	1	2030	-
12	Pump Station	201	P/S BU08	Type 2	1	2028	595,549
12	Rising Main	1509		100	1,845	2025	309,756
12	Rising Main	1530		100	301	2029	54,075
12	Rising Main	1531		375	561	2022	471,522
12	Rising Main	1532		100	265	2028	44,491
12	Rising Main	1579		600	2,665	2028	4,187,866
12	Rising Main	1504a		300	105	2022	73,655
12	Rising Main	1504b		300	722	2022	375,531
13	Pump Station	291	P/S LH21A	Type 2	1	2028	721,644
13	Rising Main	1777		100	360	2028	60,440
13	Rising Main	1826	New SRM from P/S BU3 to NSB crossing	600	560	2028	1,003,286
14	Pump Station	264	P/S LB21A	Type 2	1	2025	80,710
14	Rising Main	1526	New DN750 from Everett St to MSJ WWTP	750	2,402	2026	6,148,017
14	Rising Main	1778		300	996	2025	556,989
14	Treatment Plant	1004	Mt. St. John - STP upgrade	0	1	2029	82,176,271
16	Gravity Main	593	Rose Street	225	501	2019	277,482

Map	Type	ID	Description	Diameter (mm)	Length (m)	Year	Cost ($'19)
16	Gravity Main	594	Landsborough Street	150	97	2019	28,976
16	Gravity Main	1820		450	140	2019	185,749
16	Pump Station	85	P/S 7A	Type 3	1	2019	4,033,898
16	Pump Station	117	P/S A1A - Upgrade	Type 2	1	2026	140,731
16	Rising Main	1611		200	568	2026	209,834
17	Gravity Main	768		375	337	2031	342,799
17	Gravity Main	881		450	161	2025	229,518
18	Gravity Main	942		225	474	2031	301,908
18	Pump Station	74	P/S LE18A - environmental overflow	Type 2	1	2025	85,457
18	Pump Station	195	P/S BP08	Type 2	1	2022	553,999
18	Pump Station	244	P/S LR3	Type 2	1	2028	595,549
18	Pump Station	248	P/S LB17	Type 2	1	2031	1,560,489
18	Pump Station	278	P/S LA17	Type 2	1	2025	1,506,187
18	Rising Main	1519		150	636	2022	179,027
18	Rising Main	1711		150	153	2025	46,164
18	Rising Main	1712		100	48	2031	8,610
18	Rising Main	1721a		125	278	2031	116,010
18	Rising Main	1721b		125	419	2031	96,676
18	Rising Main	1771a		600	6,859	2024	12,288,933
18	Rising Main	1771b		600	81	2024	178,788
19	Rising Main	1187		300	1,306	2030	780,907
20	Pump Station	58	P/S A11C - future decommission	Type 2	1	2022	3,879
20	Pump Station	371	P/S A11C	Type 2	1	2022	757,220
20	Rising Main	1632	P/S A11C	100	148	2022	23,114
20	Rising Main	1155b		100	68	2022	10,696
21	Pump Station	96	P/S 6 - upgrade	Type 3	1	2022	2,074,576
21	Pump Station	255	P/S 24	Type 3	1	2022	994,669
21	Pump Station	270	P/S A24	Type 2	1	2020	553,999
21	Rising Main	1619		200	289	2022	99,237
21	Rising Main	1784		375	4,032	2022	4,482,186
21	Rising Main	1832	Alignment changed	150	613	2020	172,553
22	Rising Main	1783a		600	3,714	2023	5,429,568
22	Rising Main	1783b		600	540	2023	1,000,209
22	Rising Main	1783c		600	250	2023	741,924
22	Rising Main	1783d		600	436	2023	726,632
23	Gravity Main	1728		300	508	2021	357,313
23	Gravity Main	780b		225	115	2024	68,471
23	Pump Station	194	P/S BP07	Type 2	1	2026	595,549
23	Pump Station	294	P/S BP21	Type 2	1	2024	595,549
23	Rising Main	1518		150	341	2026	103,187
23	Rising Main	1737		150	367	2024	110,924
24	Gravity Main	847	Liberty Rise	300	70	2024	52,929
24	Gravity Main	848	Liberty Rise	225	674	2028	401,297
24	Pump Station	245	P/S LR2	Type 2	1	2024	595,549
24	Rising Main	1602		150	224	2024	67,784
24	Rising Main	1785a		300	385	2030	230,269
24	Rising Main	1785b		300	39	2030	23,051
24	Rising Main	1785c		300	105	2030	63,055
24	Rising Main	1787a		200	56	2020	29,114
24	Rising Main	1787b		200	1,830	2020	628,934
25	Gravity Main	1763		300	296	2019	208,220

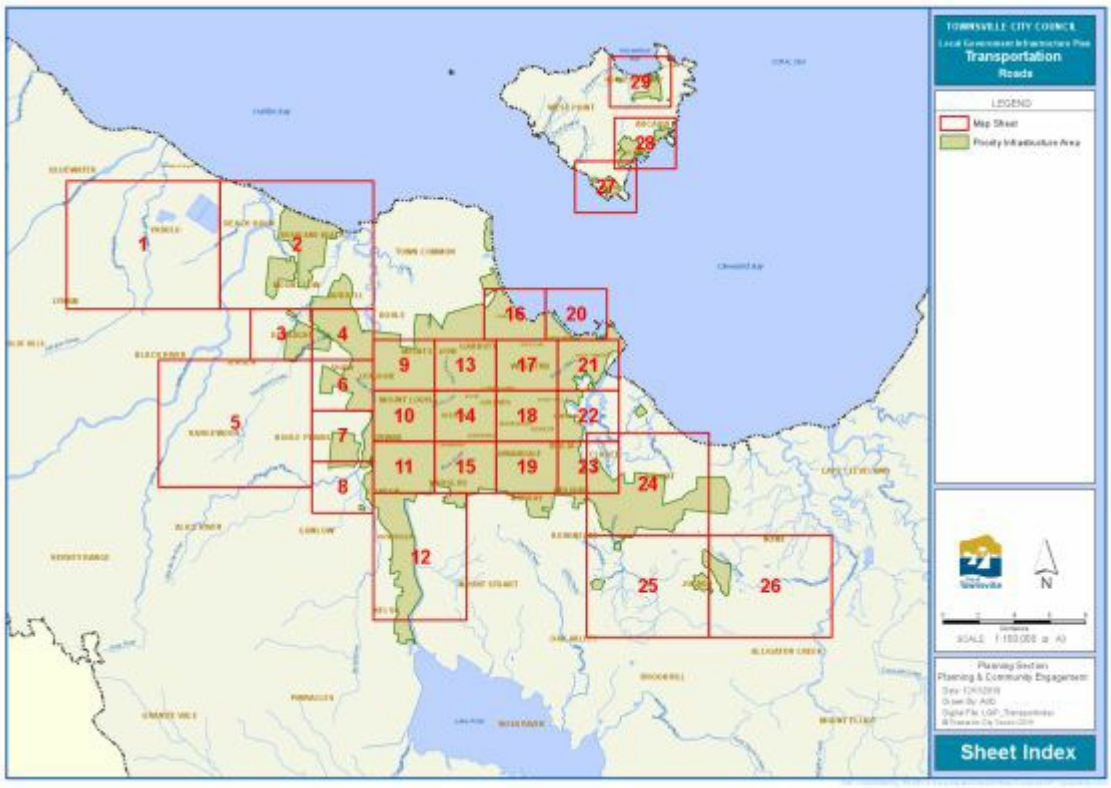
Map	Type	ID	Description	Diameter (mm)	Length (m)	Year	Cost ($'19)
25	Pump Station	1017	P/S L1C	Type 2	1	2019	2,268,928
25	Rising Main	1817		200	638	2019	219,209
26	Rising Main	1606a		600	7,142	2020	11,903,185
26	Rising Main	1606b		600	881	2020	1,811,533
27	Gravity Main	1835	ULDA The Village	300	9	2019	6,330
27	Gravity Main	1836	ULDA The Village	375	11	2019	9,730
27	Pump Station	296	P/S SA15	Type 2	1	2019	553,999
27	Rising Main	1833		100	64	2019	9,995
27	Rising Main	1788a		750	255	2020	541,740
27	Rising Main	1788b		750	3,746	2020	7,962,488
27	Rising Main	1788c		750	122	2020	316,868
28	Rising Main	1794d	Rocky Springs connection	375	121	2019	169,383
28	Rising Main	1794e	Rocky Springs connection	375	892	2019	614,235
28	Treatment Plant	1005	Cleveland Bay	0	1	2019	27,661,017
28	Treatment Plant	1005	Cleveland Bay - 50k EP up. at 2031, $59.972M (1/6/16 CAPEX)	0	1	2031	79,488,312
29	Pump Station	38	P/S C6B - upgrade	Type 3	1	2026	3,493,932
29	Pump Station	159	P/S BP12	Type 2	1	2021	553,999
29	Rising Main	1501		100	412	2021	64,394
29	Rising Main	1699a		450	4,566	2021	5,038,861
29	Rising Main	1699b		450	83	2021	114,879
30	Pump Station	400	PS SA14A REPLACEMENT PUMP STATION	Type 2	1	2029	1,009,700
30	Rising Main	1753		200	584	2024	215,745
30	Rising Main	1779		150	159	2020	44,757
31	Rising Main	1609	Decommission when RM1751 connects	225	(139)	2020	-
31	Rising Main	1751		300	1,179	2020	612,985
31	Rising Main	1752		250	769	2024	347,257
31	Rising Main	1322c	Decommission when RM1751 connects	250	(125)	2020	-
32	Gravity Main	1007		225	269	2022	148,988
32	Pump Station	372	P/S SC7	Type 2	1	2022	3,204,068
32	Rising Main	1265	DN100 srm - future decommission	100	(308)	2022	-
32	Rising Main	1837	DN250 PE srm extension from PS SA7 & PS SB7 (Wulguru)	200	1,460	2022	501,733
32	Rising Main	1839	DN100 diversion of PS SA7 with ID1694 & ID1837.	100	35	2022	5,466
32	Rising Main	1694a		150	649	2022	182,687
32	Rising Main	1694b		150	164	2022	73,596
33	Pump Station	1012	P/S 15A	Type 2	1	2023	553,999
33	Rising Main	1794a	Rocky Springs connection	375	807	2019	555,756
33	Rising Main	1794b	Rocky Springs connection	375	46	2019	64,402
33	Rising Main	1794c	Rocky Springs connection	375	976	2019	672,377
33	Rising Main	1794z	Rocky Springs connection	375	1,313	2019	904,342
33	Rising Main	1814a		150	74	2023	33,308
33	Rising Main	1814b		150	1,085	2023	305,298
34	Treatment Plant	1010	Condon	0	1	2021	17,288,136
34	Treatment Plant	1010	Condon - Biosolids upgrade	0	1	2021	599,322
37	Pump Station	290	P/S SA18B	Type 2	1	2029	637,099
37	Rising Main	1755		200	1,411	2029	557,592

Map	Type	ID	Description	Diameter (mm)	Length (m)	Year	Cost ($'19)
39	Gravity Main	1841	Rocky Springs	375	1,453	2019	1,546,230
39	Gravity Main	1842	Rocky Springs	450	1,036	2019	1,374,295
39	Pump Station	1013	Rocky Springs (P/S RS1 aka P3 on TPAR)	Type 3	9	2019	553,999
39	Rising Main	1818a		375	1,694	2019	1,424,124
39	Rising Main	1818b		375	50	2019	70,292
39	Rising Main	1818c		375	623	2019	523,592
39	Rising Main	1818d		375	59	2019	81,916
39	Rising Main	1818e		375	168	2019	140,843
41	Rising Main	1818h		300	2,714	2019	1,411,214

SC3.3.7 - Plans for trunk roads infrastructure

Editor's note—This document is intended to function in an electronic environment whereupon hyperlinks to detailed PDF maps allow for closer examination of mapping information. The following images are true copies of such maps, but at a coarser scale.

The maps are also loaded in a GIS environment. TownsvilleMaps is the current in-service GIS platform for this purpose, which can be publicly viewed at council, or privately accessed via subscription.



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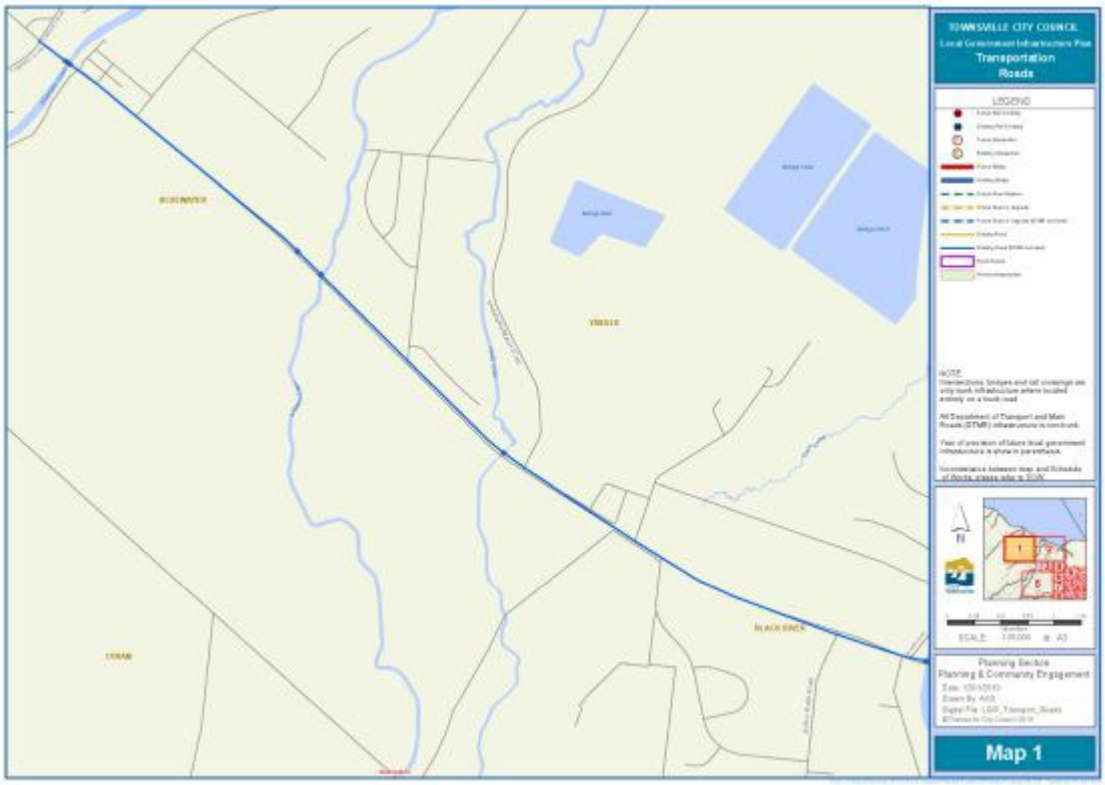

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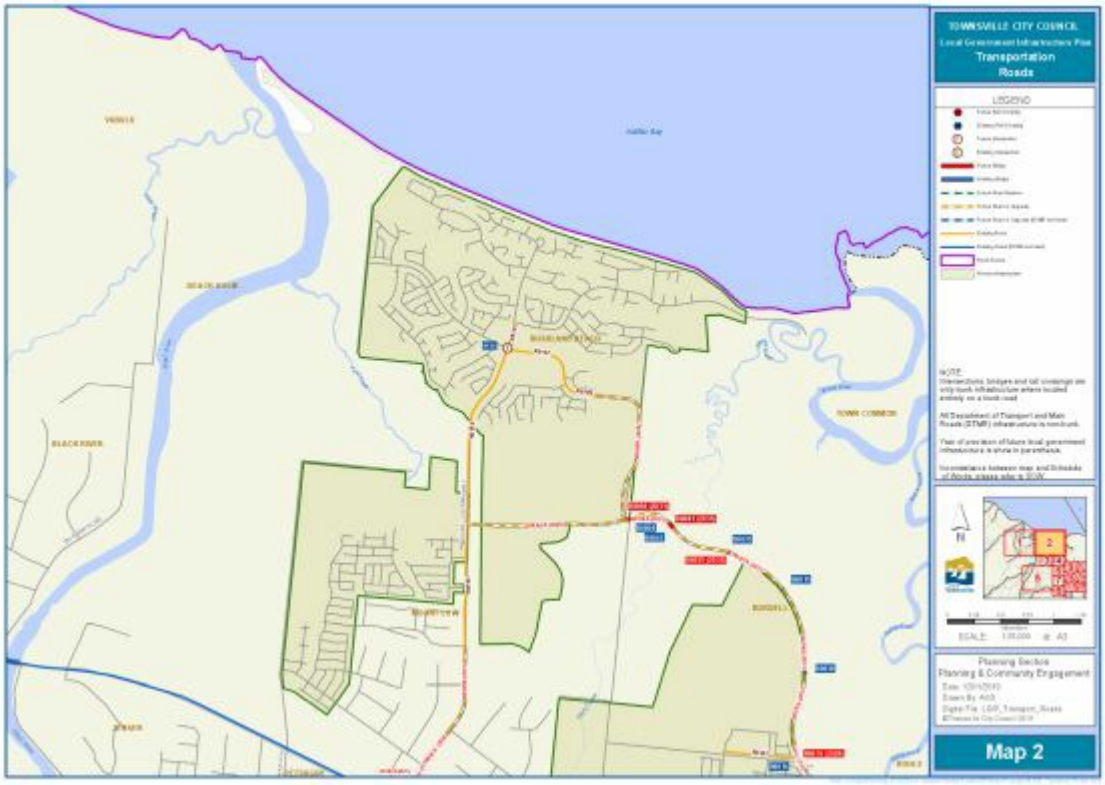

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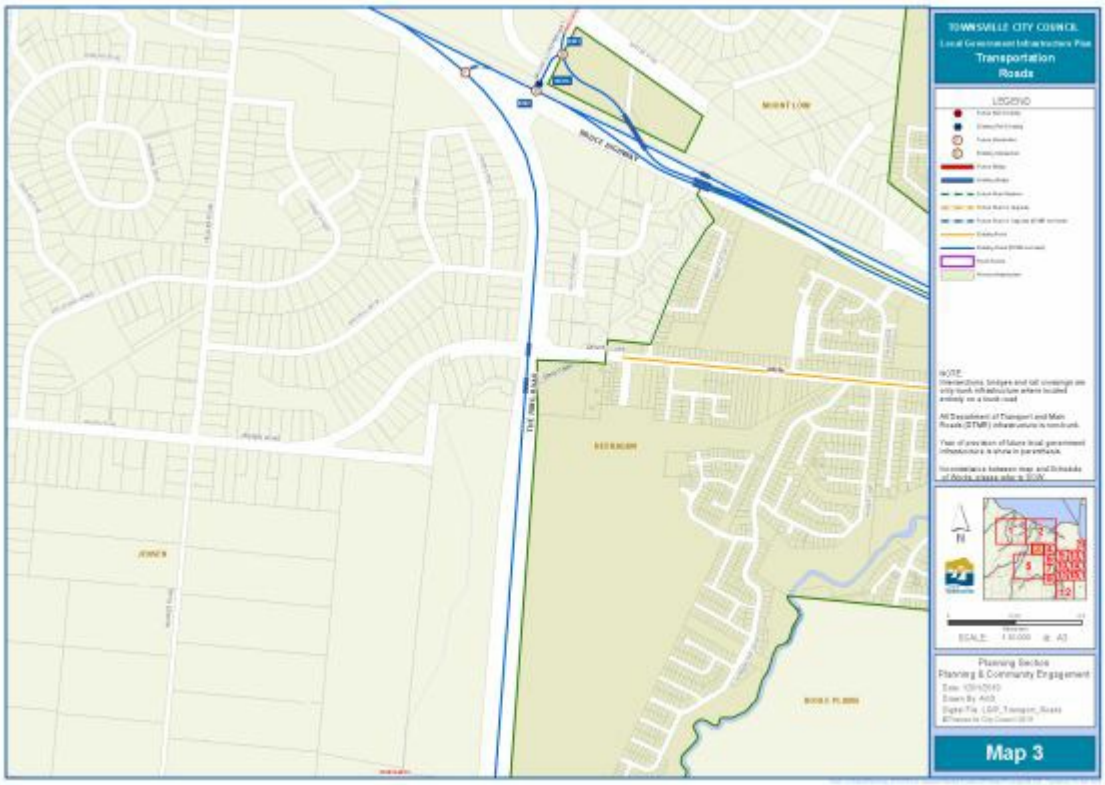

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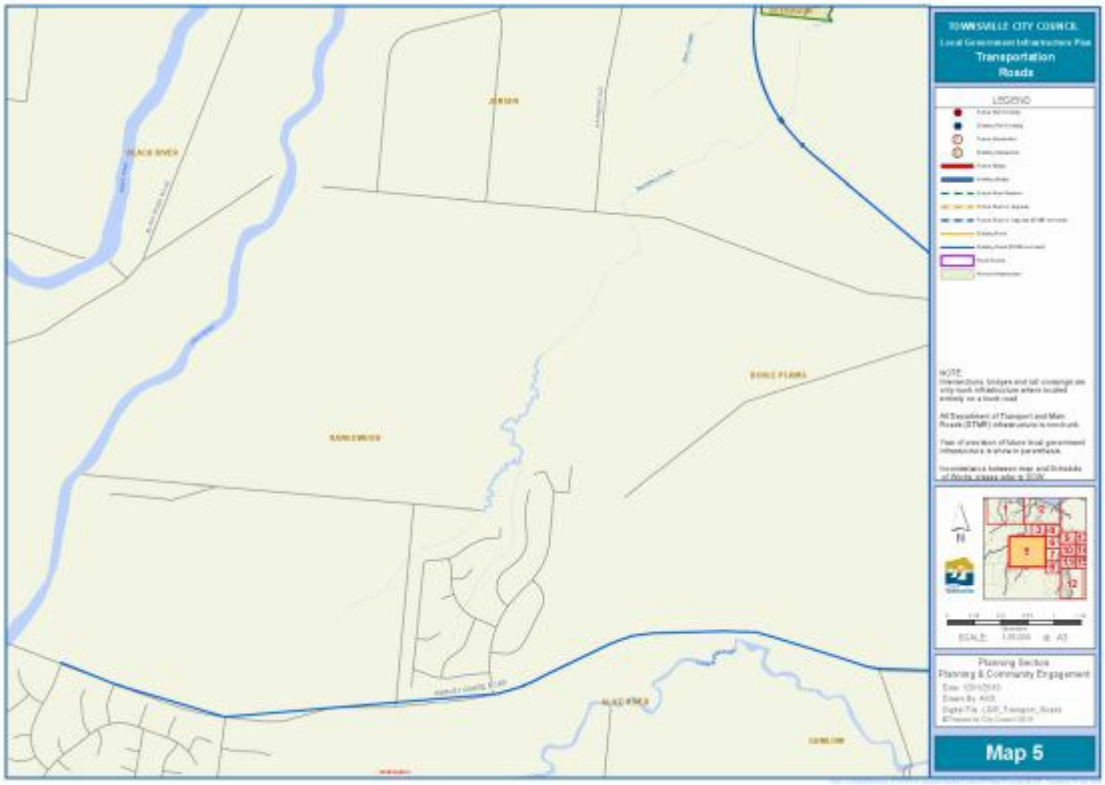

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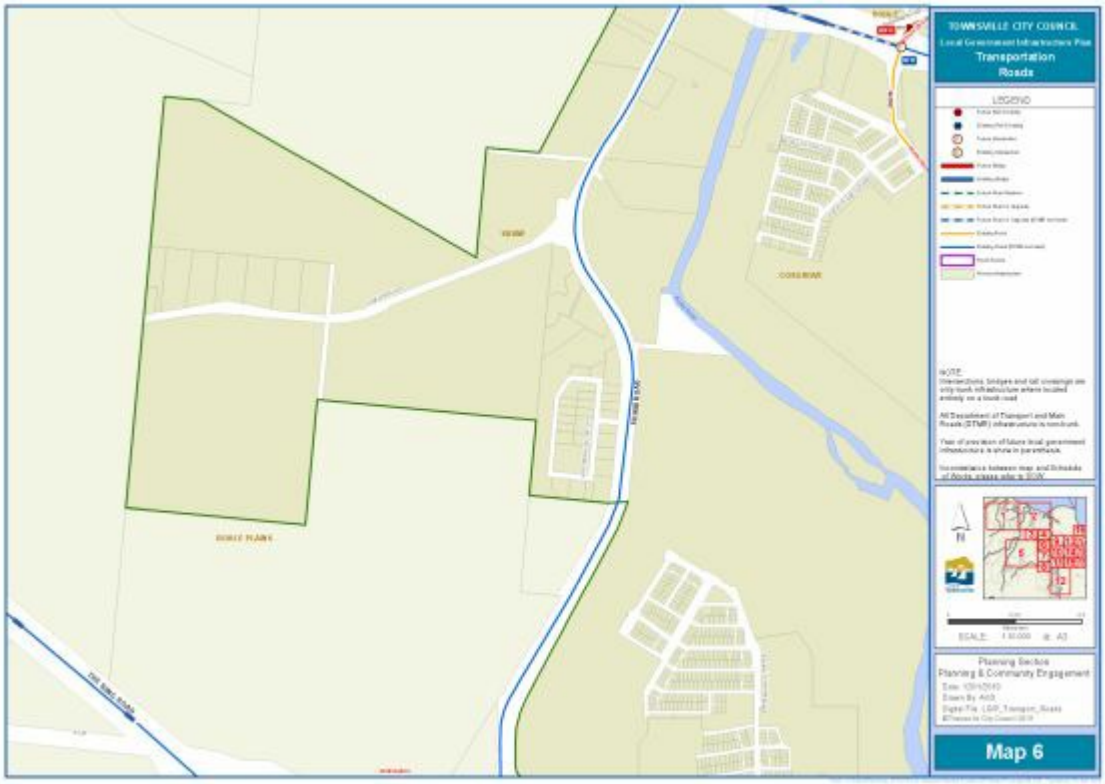

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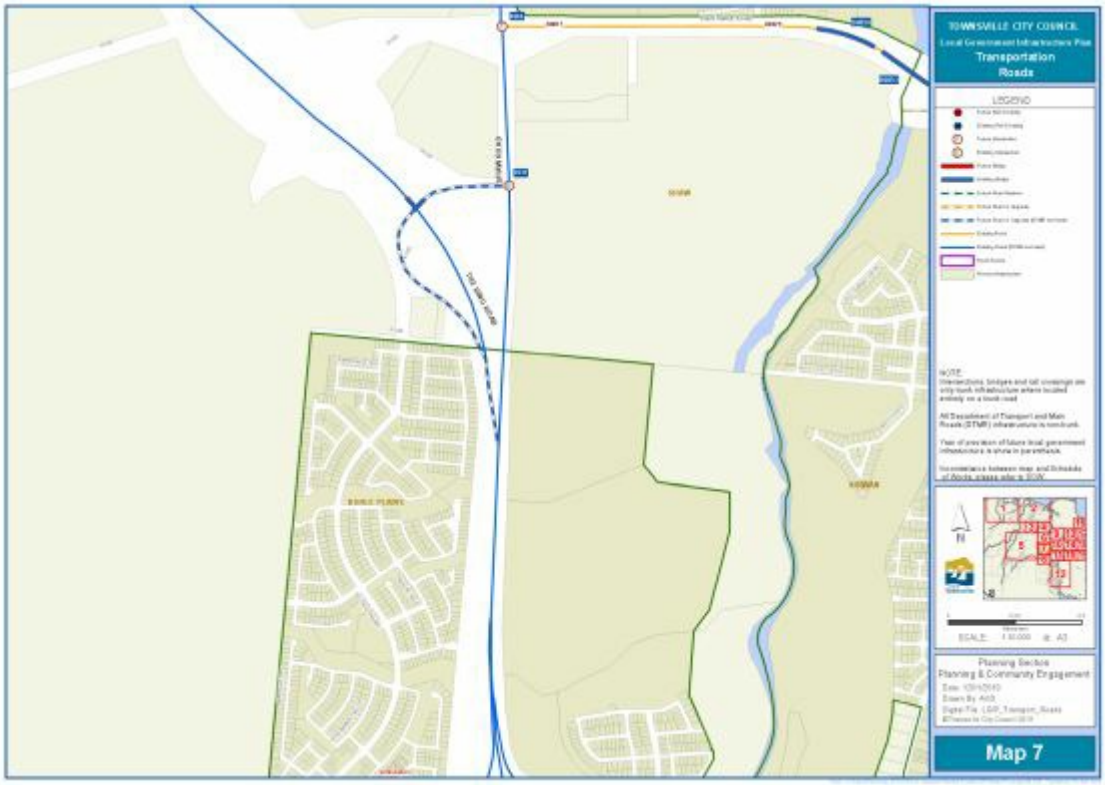

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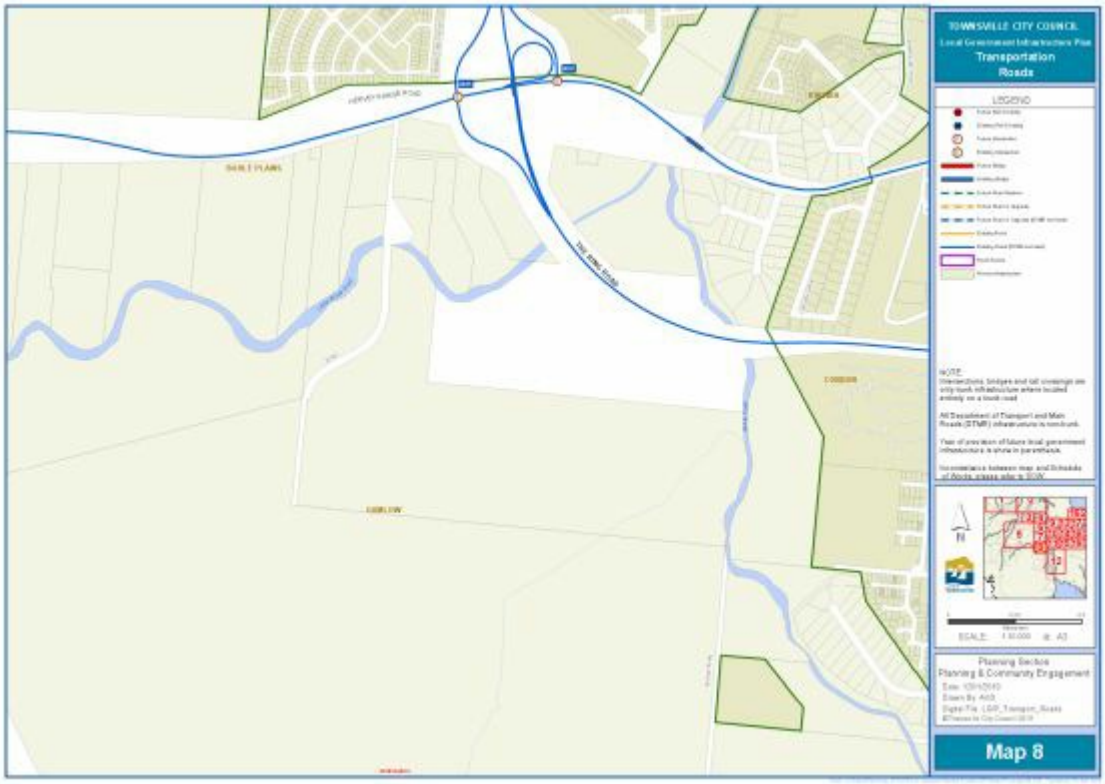

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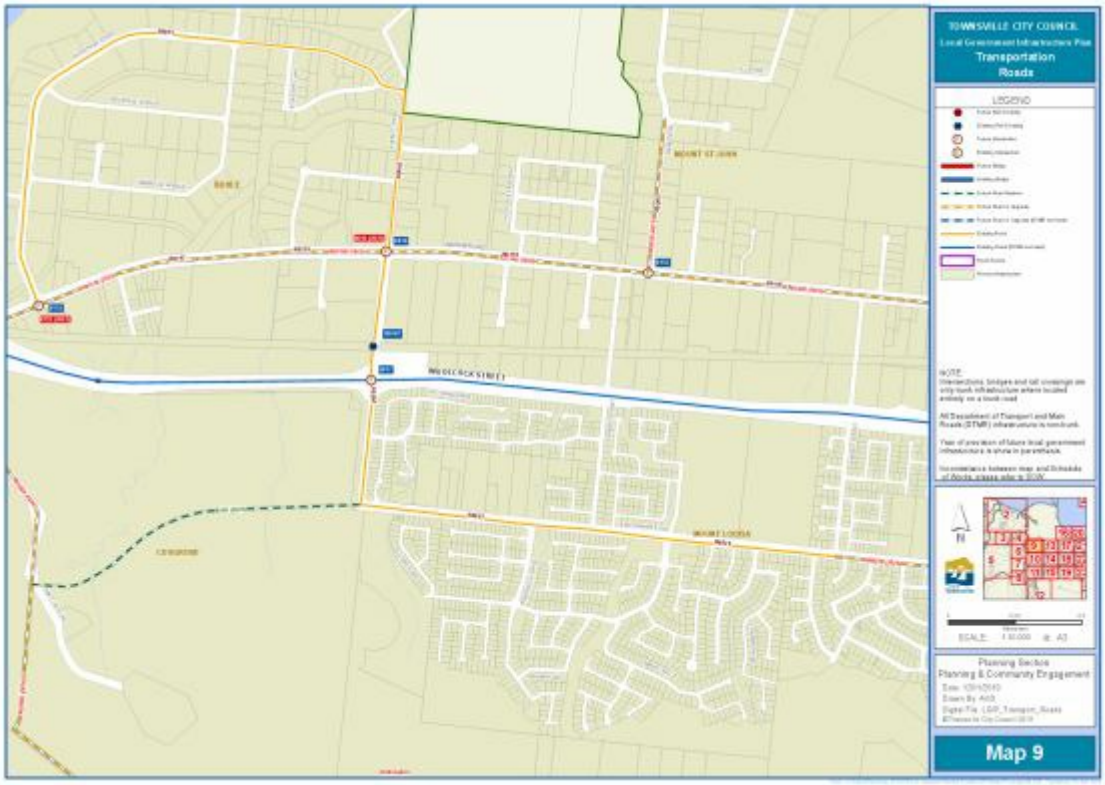

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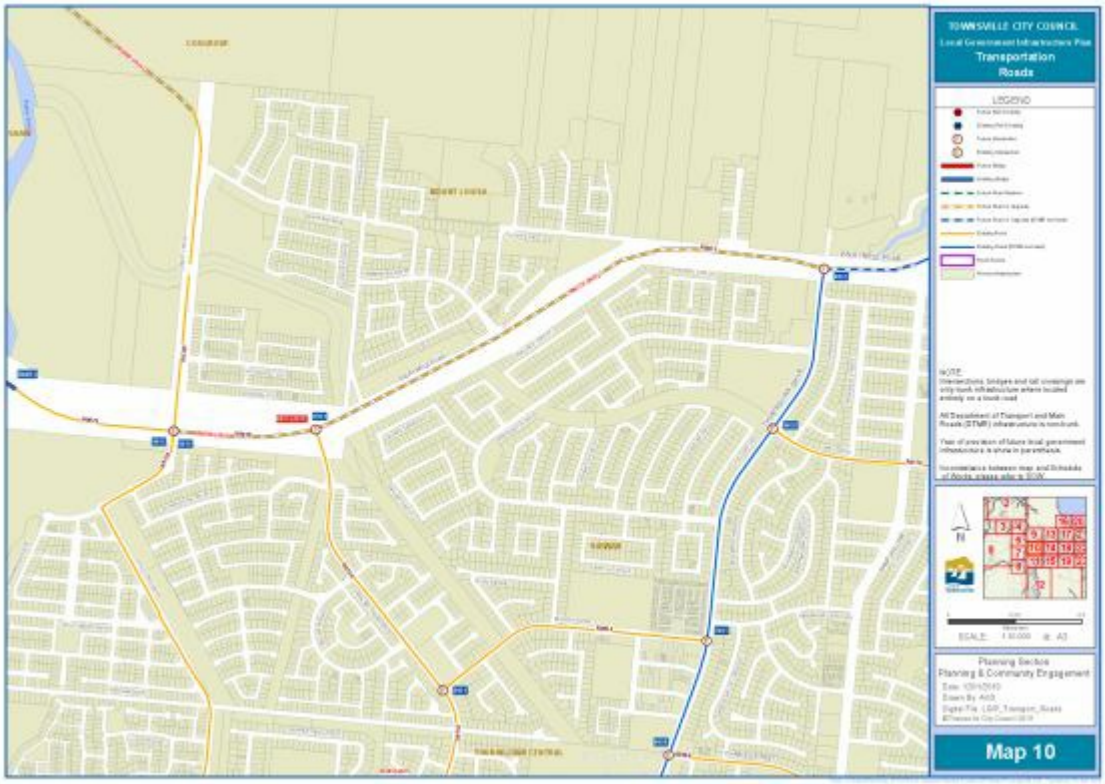

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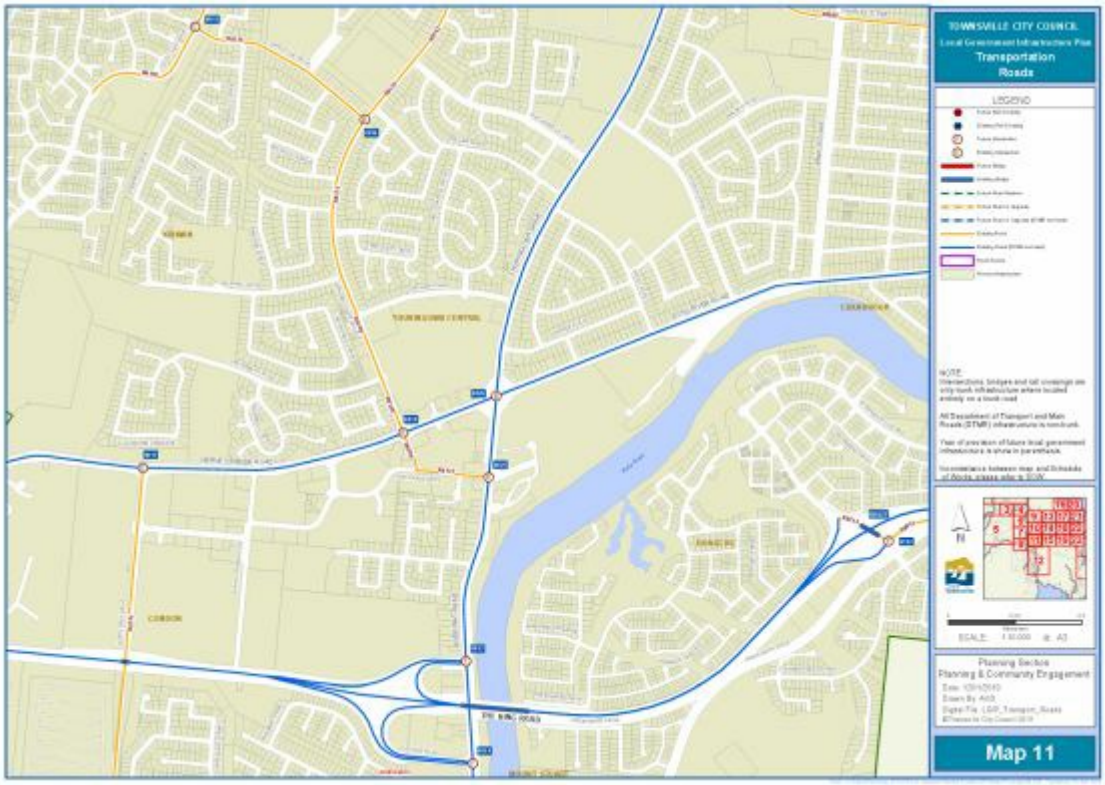

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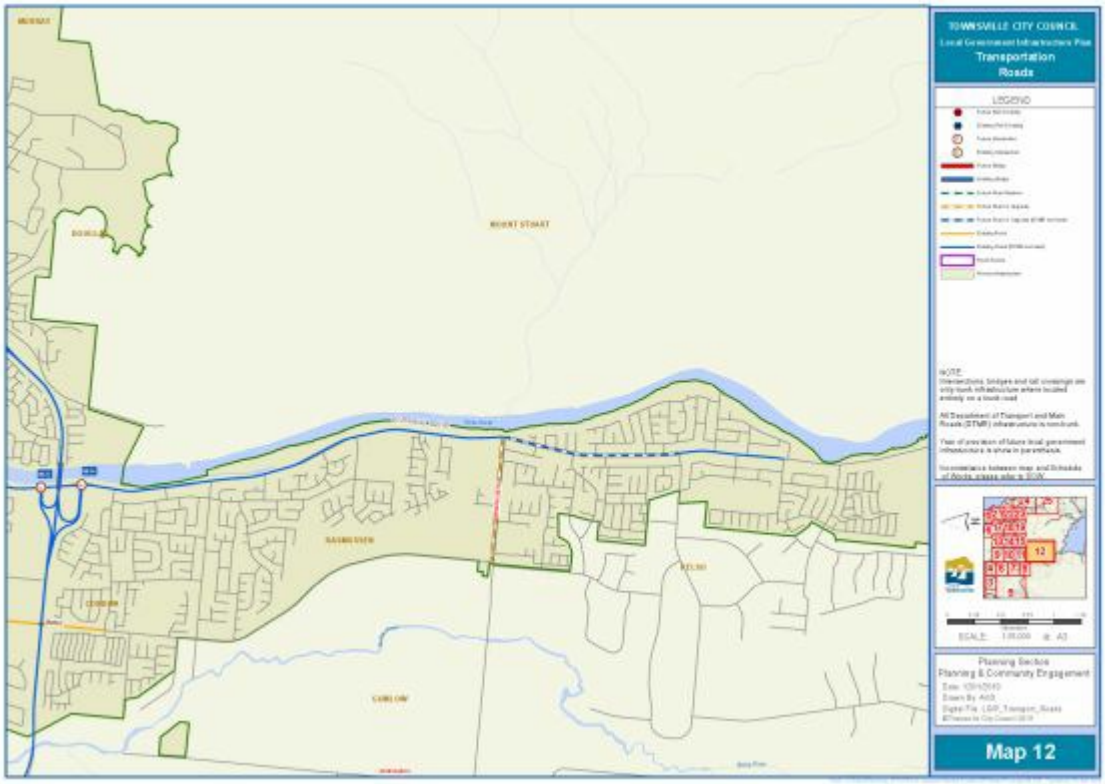

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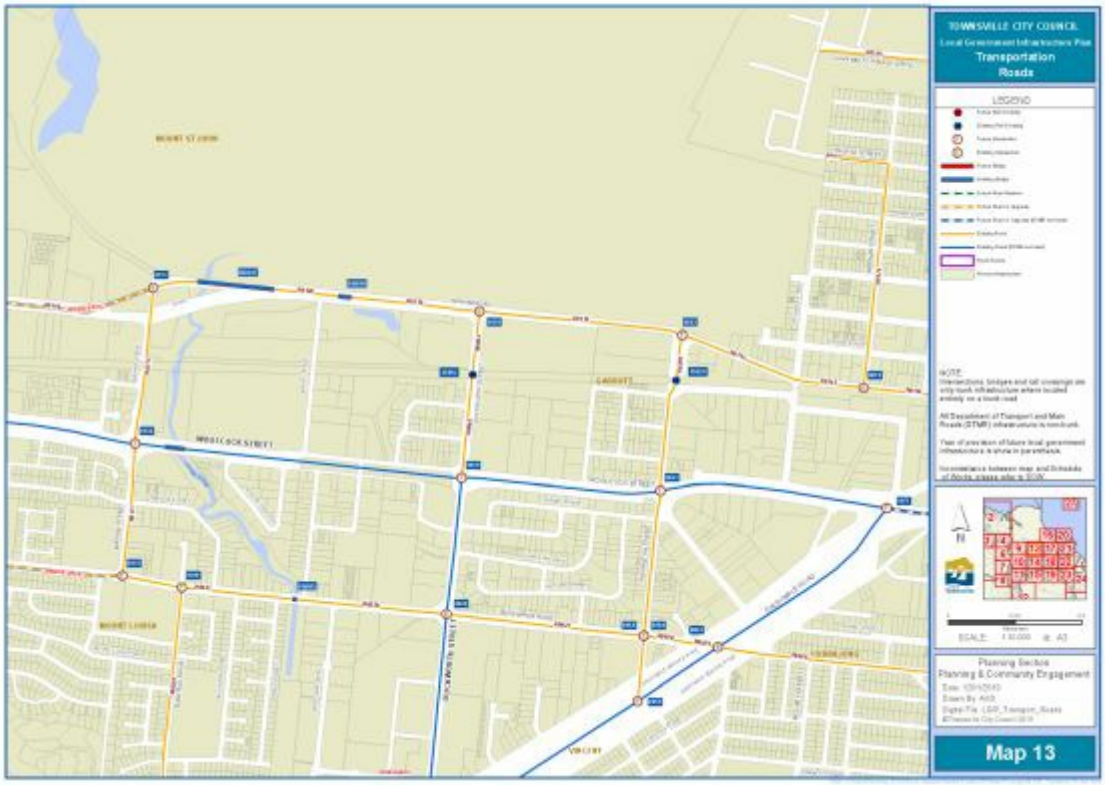

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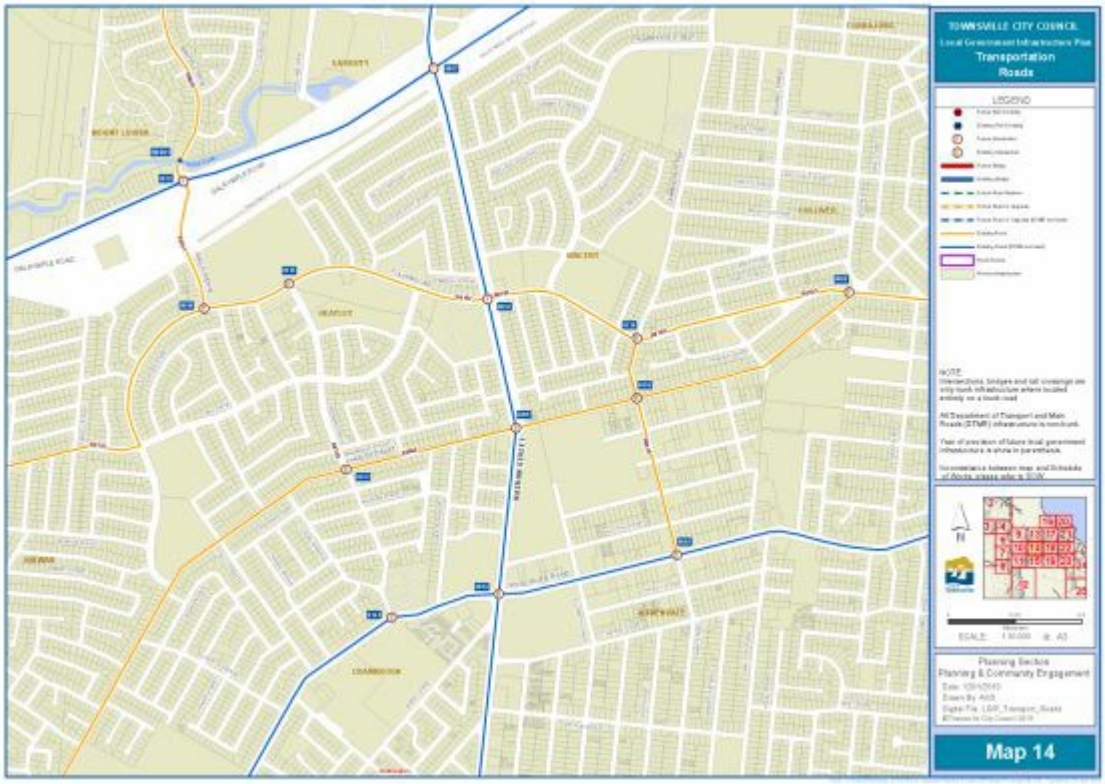

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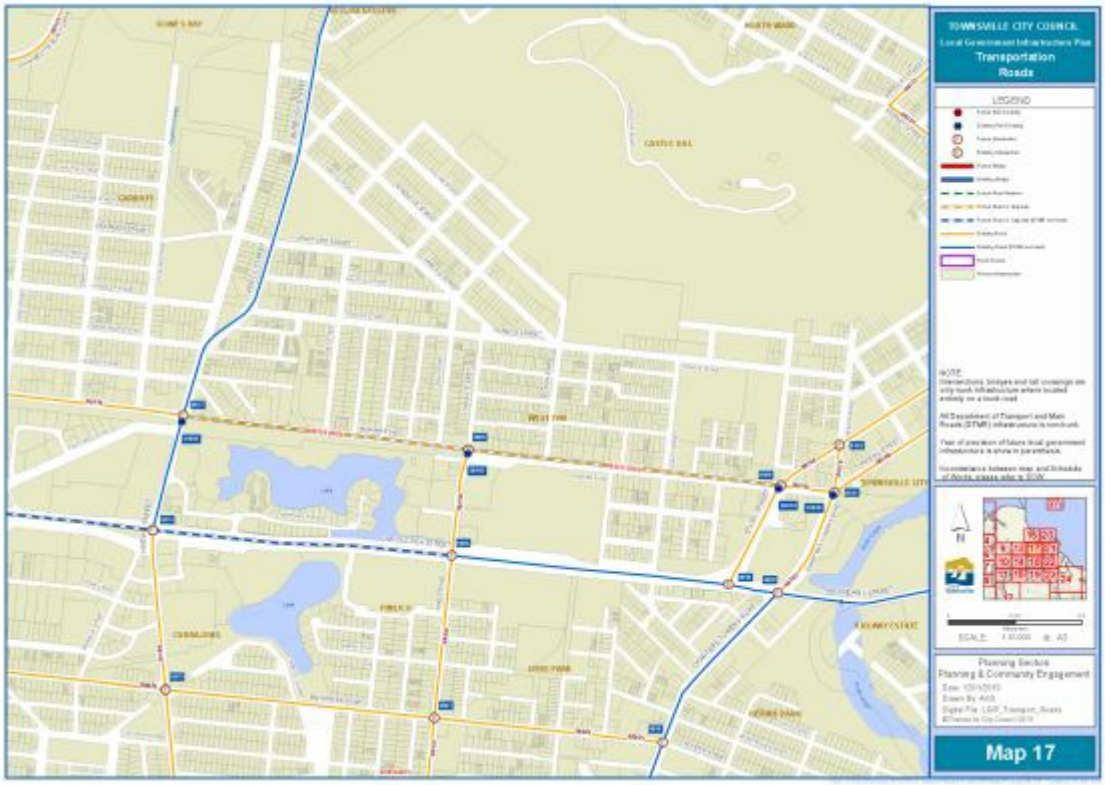

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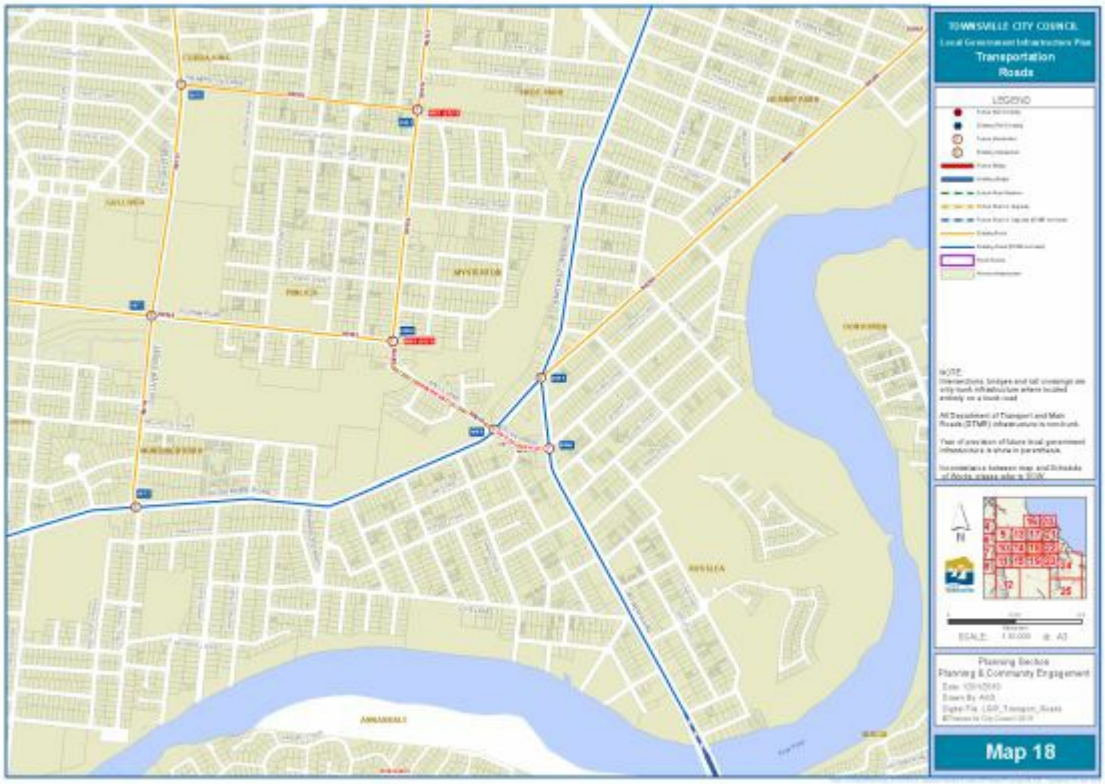

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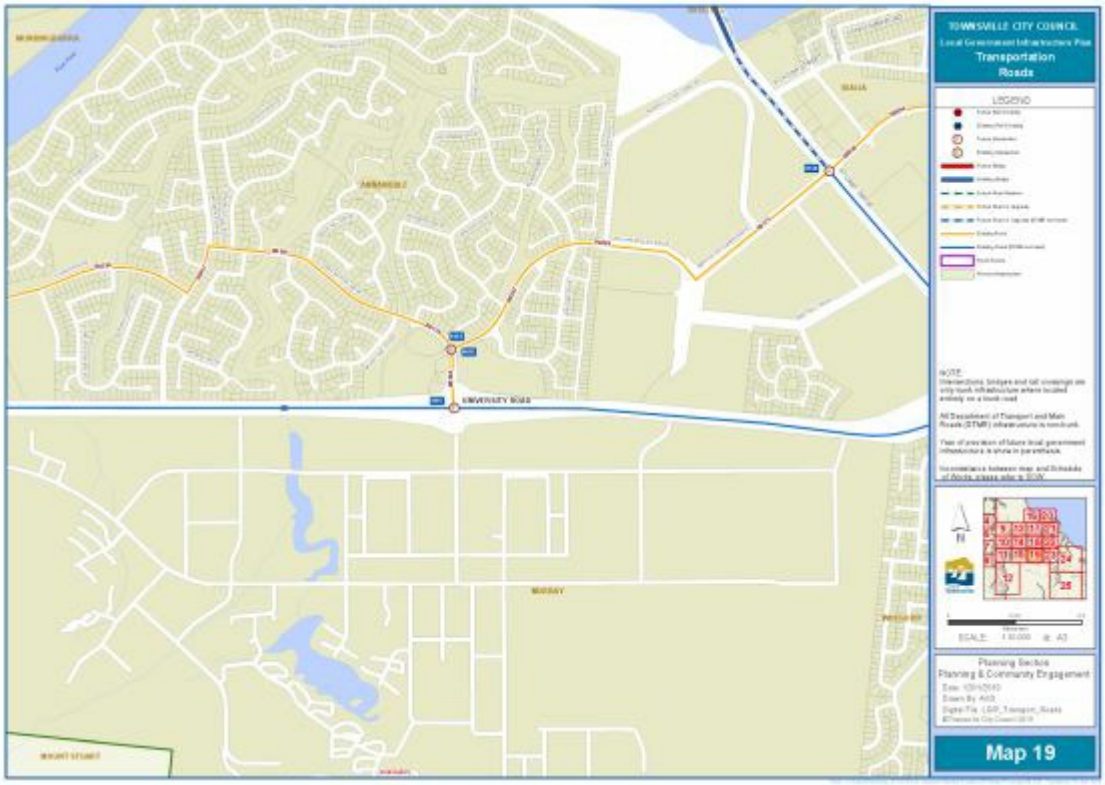

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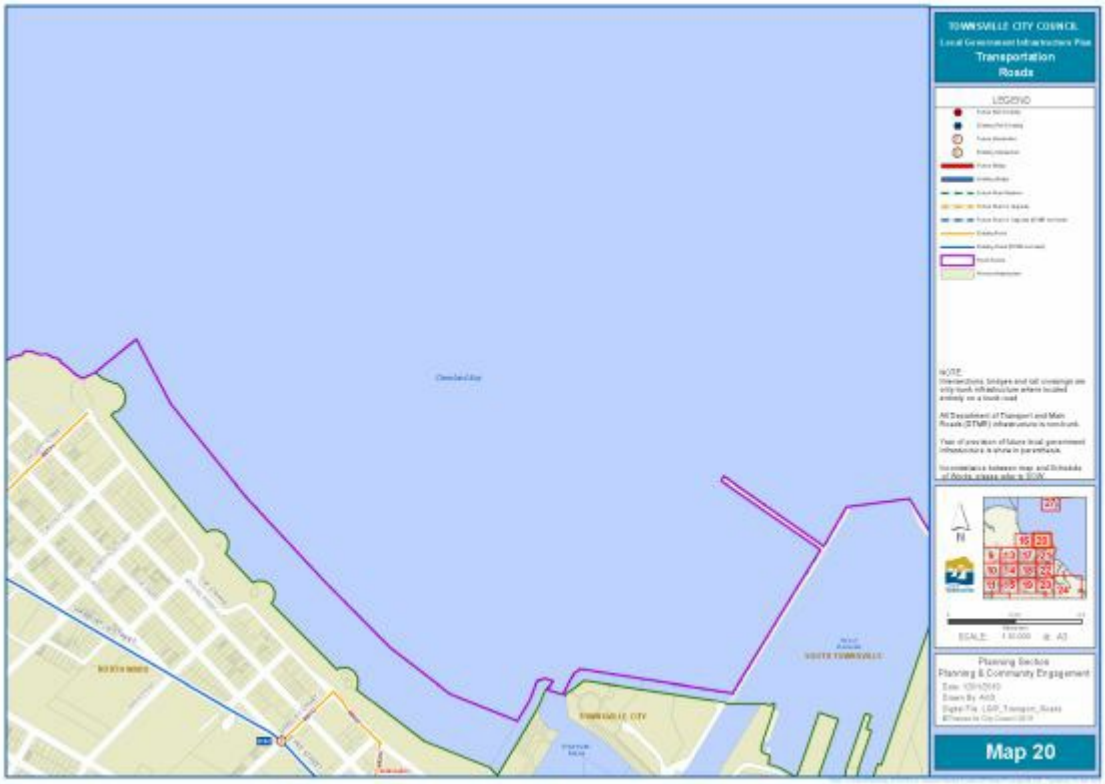

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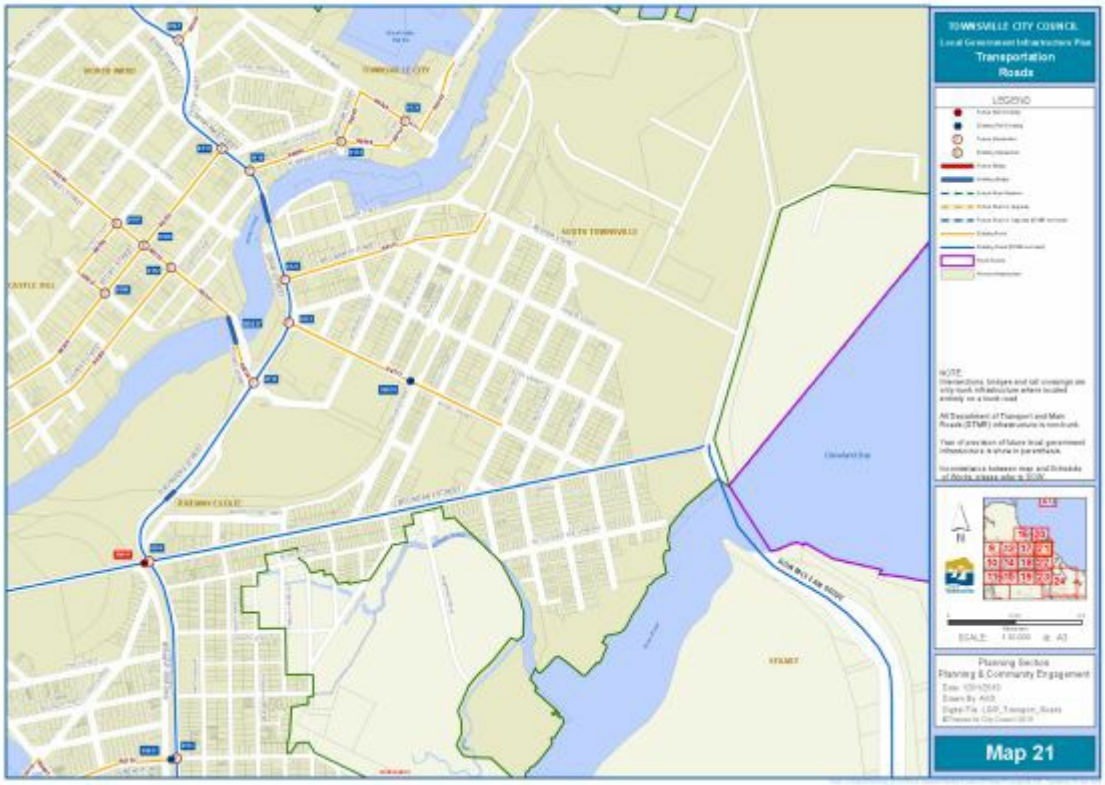

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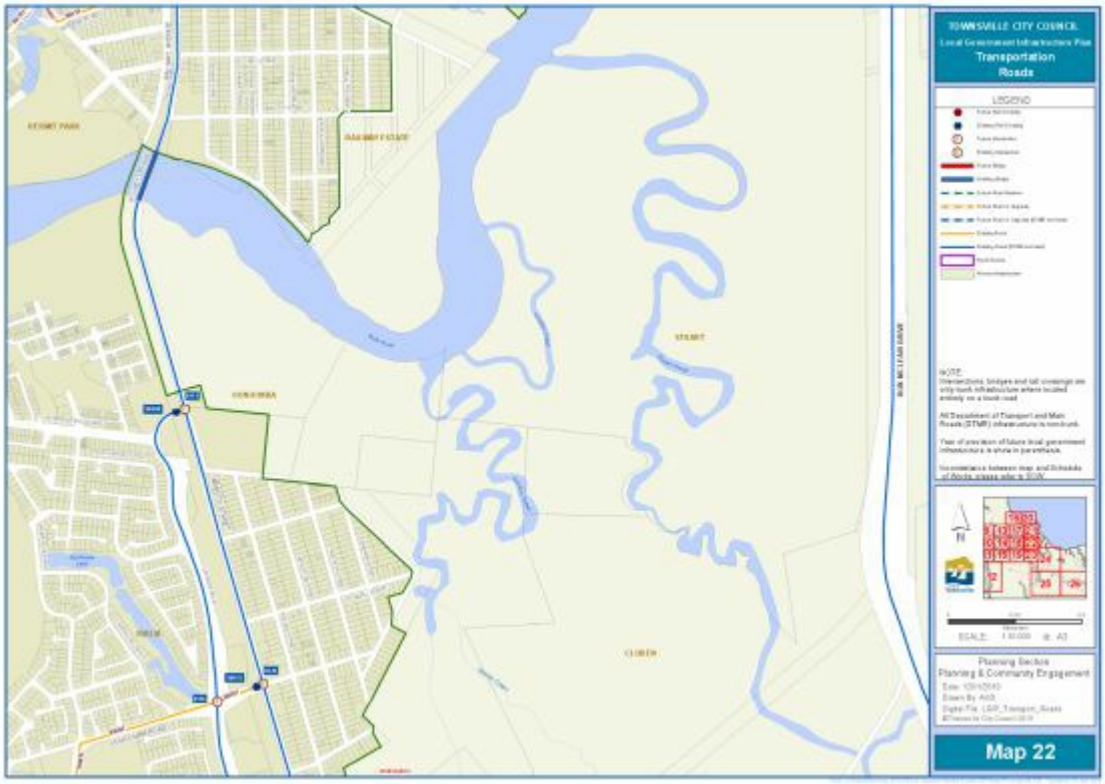

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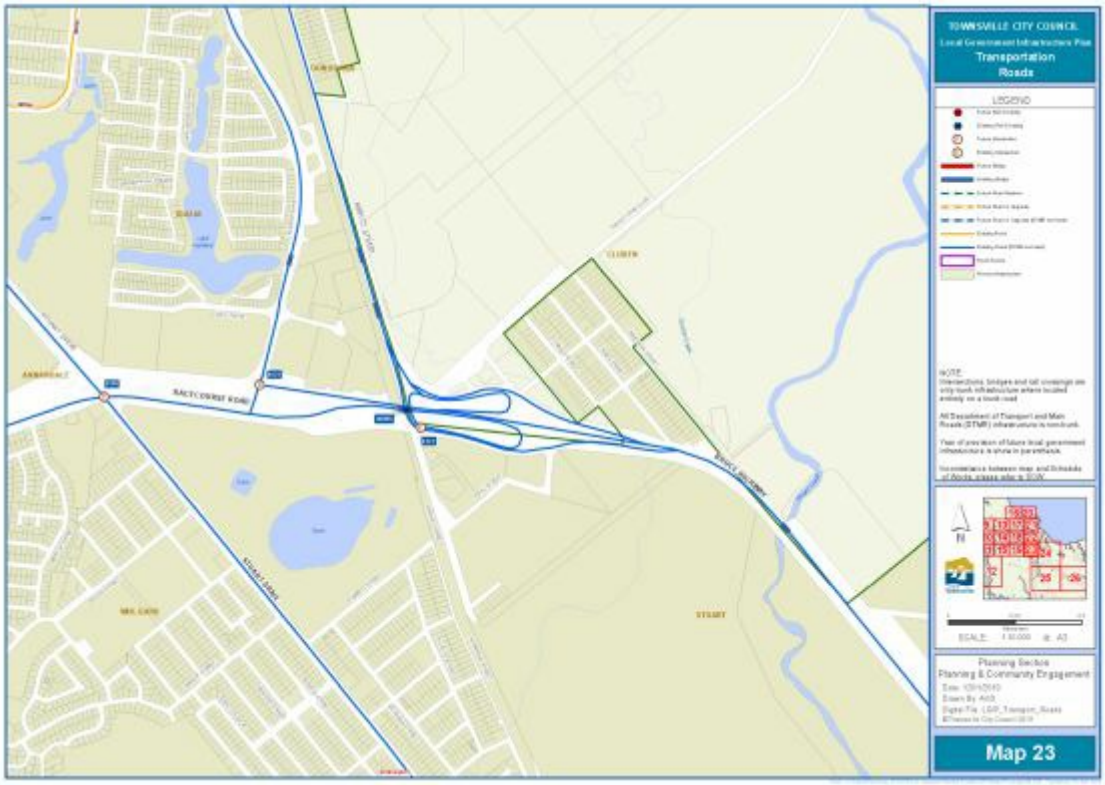

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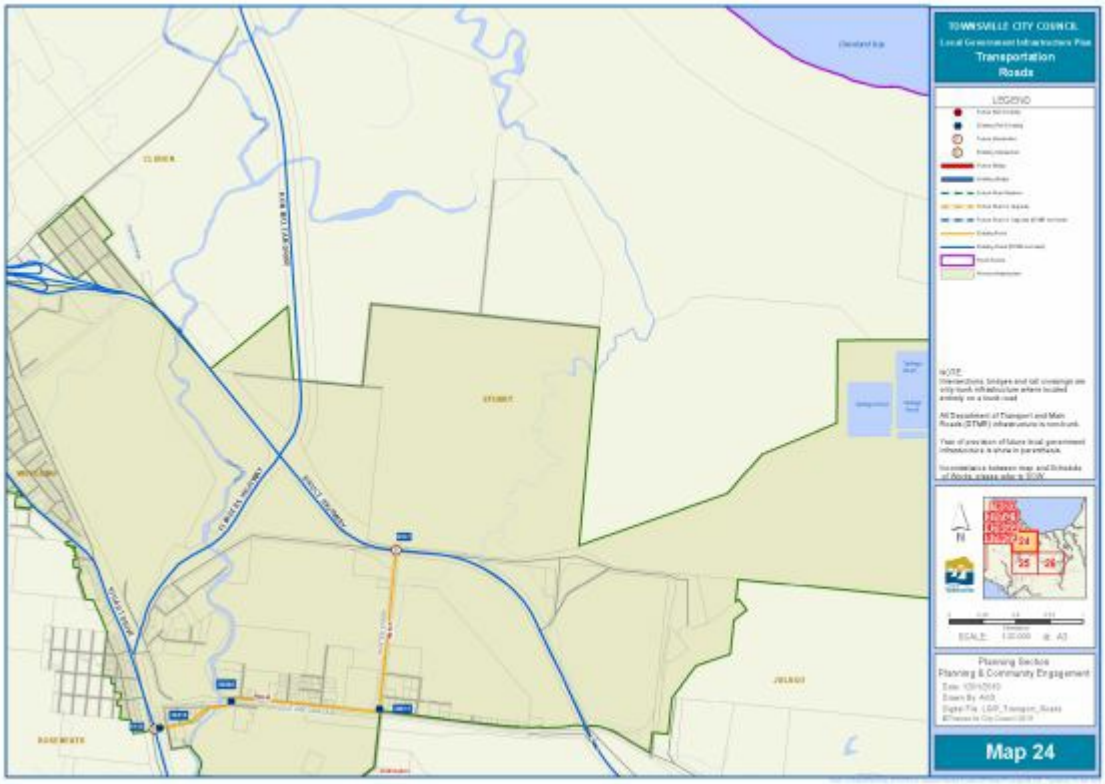

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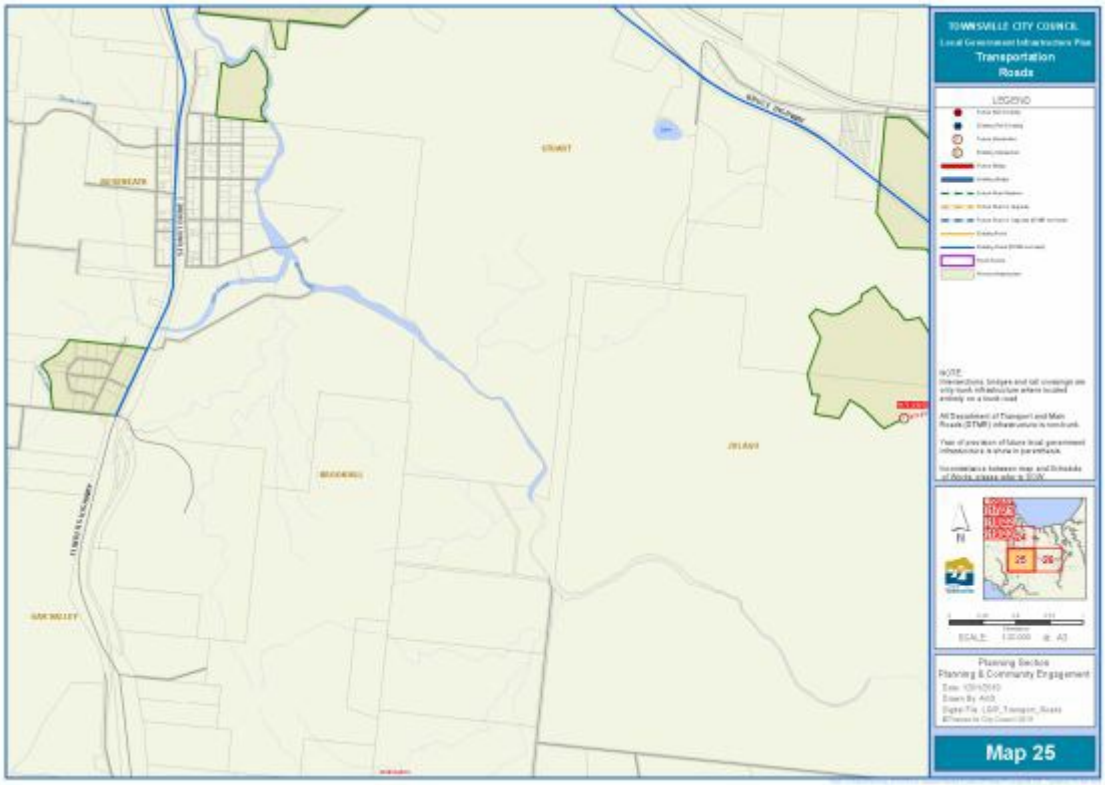

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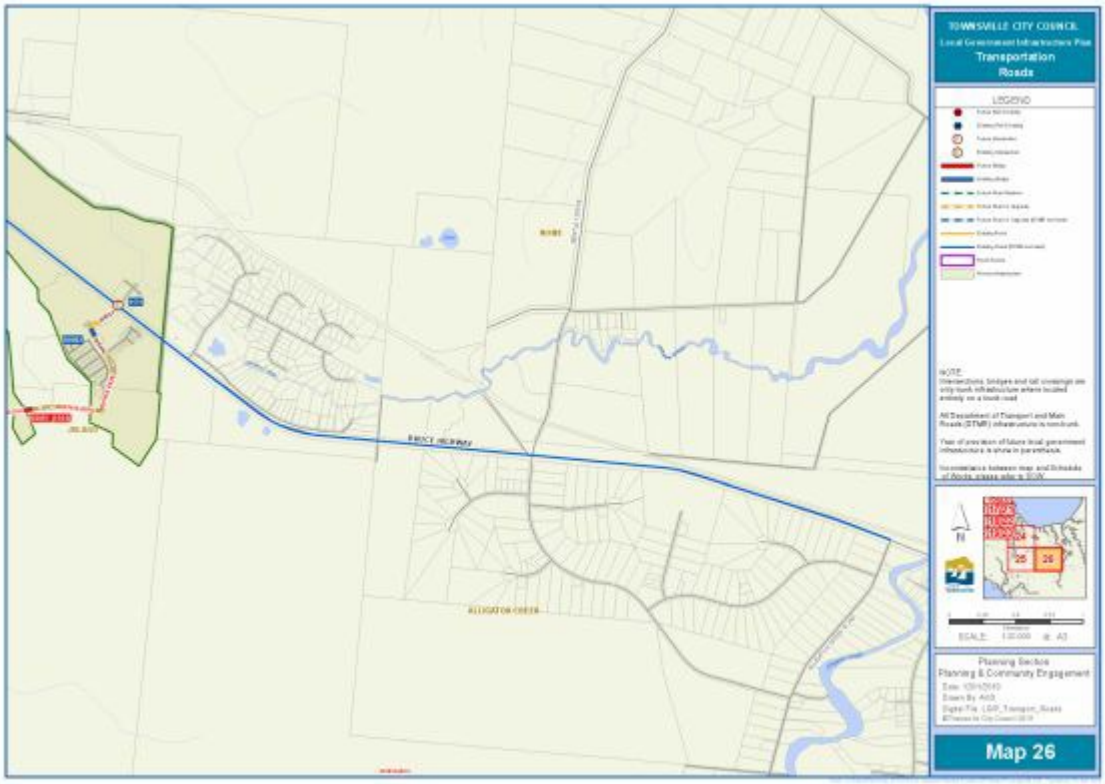

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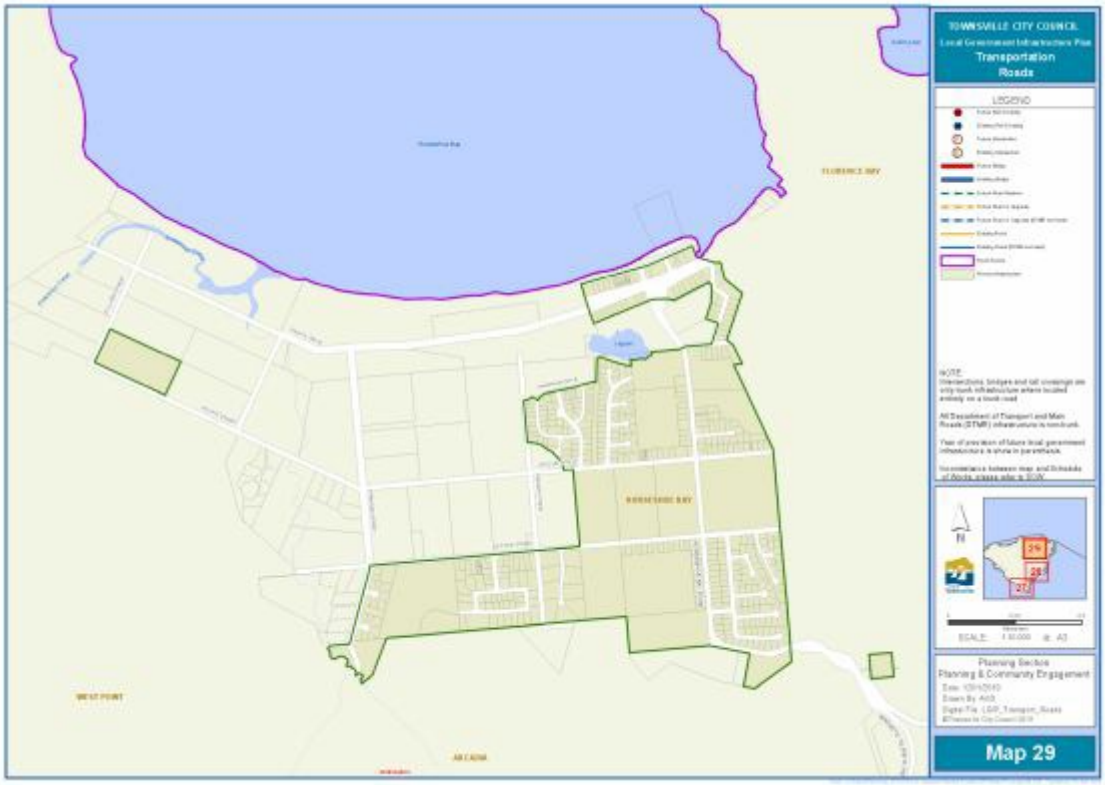

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Table SC3.3.7.1 - Roads network schedule of future works

Map	Type	ID	Profile	Location	Length (m)	Year	Cost ($'19)
2	Bridge	B15a	Culvert with 2 lanes	NORTHSHORE BOULEVARD CULVERT	(16)	2031	(72,887)
2	Bridge	B15b	Culvert with 4 lanes	NORTHSHORE BOULEVARD CULVERT	16	2031	870,575
2	Bridge	B16a	Culvert with 2 lanes	NORTHSHORE BOULEVARD CULVERT	(13)	2028	(48,316)
2	Bridge	B16b	Culvert with 4 lanes	NORTHSHORE BOULEVARD CULVERT	13	2028	684,455
2	Bridge	B35a	Culvert with 2 lanes	NORTHSHORE BOULEVARD CULVERT	(19)	2031	(85,205)
2	Bridge	B35b	Culvert with 4 lanes	NORTHSHORE BOULEVARD CULVERT	19	2031	1,012,232
2	Bridge	B38a	Culvert with 2 lanes	NORTHSHORE BOULEVARD CULVERT	(30)	2031	(130,370)
2	Bridge	B38b	Culvert with 4 lanes	NORTHSHORE BOULEVARD CULVERT	30	2031	1,531,638
2	Bridge	B41a	Bridge with short spans with 2 lanes	NORTHSHORE BOULEVARD STONY CREEK BRIDGE	(68)	2031	(746,840)
2	Bridge	B41b	Bridge with short spans with 4 lanes	NORTHSHORE BOULEVARD STONY CREEK BRIDGE	68	2031	12,148,484
2	Bridge	B4a	Culvert with 2 lanes	NORTHSHORE BOULEVARD CULVERT	(29)	2031	(126,264)
2	Bridge	B4b	Culvert with 4 lanes	NORTHSHORE BOULEVARD CULVERT	29	2031	1,484,420
2	Road	R185b	Subarterial with 2 lanes, kerbs and no median	MOUNT LOW PARKWAY (Shoalmarra - Frendon Pde)	(807)	2031	(1,997,951)
2	Road	R185b	Subarterial with 4 lanes, kerbs and median	MOUNT LOW PARKWAY (Shoalmarra - Frendon Pde)	807	2031	9,359,744
2	Road	R185c	Subarterial with 2 lanes, kerbs and no median	MOUNT LOW PARKWAY (Fendon Pde - Bonnet Rd)	(430)	2026	(1,064,584)
2	Road	R185c	Subarterial with 4 lanes, kerbs and median	MOUNT LOW PARKWAY (Fendon Pde - Bonnet Rd)	430	2026	4,779,423
2	Road	R185d	Subarterial with 2 lanes, kerbs and no median	MOUNT LOW PARKWAY (Bonnet Rd - Highway)	(182)	2021	(450,591)

Map	Type	ID	Profile	Location	Length (m)	Year	Cost ($'19)
2	Road	R185d	Subarterial with 4 lanes, kerbs and median	MOUNT LOW PARKWAY (Bonnet Rd - Highway)	182	2021	1,890,989
2	Road	R195	Arterial with 2 lanes, table drains and no median	NORTH SHORE BOULEVARD (Lionel Turner - Synnove)	(778)	2026	(2,437,335)
2	Road	R195	Arterial with 4 lanes, table drains and median	NORTH SHORE BOULEVARD (Lionel Turner - Synnove)	778	2026	9,680,208
2	Road	R196	Arterial with 2 lanes, table drains and no median	NORTH SHORE BOULEVARD (Lionel Turner - Synnove)	(803)	2026	(2,515,655)
2	Road	R196	Arterial with 4 lanes, table drains and median	NORTH SHORE BOULEVARD (Lionel Turner - Synnove)	803	2026	9,991,610
2	Road	R197	Arterial with 2 lanes, table drains and no median	NORTH SHORE BOULEVARD (Lionel Turner - Synnove)	(1,198)	2026	(3,753,119)
2	Road	R197	Arterial with 4 lanes, table drains and median	NORTH SHORE BOULEVARD (Lionel Turner - Synnove)	1,198	2026	14,910,435
2	Road	R198	Arterial with 2 lanes, table drains and no median	NORTH SHORE BOULEVARD (Lionel Turner - Synnove)	(451)	2026	(1,412,902)
2	Road	R198	Arterial with 4 lanes, table drains and median	NORTH SHORE BOULEVARD (Lionel Turner - Synnove)	451	2026	5,609,460
2	Road	R309b	Subarterial with 2 lanes, table drains and no median	LIONEL TURNER DRIVE	1,532	2026	12,231,645
2	Road	R362	Subarterial with 2 lanes, table drains and no median	NORTH SHORE BOULEVARD (Mt Low Pwy - Lionel Turner)	(1,471)	2026	(4,454,912)
2	Road	R362	Subarterial with 4 lanes, table drains and median	NORTH SHORE BOULEVARD (Mt Low Pwy - Lionel Turner)	1,471	2026	17,509,183
4	Rail Xing	X12a	Rail Crossing with 2 lanes	GARLAND ROAD	(8)	2031	(251,725)
4	Rail Xing	X12b	Rail Crossing with 6 lanes	GARLAND ROAD	8	2031	2,301,485
4	Road	R194b	Arterial with 2 lanes, table drains and no median	NORTH SHORE BOULEVARD (Erskin Pl - Main St)	(295)	2026	(924,182)
4	Road	R194b	Arterial with 6 lanes, kerbs and median	NORTH SHORE BOULEVARD (Erskin Pl - Main St)	295	2026	3,823,456
4	Road	R194c	Arterial with 2 lanes, table drains and no median	NORTH SHORE BOULEVARD (Saunders Ck - Erskin Pl)	(423)	2022	(1,329,874)
4	Road	R194c	Arterial with 4 lanes, kerbs and median	NORTH SHORE BOULEVARD (Saunders Ck - Erskin Pl)	423	2022	4,744,926
4	Road	R199a	Arterial with 4 lanes, table drains and no median	NORTH SHORE BOULEVARD (Main St - Burdell Dr)	(280)	2026	(1,104,161)

Map	Type	ID	Profile	Location	Length (m)	Year	Cost ($'19)
4	Road	R199a	Arterial with 6 lanes, kerbs and median	NORTH SHORE BOULEVARD (Main St - Burdell Dr)	280	2026	3,852,216
4	Road	R199b	Arterial with 4 lanes, table drains and no median	NORTH SHORE BOULEVARD (Burdell Dr - Highway)	(446)	2023	(1,758,771)
4	Road	R199b	Arterial with 6 lanes, kerbs and median	NORTH SHORE BOULEVARD (Burdell Dr - Highway)	446	2023	5,735,854
4	Road	R20	Subarterial with 2 lanes, kerbs and no median	BANFIELD DRIVE	1,385	2022	8,952,648
4	Road	R32b	Arterial with 2 lanes, table drains and no median	NORTH SHORE BOULEVARD (Synnove Dr - Waterway Dr)	(1,161)	2026	(3,637,205)
4	Road	R32b	Arterial with 4 lanes, table drains and median	NORTH SHORE BOULEVARD (Synnove Dr - Waterway Dr)	1,161	2026	14,746,048
4	Road	R32c	Arterial with 2 lanes, table drains and no median	NORTH SHORE BOULEVARD (Waterway Dr - Saunders Ck)	(491)	2022	(1,543,660)
4	Road	R32c	Arterial with 4 lanes, kerbs and median	NORTH SHORE BOULEVARD (Waterway Dr - Saunders Ck)	491	2022	5,507,704
6	Rail Xing	X14a	Rail Crossing with 2 lanes	INGHAM ROAD	(8)	2022	(251,725)
6	Rail Xing	X14b	Rail Crossing with 6 lanes	INGHAM ROAD	8	2022	2,061,747
9	Intersection	I139	4 way unsignalised intersection with 0, 0, 0, 0 lanes	Abattoir Road Bayswater Road		2024	646,469
9	Intersection	I153	3 way unsignalised intersection with 3, 3, 3 lanes	Ingham Road Enterprise Street		2022	2,581,132
9	Intersection	I153	3 way unsignalised intersection with 3, 5, 5 lanes	Ingham Road Enterprise Street		2022	1,833,672
9	Road	R146a	Subarterial with 2 lanes, kerbs and median	INGHAM ROAD	(1,620)	2021	(3,962,609)
9	Road	R146b	Subarterial with 4 lanes, table drains and median	INGHAM ROAD	1,620	2021	18,749,352
9	Road	R147a	Subarterial with 2 lanes, kerbs and median	INGHAM ROAD	(886)	2022	(2,166,644)
9	Road	R147b	Subarterial with 4 lanes, kerbs and median	INGHAM ROAD	886	2022	9,203,205
9	Road	R24a	Major Collector with 2 lanes, kerbs and no median	BAYSWATER ROAD	(785)	2024	(1,764,344)
9	Road	R24b	Major Collector with 4 lanes, kerbs and no median	BAYSWATER ROAD	785	2024	6,605,852
9	Road	R283a	Major Collector with 2 lanes, kerbs and no median	WEBB DRIVE	(579)	2031	(985,720)

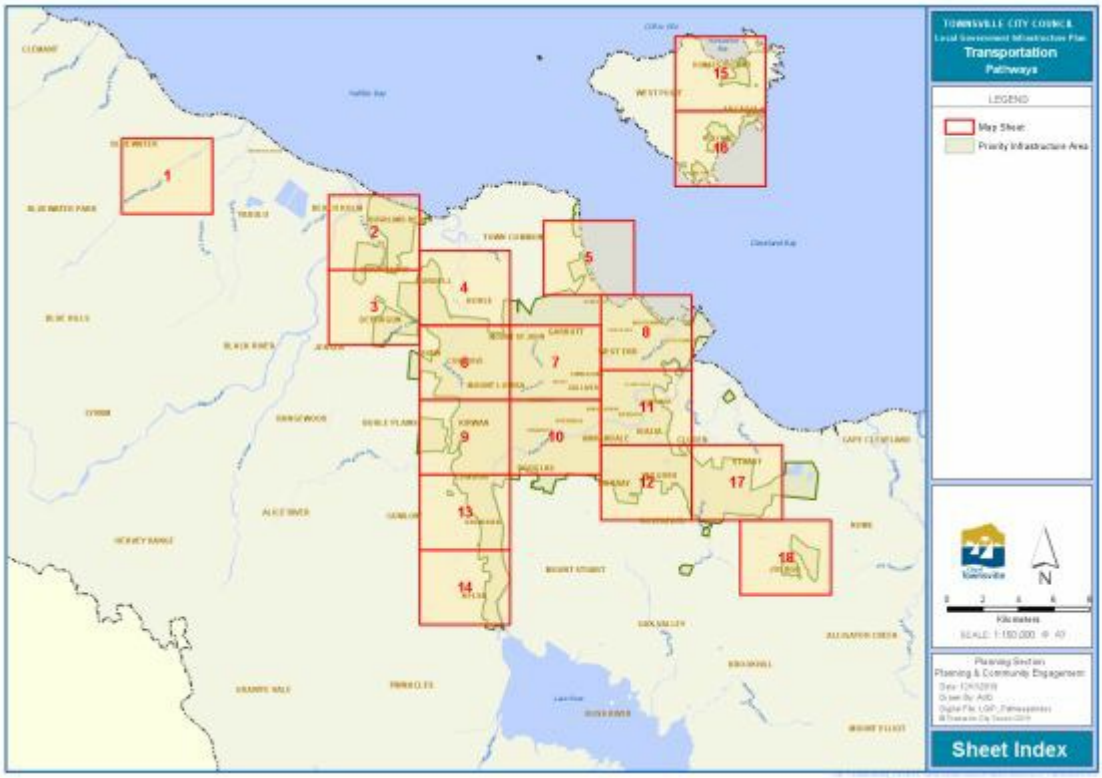
Map	Type	ID	Profile	Location	Length (m)	Year	Cost ($'19)
9	Road	R283b	Major Collector with 4 lanes, kerbs and no median	WEBB DRIVE	579	2031	4,463,536
9	Road	R299a	Road reserve only (sub-arterial)	BAYSWATER ROAD (Extension)	1,200	2024	1,262,523
9	Road	R299b	Subarterial with 2 lanes, table drains and no median	BAYSWATER ROAD	1,317	2023	8,974,324
9	Road	R319a	Subarterial with 2 lanes, kerbs and median	INGHAM ROAD	(733)	2022	(1,792,224)
9	Road	R319b	Subarterial with 4 lanes, kerbs and median	INGHAM ROAD	733	2022	7,612,790
9	Road	R348a	Subarterial with 2 lanes, table drains and no median	LIBERTY DRIVE	576	2024	4,198,825
10	Intersection	I14	3 way signalised intersection with 5, 4, 5 lanes	Kern Brother Drive Dalrymple Road		2027	(1,744,067)
10	Intersection	I14	3 way signalised intersection with 5, 5, 5 lanes	Kern Brother Drive Dalrymple Road		2027	2,232,138
10	Road	R308b	Subarterial with 2 lanes, table drains and no median	LIBERTY DRIVE	1,416	2024	10,320,654
10	Road	R72a	Arterial with 2 lanes, table drains and no median	DALRYMPLE ROAD	(2,083)	2022	(4,584,679)
10	Road	R72b	Arterial with 4 lanes, table drains and median	DALRYMPLE ROAD	2,083	2022	22,181,549
10	Road	R78a	Arterial with 2 lanes, table drains and no median	DALRYMPLE ROAD	(535)	2022	(1,638,583)
10	Road	R78b	Arterial with 4 lanes, table drains and no median	DALRYMPLE ROAD	535	2022	4,894,343
12	Road	R363	Subarterial with 2 lanes, table drains and no median	ALLAMBIE LANE (Riverway Dr - Beck Drive)	(1,160)	2031	(3,770,324)
12	Road	R363	Subarterial with 4 lanes, kerbs and median	ALLAMBIE LANE (Riverway Dr - Beck Drive)	1,160	2031	13,762,635
13	Intersection	I151	4 way signalised intersection with 3, 3, 3, 3 lanes	Ingham Road Mather Street		2021	(1,555,426)
13	Intersection	I151	4 way signalised intersection with 3, 5, 4, 5 lanes	Ingham Road Mather Street		2021	2,137,777
17	Road	R143b	Subarterial with 2 lanes, kerbs and no median	INGHAM ROAD	(1,075)	2023	(2,673,380)
17	Road	R143b	Subarterial with 4 lanes, kerbs and no median	INGHAM ROAD	1,075	2023	8,997,328
18	Intersection	I80	3 way 1 lane roundabout with 2, 2, 2 lanes	Kings Road Balls Lane Fulham Road		2026	(963,077)
18	Intersection	I80	3 way 2 lane roundabout with 4, 4, 4 lanes	Kings Road Balls Lane Fulham Road		2026	4,821,809
18	Intersection	I81	3 way unsignalised intersection with 3, 2, 3 lanes	Kings Road Palmerston Street		2021	(607,383)
18	Intersection	I81	3 way 2 lane roundabout with 3, 2, 3 lanes	Kings Road Palmerston Street		2021	3,170,506

Map	Type	ID	Profile	Location	Length (m)	Year	Cost ($'19)
18	Road	R159a	Subarterial with 2 lanes, kerbs and median	KINGS ROAD	(92)	2026	(225,037)
18	Road	R159b	Subarterial with 3 lanes, kerbs and median	KINGS ROAD	92	2026	929,388
18	Road	R19a	Subarterial with 2 lanes, kerbs and no median	BALLS LANE	(454)	2026	(864,547)
18	Road	R19b	Subarterial with 3 lanes, kerbs and no median	BALLS LANE	454	2026	3,531,960
18	Road	R70a	Subarterial with 2 lanes, kerbs and no median	CROSS STREET	(115)	2026	(219,799)
18	Road	R70b	Subarterial with 3 lanes, kerbs and no median	CROSS STREET	115	2026	870,360
18	Road	R71a	Subarterial with 2 lanes, kerbs and no median	CROSS STREET	(113)	2026	(215,038)
18	Road	R71b	Subarterial with 3 lanes, kerbs and no median	CROSS STREET	113	2026	820,909
26	Bridge	B81	Culvert with 2 lanes	Rocky Springs	63	2024	1,750,623
26	Road	R343	Major Collector with 2 lanes, kerbs and median	Rocky Springs	388	2024	2,841,386
26	Road	R344	Major Collector with 2 lanes, kerbs and median	Rocky Springs	445	2024	3,261,848
26	Road	R345	Major Collector with 2 lanes, kerbs and median	Rocky Springs	410	2020	2,807,660

SC3.3.8 - Plans for trunk footpaths and cycleways infrastructure

Editor's note—This document is intended to function in an electronic environment whereupon hyperlinks to detailed PDF maps allow for closer examination of mapping information. The following images are true copies of such maps, but at a coarser scale.

The maps are also loaded in a GIS environment. TownsvilleMaps is the current in-service GIS platform for this purpose, which can be publicly viewed at council, or privately accessed via subscription.



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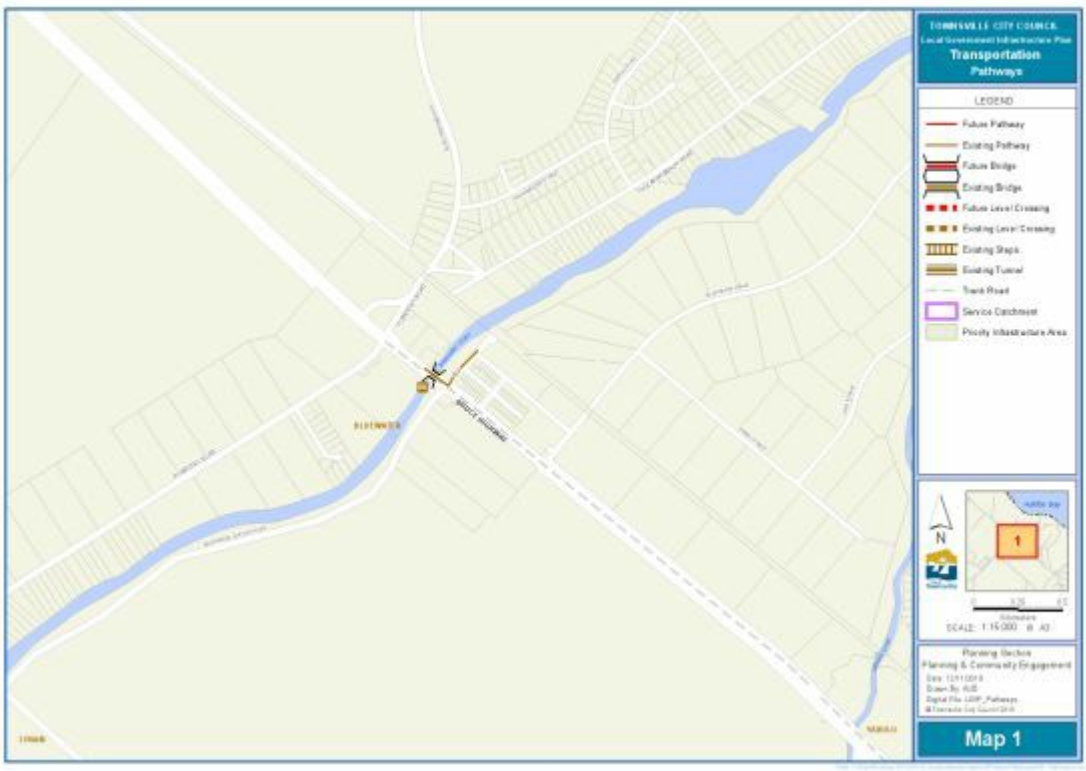

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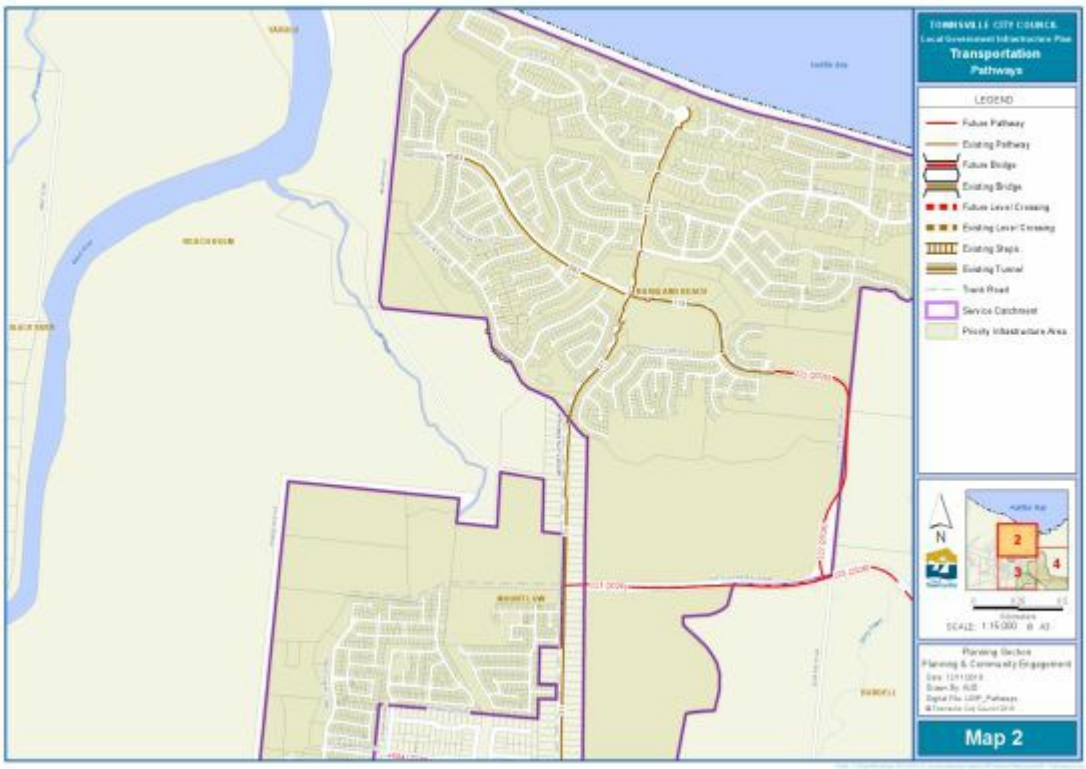

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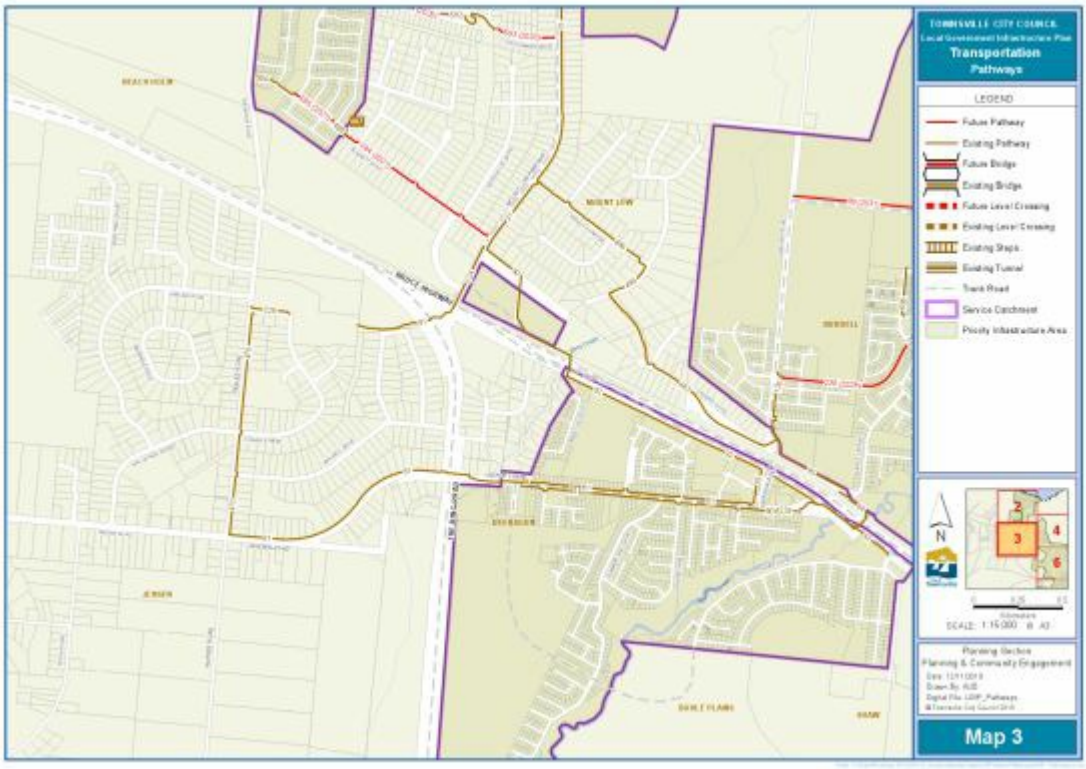

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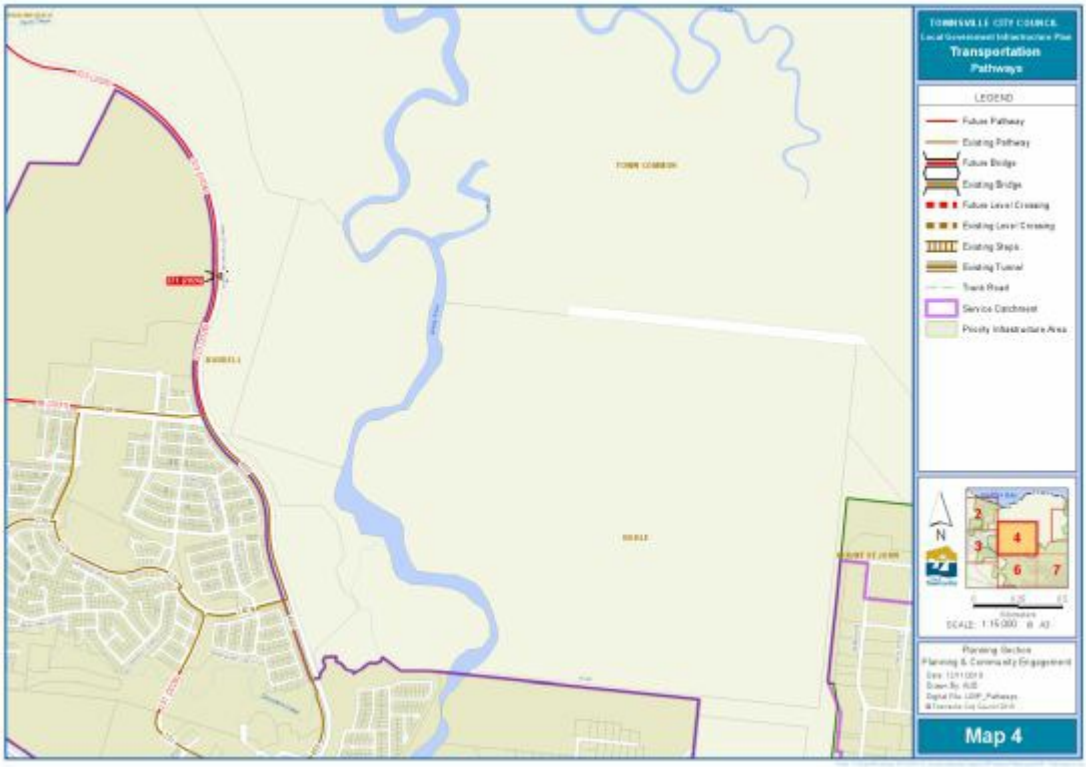

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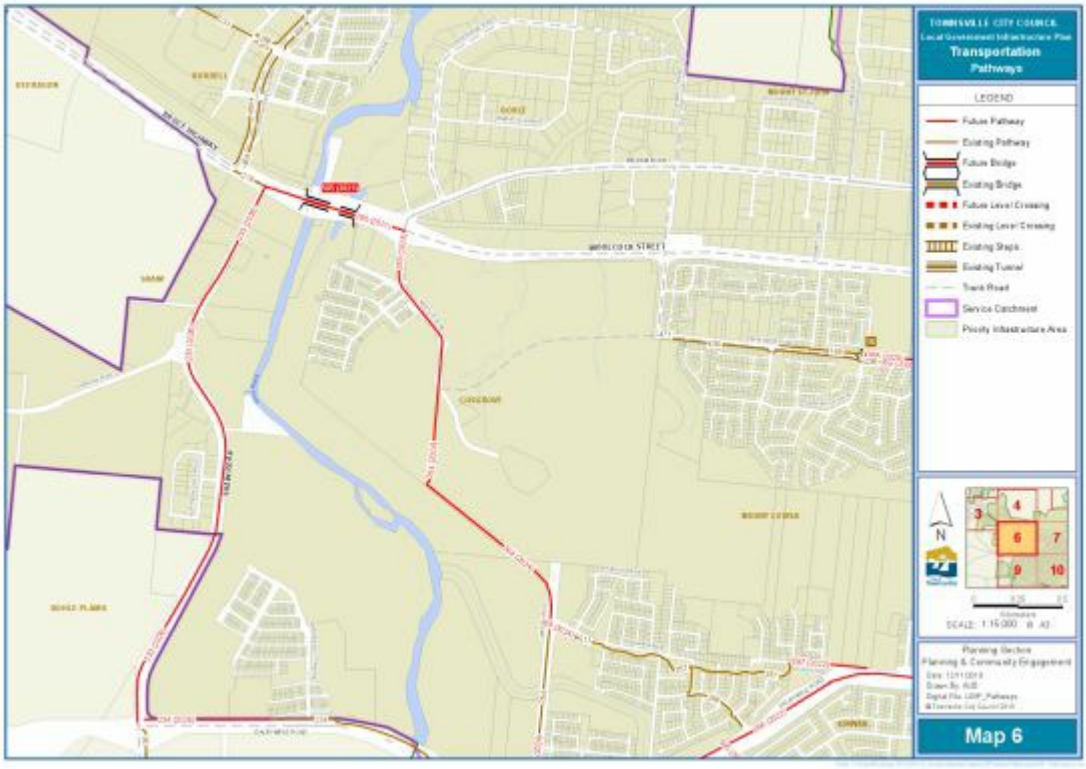

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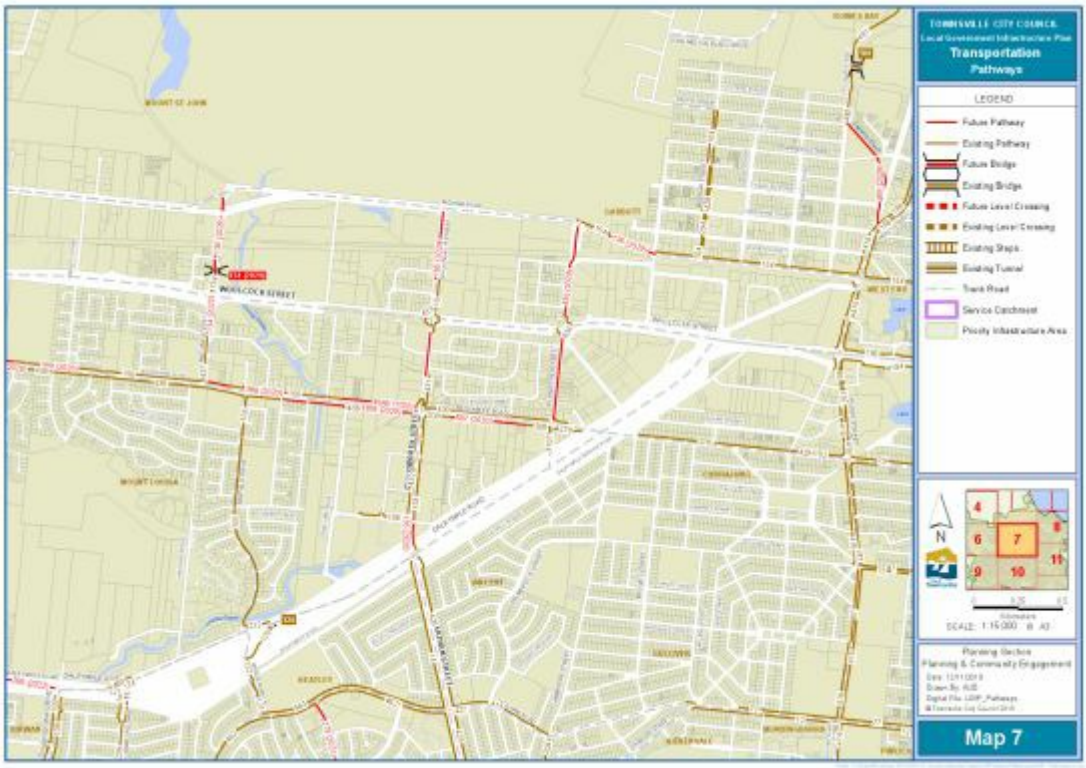

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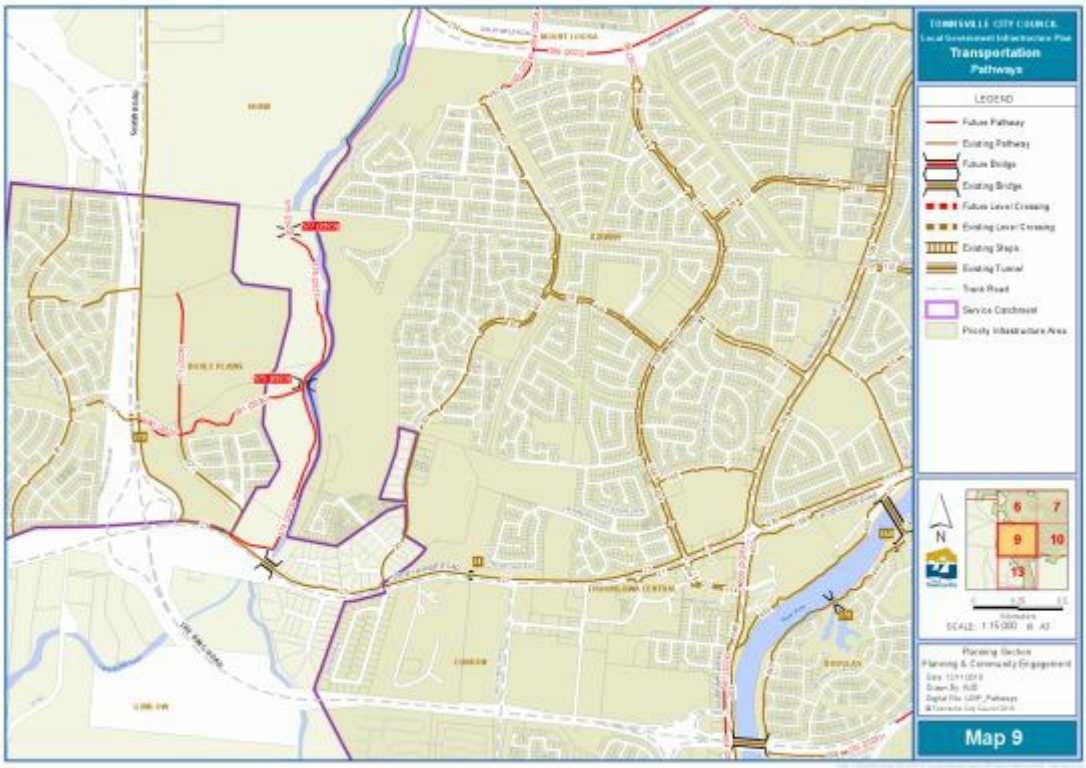

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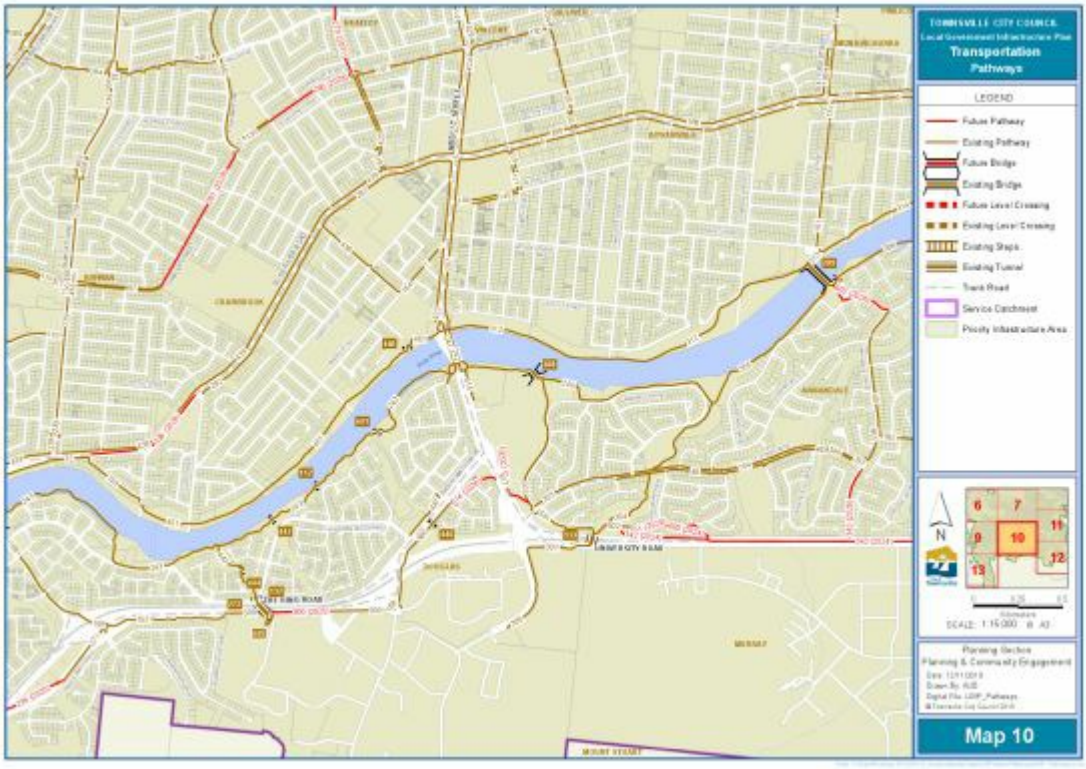

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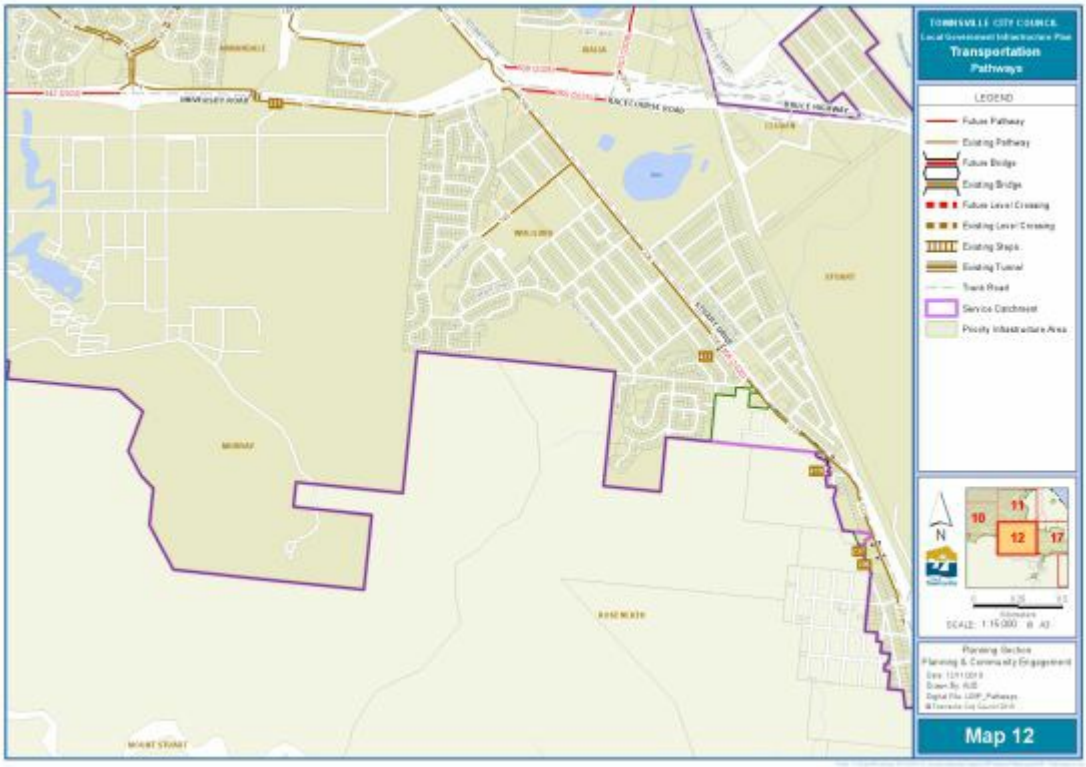

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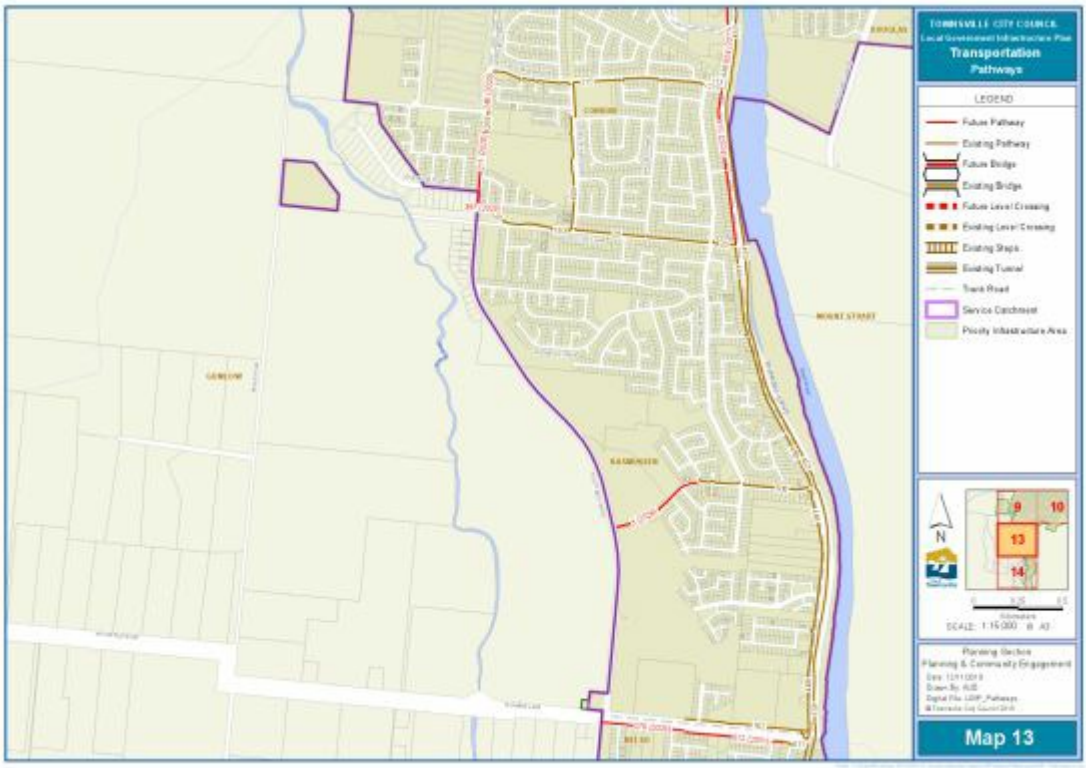

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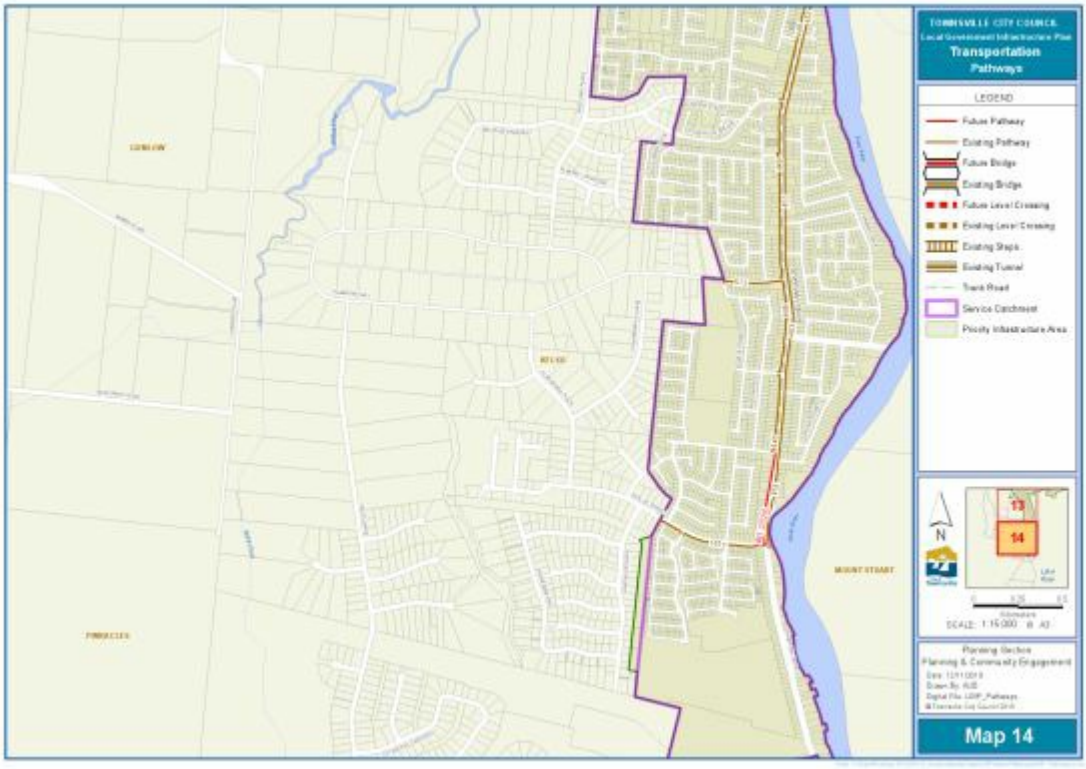

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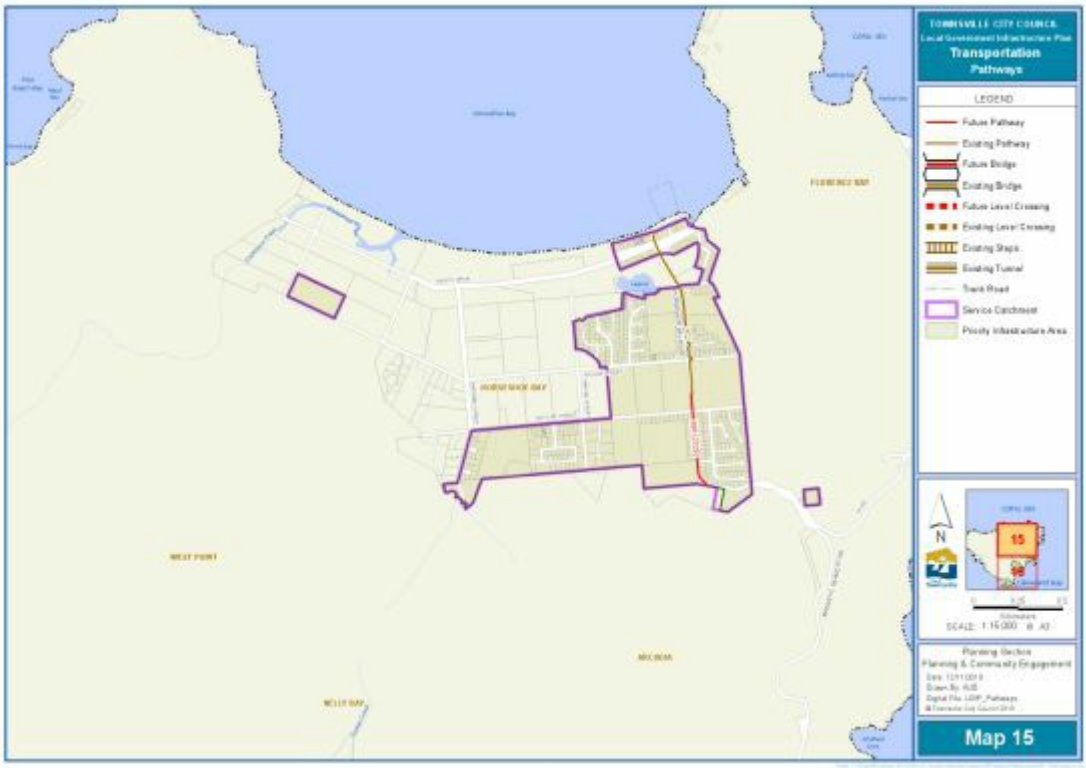

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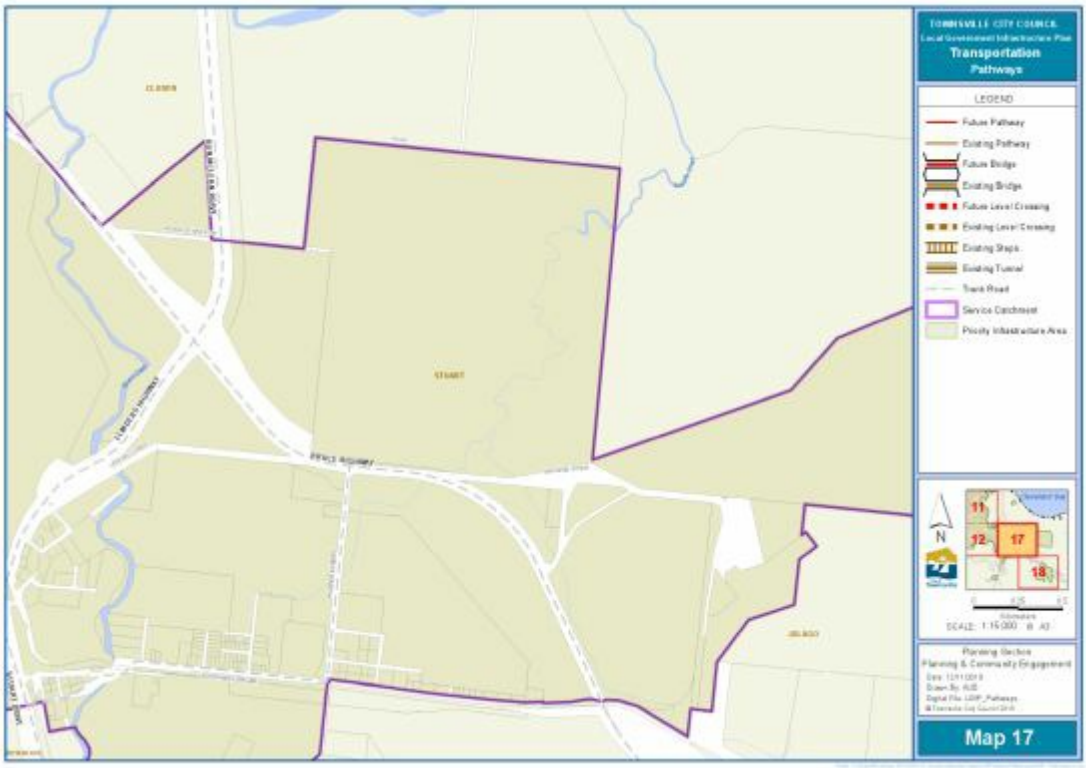

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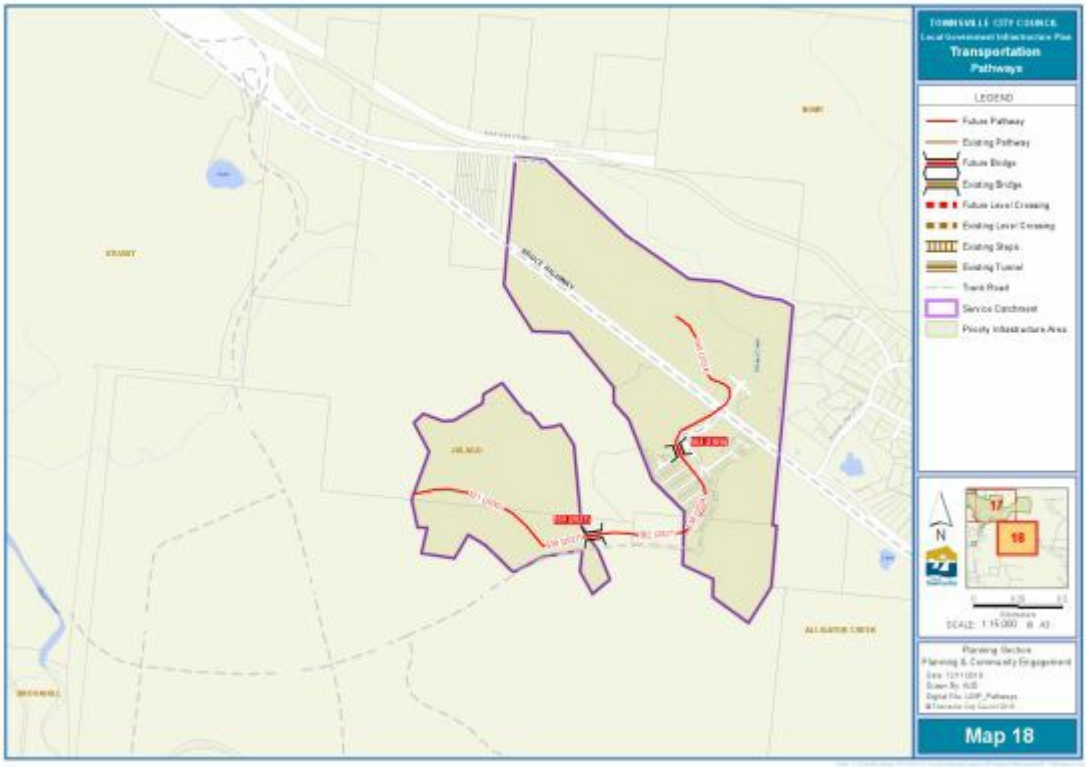

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Table SC3.3.8.1 - Footpaths and cycleways network schedule of future works

Map	Type	ID	Location	Length (m)	Year	Cost ($'19)
2	Bridge	370	North Shore Boulevard	68	2026	194,398
2	Path	222	Lionel Turner Drive	1,532	2026	516,699
2	Path	594	Shoalmarra Drive	284	2020	98,384
3	Path	230	Weatherby Drive	848	2028	315,798
3	Path	284	Bonnett Road	999	2021	346,075
3	Path	593	Shoalmarra Drive	336	2020	116,398
3	Path	595	Bonnett Road	293	2021	101,502
4	Bridge	371	North Shore Boulevard	30	2026	86,297
4	Path	98	Synnove Drive (pka Garland Link Road)	1,105	2031	398,686
4	Path	223	North Shore Boulevard	4,706	2026	1,587,198
4	Path	231	Yalbira Drive	266	2028	99,059
5	Path	40	Cape Pallarenda Road	1,095	2020	379,332
6	Bridgeh	585	Bruce Highway	225	2021	2,418,869
6	Path	233	Shaw Road	2,237	2026	833,067
6	Path	233	Shaw Road	1,054	2026	392,513
6	Path	234	Dalrymple Road	713	2026	240,474
6	Path	259	Abattoir Road	973	2024	362,528
6	Path	260	Bruce Highway	595	2021	206,121
6	Path	264	Liberty Drive (Abattoir Rd to Graham Ave)	1,616	2024	601,892
6	Path	266	Dalrymple Road	2,592	2022	897,925
6	Path	269	Graham Avenue	92	2024	34,261
6	Path	388	Bayswater Road	1,385	2020	479,794
6	Path	389	Bayswater Road	196	2020	67,899
6	Path	597	Horn Street	431	2022	149,308
7	Bridgeh	134	Mather Street	27	2029	333,804
7	Path	134	Mather Street	141	2020	48,845
7	Path	134	Mather Street	370	2029	147,403
7	Path	135	Duckworth Street	236	2020	81,756
7	Path	136	Ingham Road	281	2029	111,946
7	Path	155	Duckworth Street	631	2029	251,381
7	Path	435	Pilkington Street	982	2029	391,214
7	Path	489	Hugh Street	632	2028	235,359
7	Path	586	Bayswater Road	401	2020	138,915
7	Path	587	Bayswater Road	423	2020	146,536
8	Bridge	329	Little Fletcher Street Bridge Over Ross Creek.	74	2020	218,641
8	Bridge	492	Old Common Road	36	2028	114,343
8	Bridge	591	Boundary Street	15	2021	44,319
8	Levelxing	509	Reid Park	25	2021	26,841
8	Path	135	Reid Park to QR station	418	2021	144,804
8	Path	319	Woolcock Street	737	2021	255,313
8	Path	319	Woolcock Street	264	2021	91,455
8	Path	320	Sturt Street	354	2031	141,028
8	Path	323	Mcilwraith Street	373	2021	129,215
8	Path	328	Waterfront PDA path between bridge links	854	2021	295,844
8	Path	330	Ross Creek	269	2031	107,166
8	Path	347	Ross Creek	414	2031	164,931
8	Path	350	Ross Creek waterfront from Reef HQ to old Monsoon's	700	2021	242,495
8	Path	362	Reid Park	619	2021	214,435
8	Path	363	Reid Park	145	2021	50,231
8	Path	474	Oxley Street	125	2026	46,727

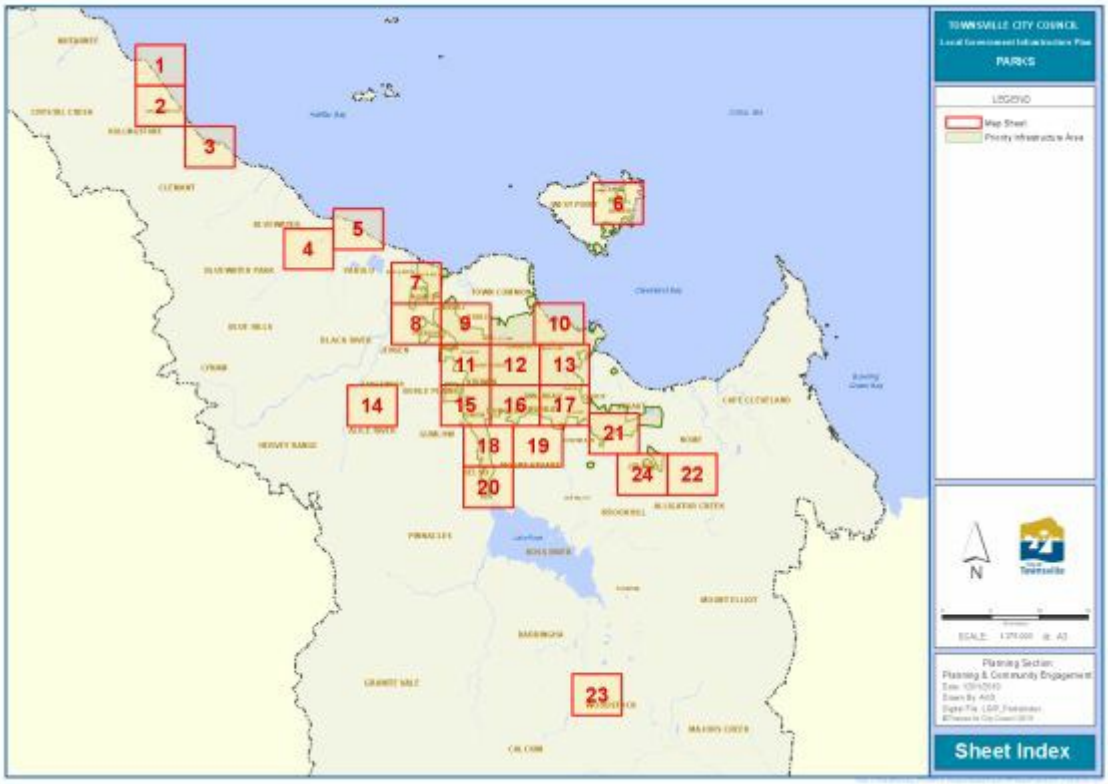
Map	Type	ID	Location	Length (m)	Year	Cost ($'19)
8	Path	482	Ross Creek	512	2031	204,158
8	Path	493	Lynam Street (Balance)	655	2028	243,855
8	Path	570	Dean Street	417	2021	144,458
8	Path	590	Morey Street	600	2021	207,853
9	Bridge	575		41	2023	121,139
9	Bridge	577		33	2023	97,502
9	Path	96	Kern Brothers Drive	98	2022	33,949
9	Path	136	Riverway Drive	250	2028	93,101
9	Path	137	Riverway Drive	454	2024	169,071
9	Path	235	Angus Smith Drive	720	2020	249,424
9	Path	264	Liberty Dr (Roosevelt Loop to Dalrymple)	276	2024	102,967
9	Path	265	Golf Links Drive	278	2024	103,528
9	Path	505	Dalrymple Road (Green View To Greenwood)	191	2022	66,167
9	Path	571		805	2023	278,870
9	Path	574		1,243	2023	430,602
9	Path	576		942	2023	326,329
9	Path	578		105	2023	36,374
9	Path	580		272	2023	94,227
9	Path	581		809	2023	280,255
10	Path	138	River Park Drive	378	2026	140,769
10	Path	279	Lindeman Avenue	699	2031	278,471
10	Path	280	Charles Street	522	2028	194,395
10	Path	281	Charles Street	846	2028	315,053
10	Path	300	Angus Smith Drive	379	2025	141,011
10	Path	336	Ross River Road	723	2028	269,248
10	Path	342	University Road	2,334	2024	869,190
10	Path	343	Annandale Drive	390	2026	145,237
10	Path	616	University Road	470	2020	162,818
10	Path	9996	Angus Smith Drive	800	2026	297,923
11	Levelxing	369	Abbott Street Deviation	18	2020	19,204
11	Path	139	Railway Avenue Service Road	1,179	2020	408,431
11	Path	322	Fairfield Waters Drive	642	2024	239,083
11	Path	352	Abbott Street	249	2020	86,259
11	Path	353	Lakeside Drive	125	2028	46,550
11	Path	353	Lakeside Drive	1,676	2028	624,148
11	Path	368	Riveredge Boulevard	129	2020	44,688
11	Path	9994	Lakeside Drive	1,000	2028	372,404
12	Path	355	Racecourse Road	500	2025	186,202
12	Path	356	Stuart Drive	203	2020	70,324
12	Path	9991	Racecourse Road	600	2028	223,442
13	Path	3	Santal Drive	535	2028	199,236
13	Path	140	Riverway Drive	268	2022	92,841
13	Path	211	North Beck Drive	423	2020	146,536
13	Path	246	North Beck Drive	178	2020	61,663
13	Path	276	Allambie Lane	472	2026	175,774
13	Path	387	Gollogoly Lane	50	2020	17,321
13	Path	9987	Riverway Drive	875	2024	325,853
13	Path	9990	Allambie Lane	555	2031	221,104
14	Path	481	Riverway Drive	571	2020	197,807
15	Path	498	Horseshoe Bay Road	527	2026	231,435
16	Path	256	Birt Street	736	2026	323,218
18	Bridge	559	Rocky Springs	95	2027	301,474

Map	Type	ID	Location	Length (m)	Year	Cost ($'19)
18	Bridge	564	Rocky Springs	69	2020	203,868
18	Path	521	Rocky Springs	840	2030	334,644

SC3.3.9 - Plans for trunk parks and land for community facilities

Editor's note—This document is intended to function in an electronic environment whereupon hyperlinks to detailed PDF maps allow for closer examination of mapping information. The following images are true copies of such maps, but at a coarser scale.

The maps are also loaded in a GIS environment. TownsvilleMaps is the current in-service GIS platform for this purpose, which can be publicly viewed at council, or privately accessed via subscription.



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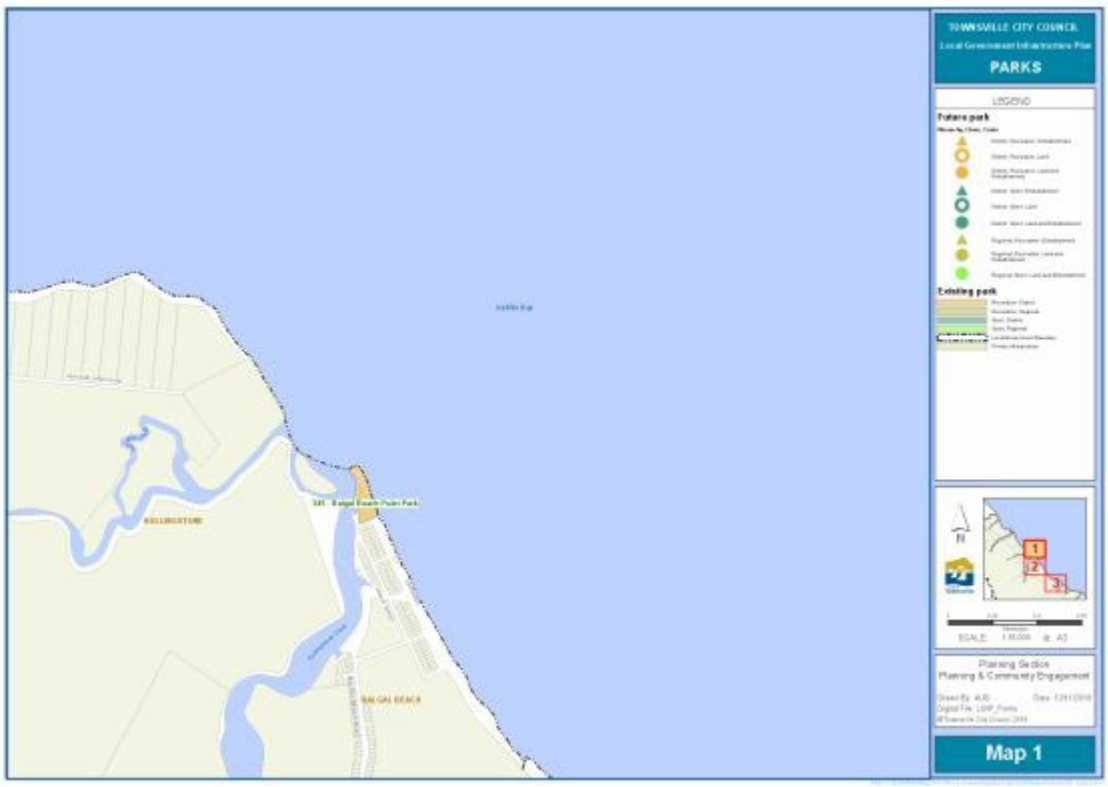

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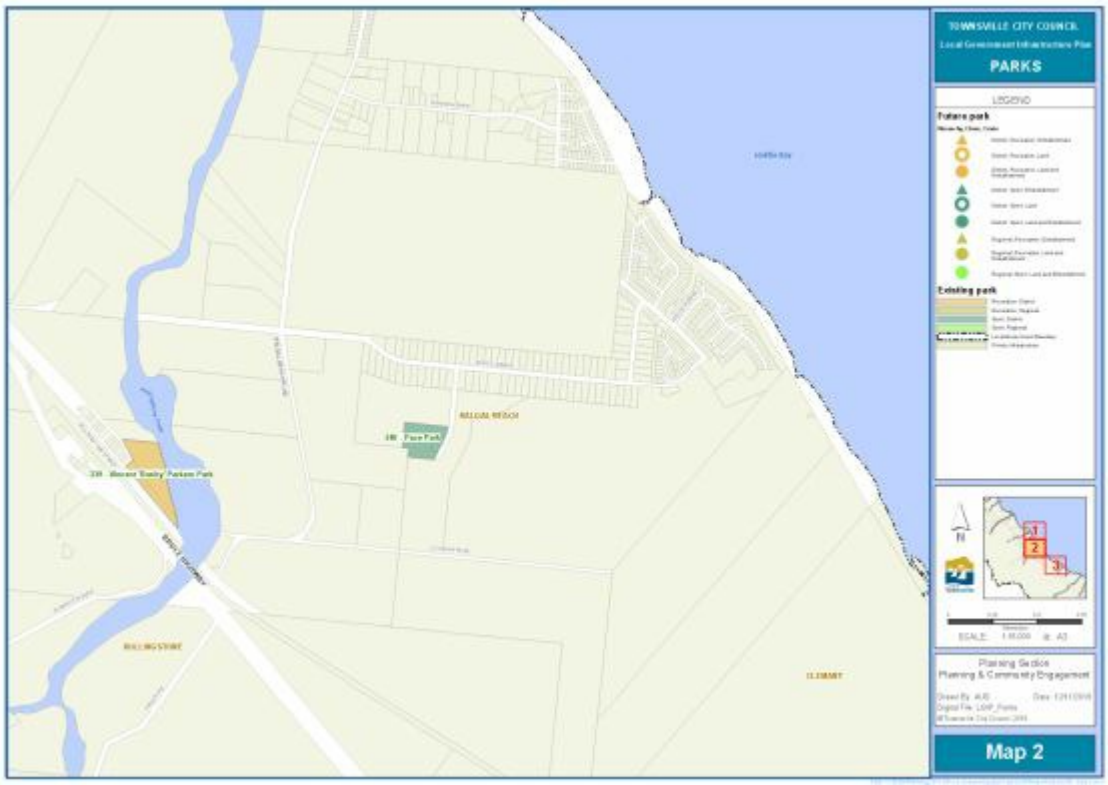

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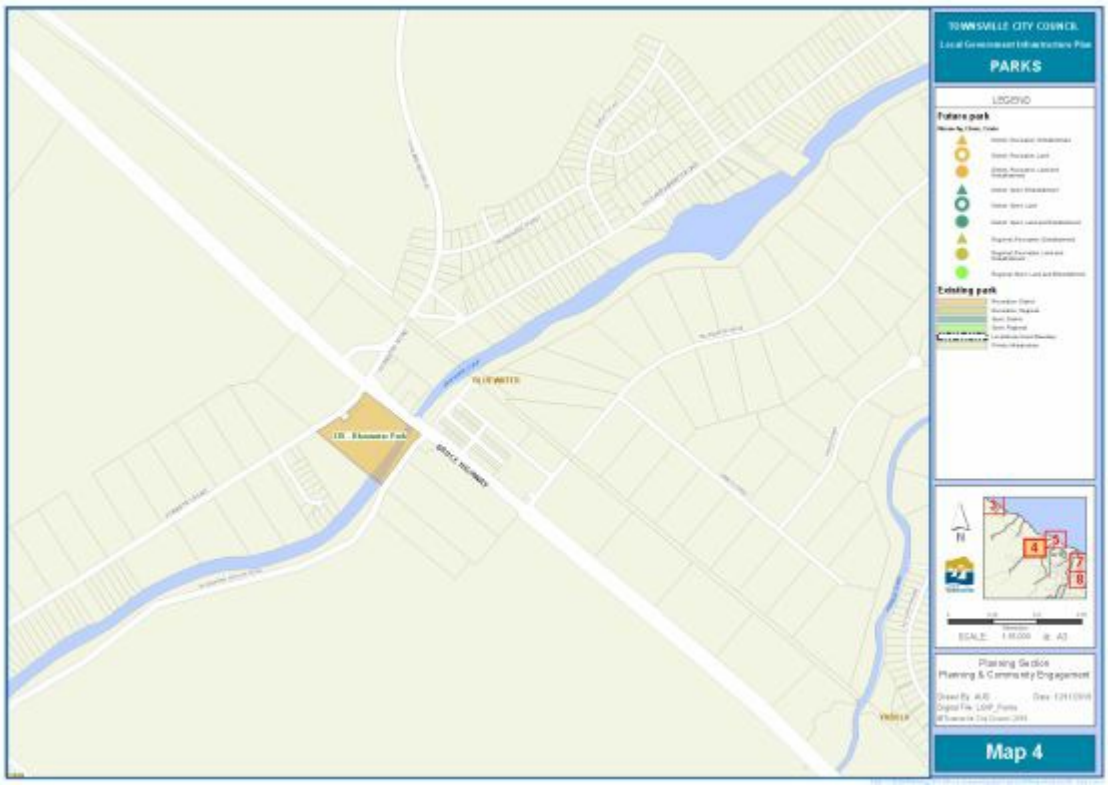

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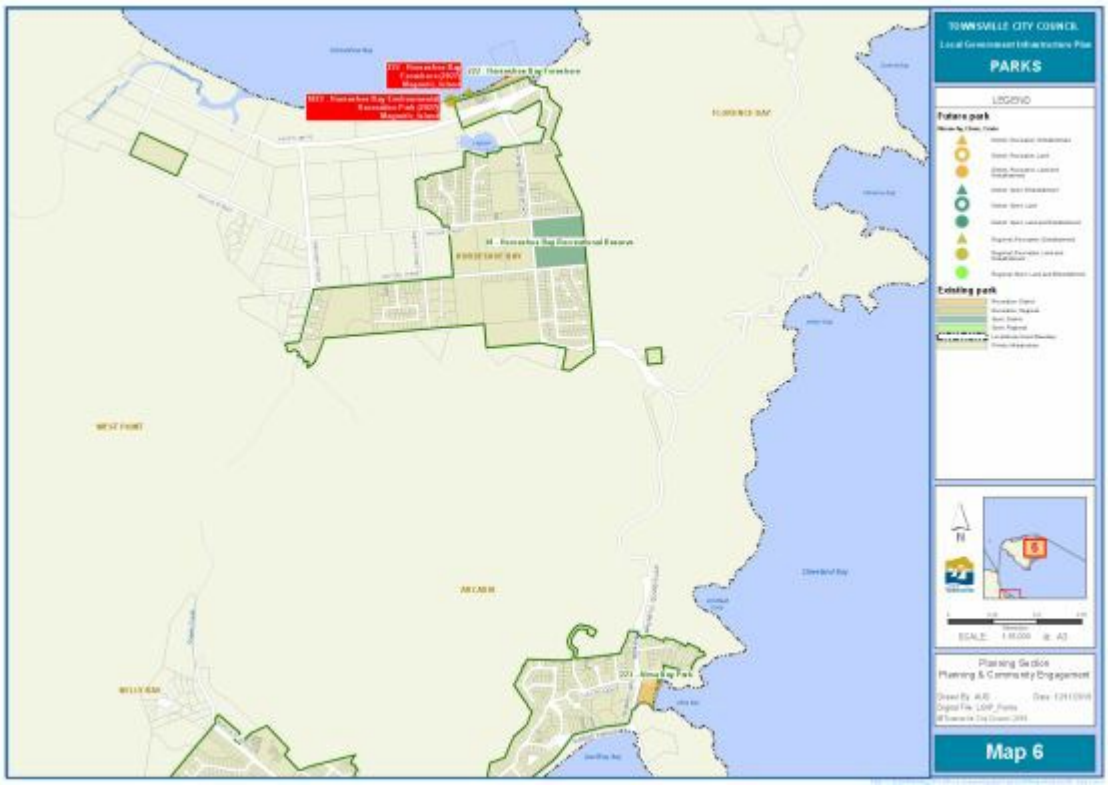

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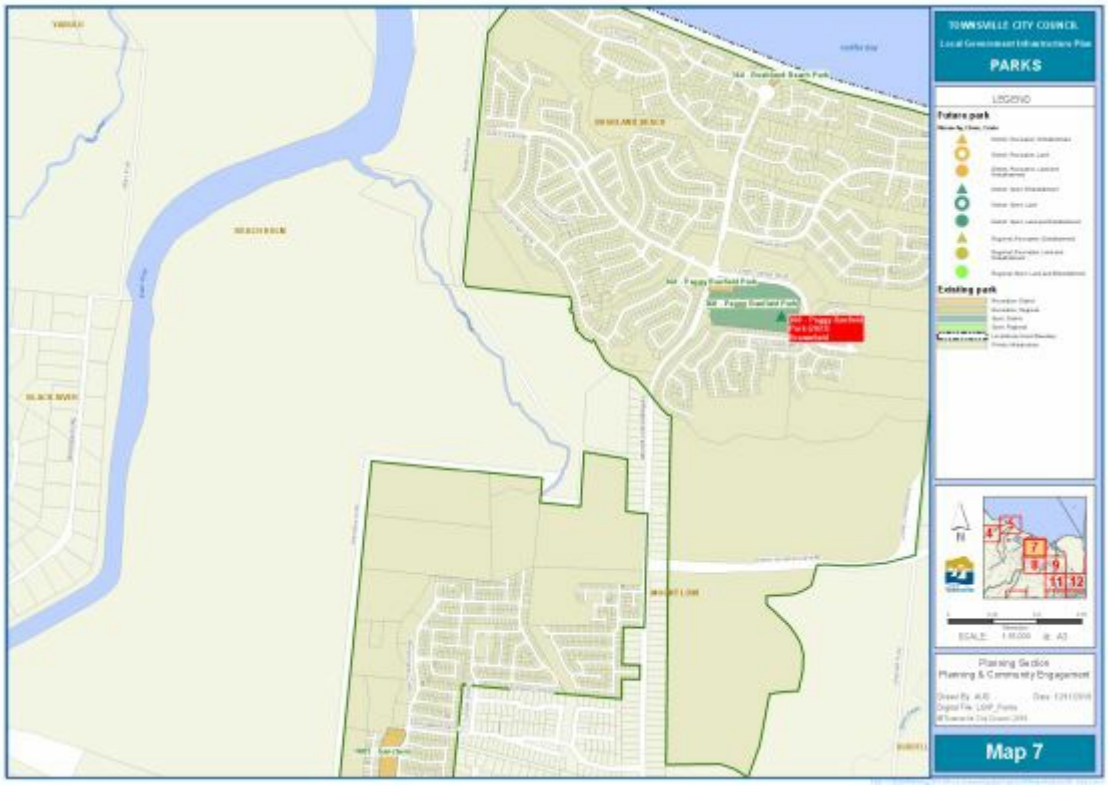

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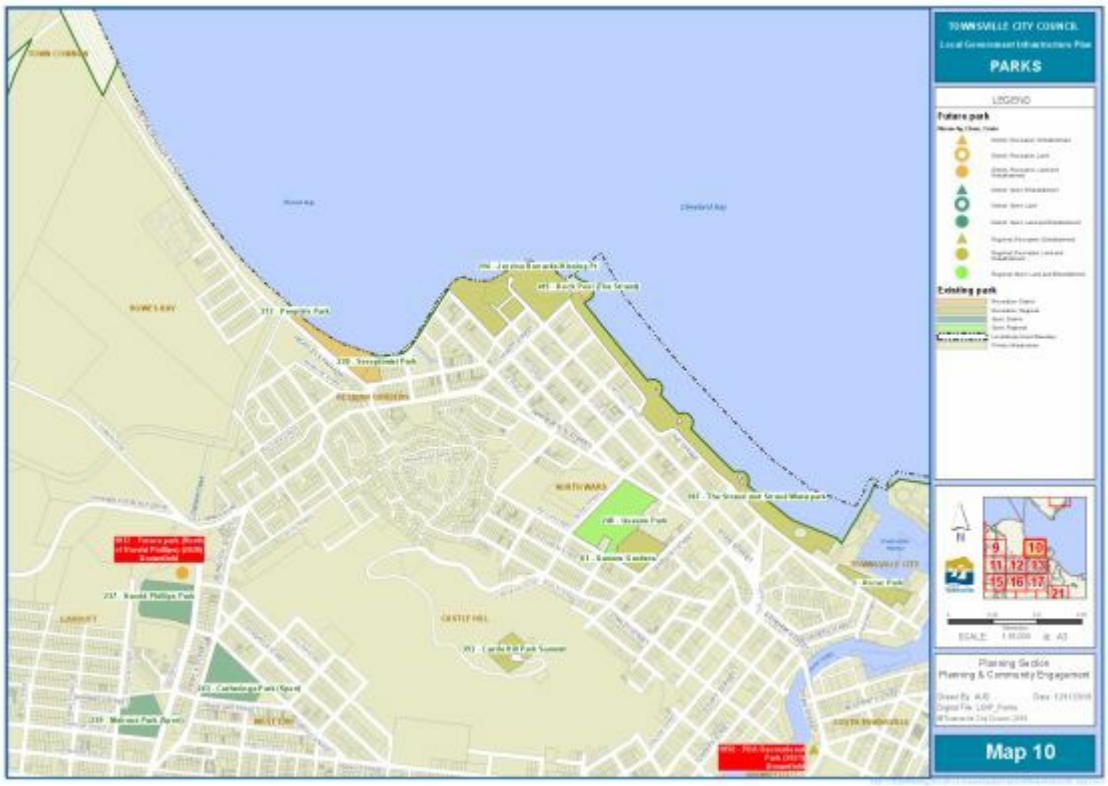

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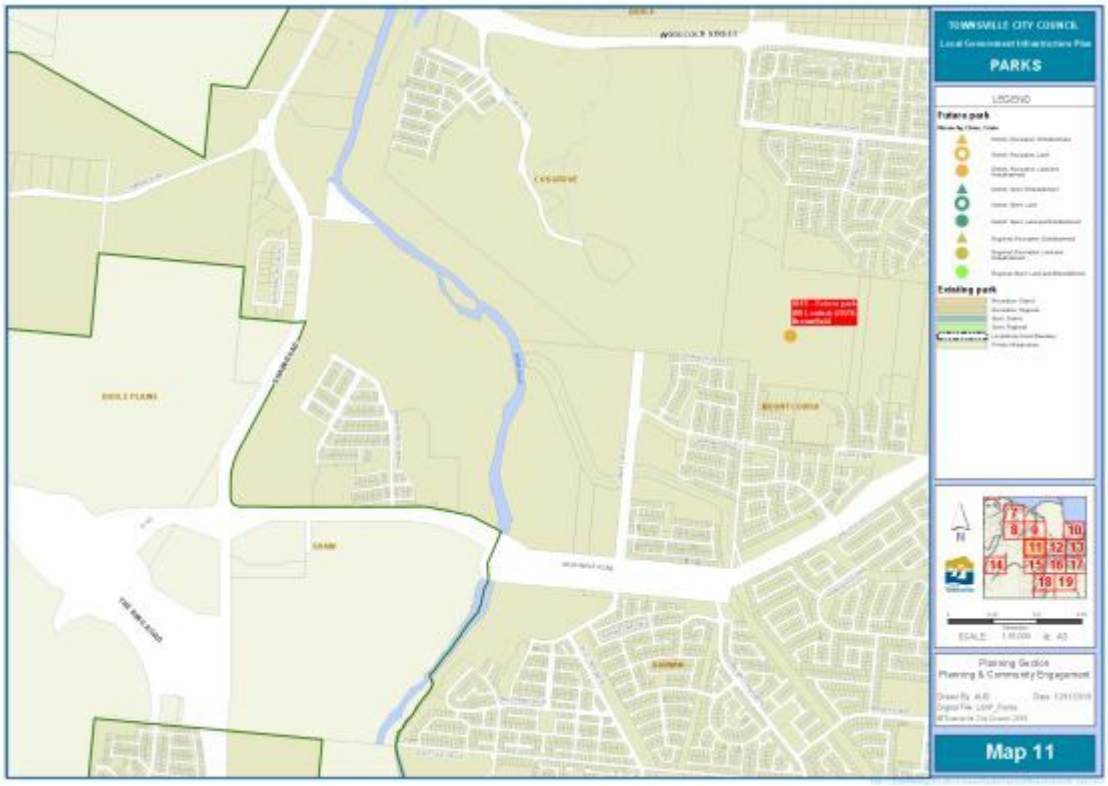

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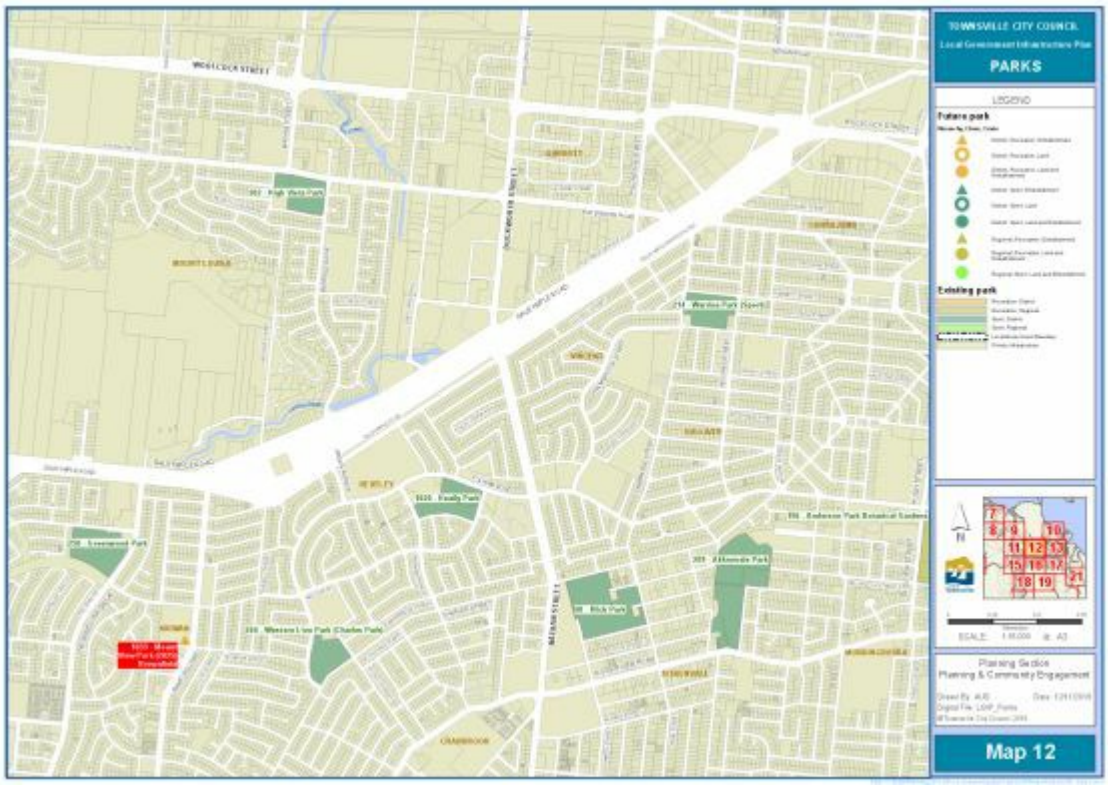

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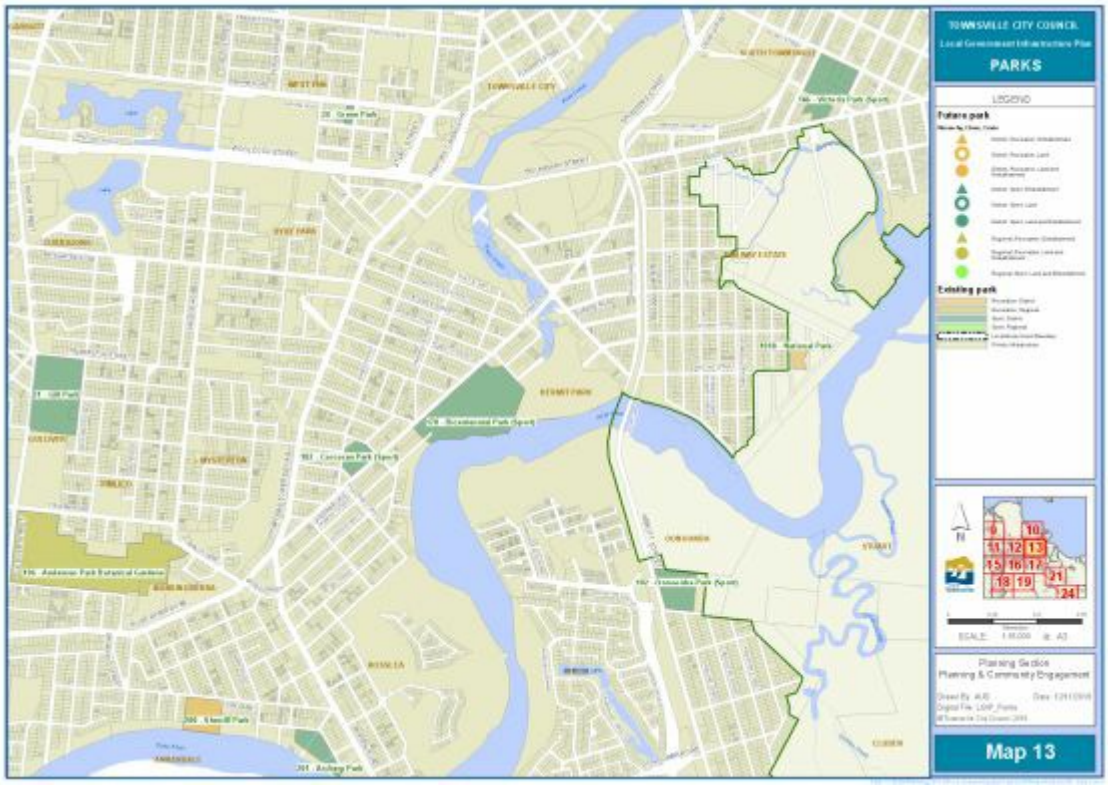

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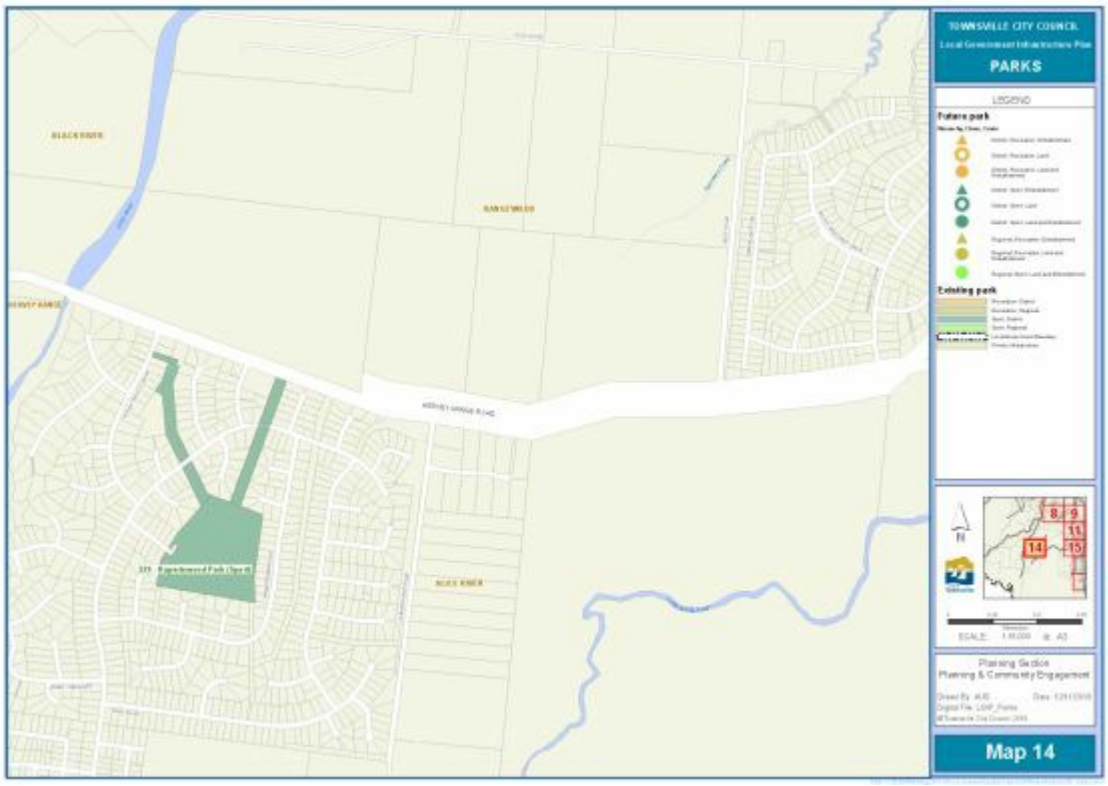

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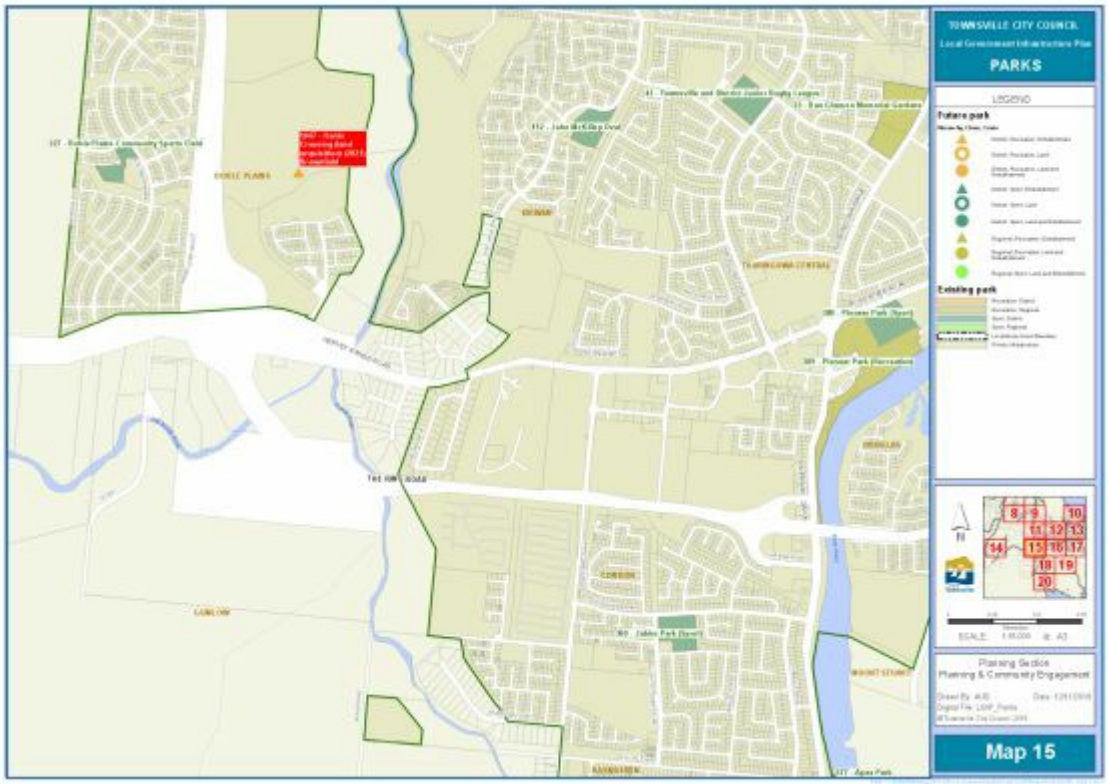

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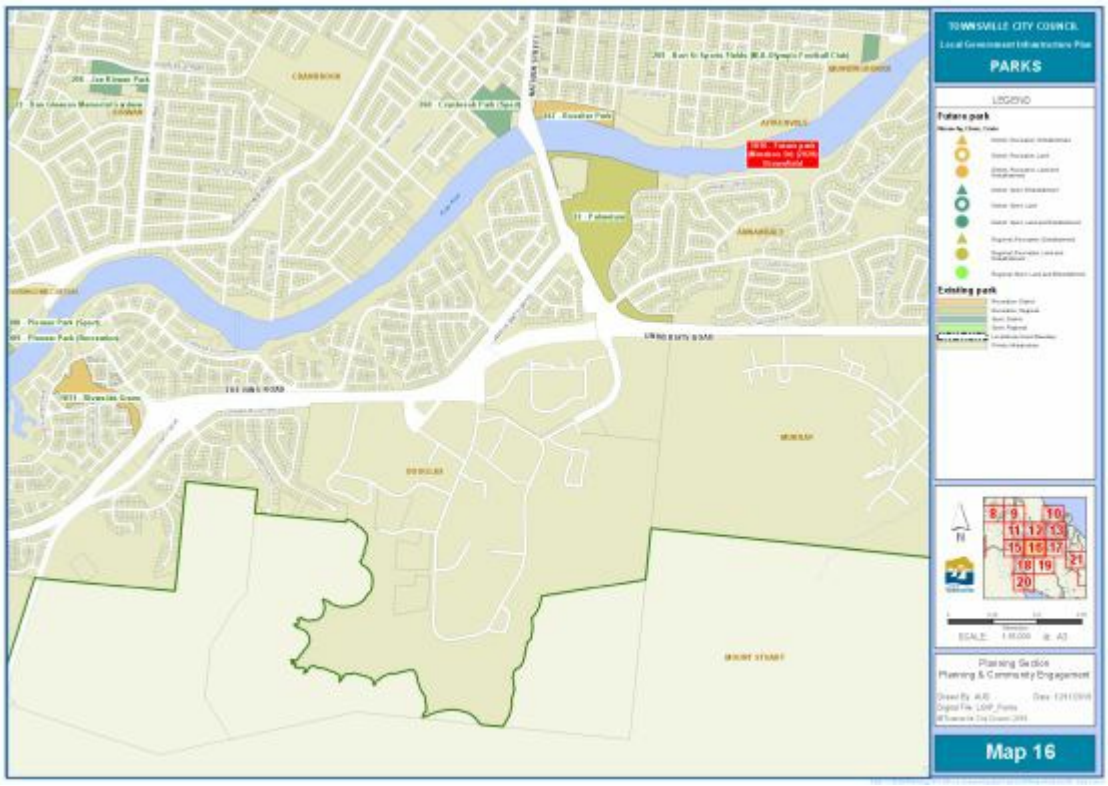

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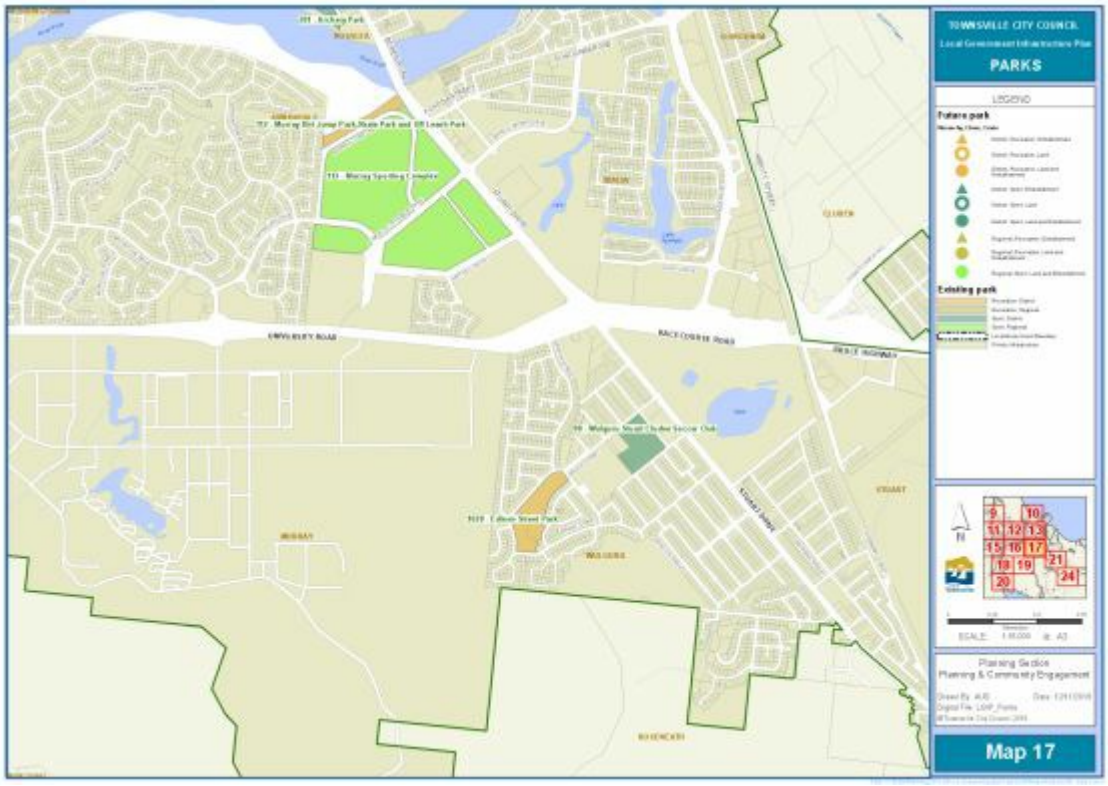

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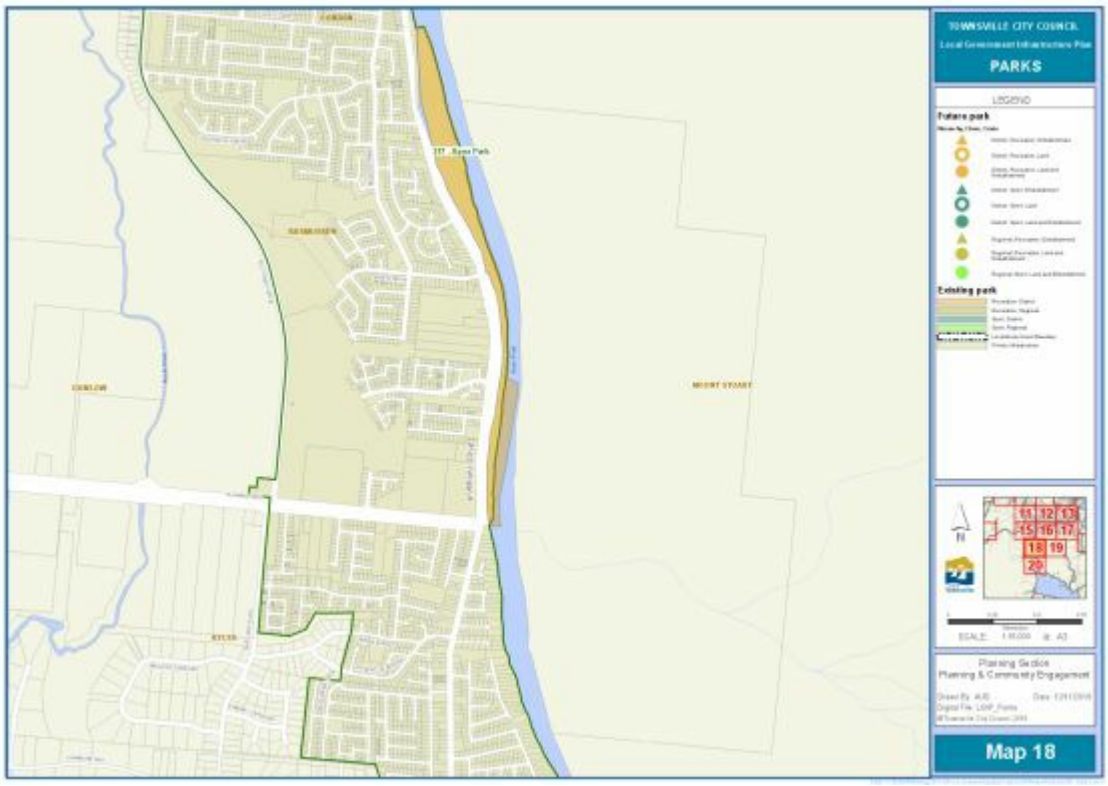

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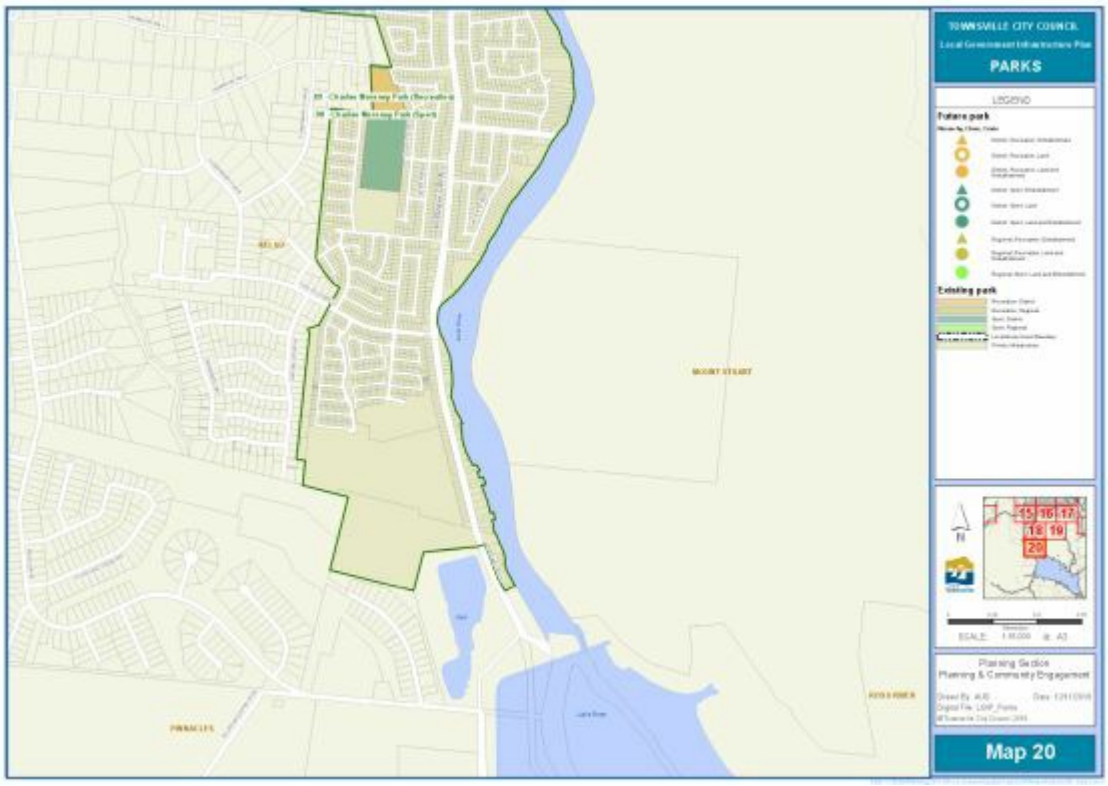

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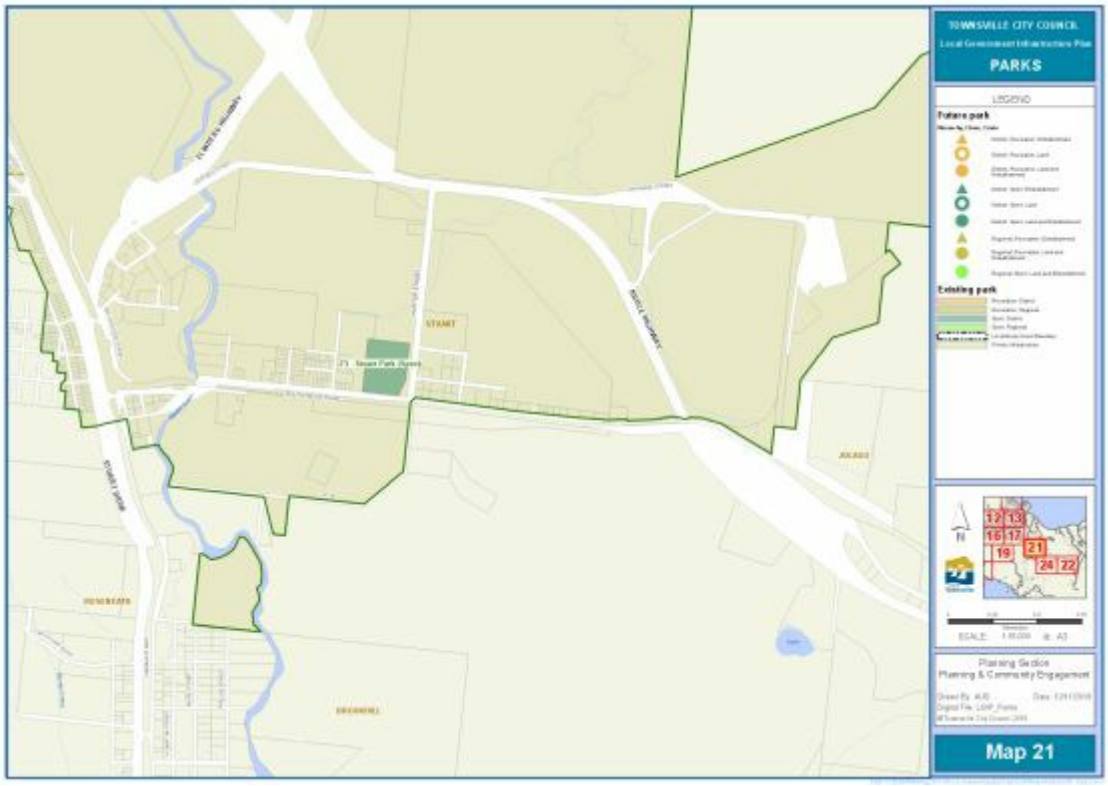

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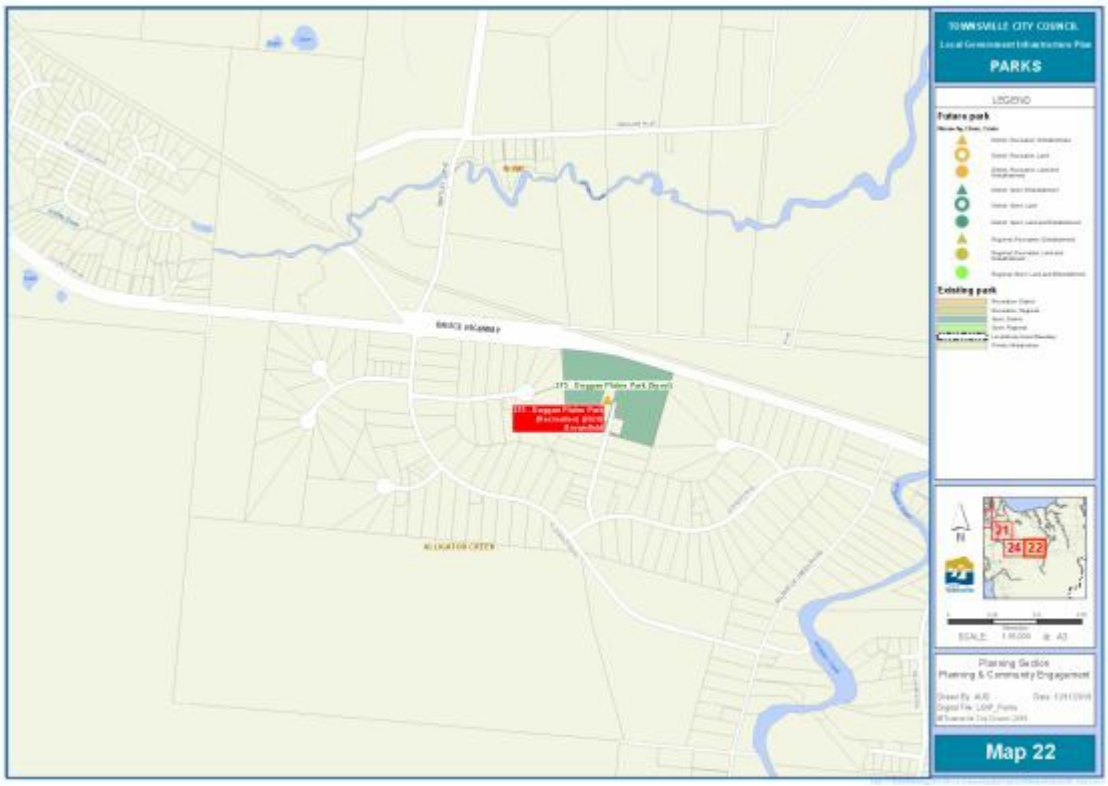

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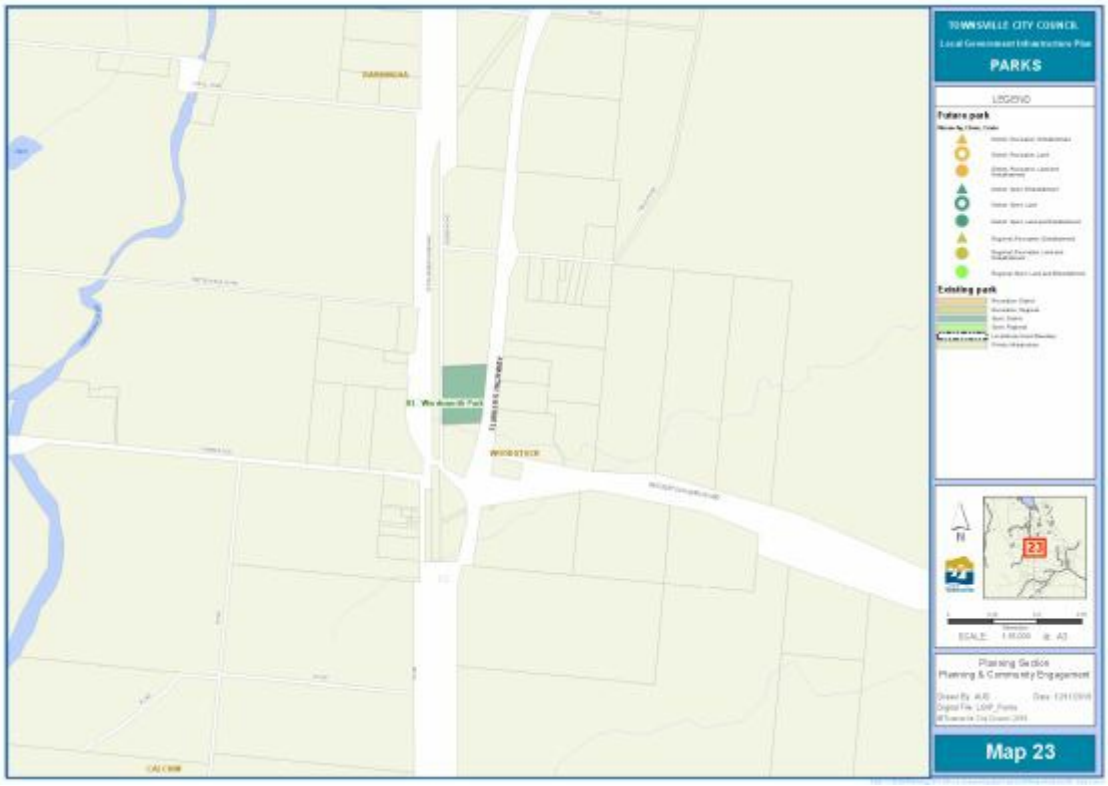

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Table SC3.3.9.1 - Parks and land for community facilities network schedule of future works

Map	Type	ID	Area (Ha)	Name	Suburb	Year	Cost ($'19)
6	District recreation	222	(1.4)	Horseshoe Bay Foreshore	HORSESHOE BAY	2027	(1,663,622)
6	Regional recreation	222	1.4	Horseshoe Bay Foreshore	HORSESHOE BAY	2027	3,744,062
6	Regional recreation	1023	2.5	Horseshoe Bay Environmental Recreation Park	HORSESHOE BAY	2027	6,685,825
7	District sport	360	-	Peggy Banfield Park	BUSHLAND BEACH	2023	873,773
8	District sport	71	-	Broadmeadows Park	DEERAGUN	2025	1,878,613
8	District sport	1024	3.6	Kilcora Park (Frendon Parade Park)	MOUNT LOW	2023	4,195,422
9	District sport	1007	6.0	North Shore master plan (Saunders Ck)	MOUNT LOW	2023	6,906,044
9	Regional recreation	1006	12.0	North Shore master plan (central park)	MOUNT LOW	2028	26,609,953
10	District recreation	1012	2.5	Future park (North of Harold Phillips)	GARBUTT	2028	2,722,848
10	Regional recreation	1050	1.7	Central Park	TOWNSVILLE CITY	2021	3,613,851
11	District recreation	1015	4.0	Future park (Mount Louisa)	MOUNT LOUISA	2025	4,356,557
11	District sport	1013	3.0	Future park (Greater Ascot)	BOHLE PLAINS	2026	3,711,999
12	District recreation	1033	3.6	Mount View Park	KIRWAN	2025	3,888,227
15	District recreation	1047	4.0	New park land (Harris Crossing)	BOHLE PLAINS	2021	1,108,935
22	District recreation	375	1.3	Duggan Plains Park (Recreation)	ALLIGATOR CREEK	2024	1,371,787
24	District sport	1001	6.0	New park land (Rocky Springs - D1)	JULAGO	2024	1,381,759

Schedule 4 Notations required under the Planning Act 2016

SC4.1 Notation of decisions affecting the planning scheme under section 89 of the Act

Table SC4.1.1—Notation of decisions under section 89 of the Act

Date of decision	Location (real property description)	Decision type	File/Map reference
17/12/2014	122 Webb Road, MAJORS CREEK QLD 4816 (Lot 4 SP267460)	Superseded Planning Scheme Request - Lot Creation One (1) into Three (3)	SPS14/0001
16/01/2015	Bruce Highway, DEERAGUN QLD 4814 (Lot 2 EP2209)	Superseded Planning Scheme Request - Community Facilities (Water Reservoir)	SPS14/0002
6/02/2015	599 Ross River Road, KIRWAN QLD 4817 (Lot 23 RP716944)	Superseded Planning Scheme Request - Medical Centre	SPS14/0003
20/02/2015	609-673 Sturt Street, TOWNSVILLE CITY QLD 4810 (Lot 501 on SP195746)	Superseded Planning Scheme Request - Sales or Hire Yard	SPS15/0001
27/04/2015	2-4 Marinez Avenue, WEST END QLD 4810 (Lot 1 RP893499)	Superseded Planning Scheme Request - Extension of Morleys Funerals	SPS15/0002
31/08/2015	52-54 The Strand, NORTH WARD QLD 4810 (Lot 3 & 4 on RP712269 and Lots 255, 256 & 264 - 266 T1181)	Superseded Planning Scheme Request - Multiple Dwelling	SPS15/0005
23/07/2015	2 Conway Street, MOUNT LOW QLD 4818 (Lot 63 SP226254)	Superseded Planning Scheme Request - Lot Creation One (1) into Two (2)	SPS15/0006
22/10/2015	28 Darling Road, JENSEN QLD 4818 (Lot 2 RP800747)	Superseded Planning Scheme Request - Lot Creation One (1) into 10	SPS15/0010
29/05/2015	51-101 Everett Street, TOWNSVILLE QLD 4818 (Lot 7 RP889756 & Lot 6 RP889760)	Negotiated Development Application Decision - Approved	MI11/0010
24/06/2015	44 Hugh Street, GARBUTT QLD 4814 (Lot 420 EP1533)	Negotiated Development Application Decision - Approved	MI11/0054
23/03/2015	47 and 55 Texas Road, JENSEN QLD 4818 (Lot 3 RP748165 & Lot 82 RP846352)	Negotiated Development Application Decision - Approved	MI13/0045

20/03/2015	Nexus Drive, BURDELL QLD 4818 (Lot 2500 SP248845)	Development Application Decision - Approved	MI14/0008
27/01/2015	84 Marina Drive, BUSHLAND BEACH QLD 4818 (Lot 505 SP247145)	Development Application Decision - Approved	MI14/0032
20/10/2015	Place Park, 52B Mystic Avenue, Balgal Beach QLD 4816 (Lot 2 SP160493)	Superseded Planning Scheme Request - Rollingstone Rural Fire Brigade	SPS15/0009
11/11/2015	11 Sunderland Street, Garbutt QLD 4814 (Lot 147 T118291)	Superseded Planning Scheme Request - Lot Creation - One (1) into Two (2) Lots	SPS15/0012
4/12/2015	15 Slayton Road, Jensen QLD 4818 (Lot 57 RP725245)	Superseded Planning Scheme Request - Dual Occupancy	SPS15/0015
11/11/2015	36 McKillop Street, Belgian Gardens QLD 4810 (Lot 12 RP701679)	Superseded Planning Scheme Request - Lot Creation One (1) into Two (2)	SPS15/0016
11/12/2015	11 Armidale Avenue Balgal Beach QLD4816 (Lot 15 RP743003)	Superseded Planning Scheme Request - Lot Creation - One (1) into Two (2)	SPS15/0017
18/12/2015	697 Ross River Road, Kirwan QLD 4817 (Lot 12 T118519, Lot 13 T118519 and Lot 11 T118519)	Superseded Planning Scheme Request - Mixed Commercial Development	SPS15/0018
17/12/2015	235 Purono Parkway, Yabulu QLD 4818 (Lot 30 RP859135)	Superseded Planning Scheme Request - Lot Creation - One (1) into Two (2)	SPS15/0019
4/12/2015	130 Woodfield Road, Gumlow QLD 4815 (Lot 25 RP912553)	Superseded Planning Scheme Request - Reconfiguring a Lot	SPS15/0020
4/12/2015	76 One Mile Drive, Gumlow QLD 4815 (Lot 5 SP171604, Lot 30 SP132600 and Lot 6 SP171604	Superseded Planning Scheme Request - Reconfiguring a Lot	SPS15/0021
21/12/2015	40057 Bruce Highway, Deeragun QLD 4818 (Lot 1 RP747112)	Superseded Planning Scheme Request - Showroom	SPS15/0023
18/12/2015	101 Thuringowa Drive, Kirwan 4817 (Lot 22 T118595)	Superseded Planning Scheme Request - Health Care Services	SPS15/0024

22/12/2015	369 Shaw Road, Shaw QLD 4818 (Lot 16 SP232874	Superseded Planning Scheme Request - Warehouse and Service Station (Preliminary Approval component withdrawn)	SPS15/0025
21/12/2015	325 Shaw Road, Shaw QLD 4818 (Lot 19 SP107219	Superseded Planning Scheme Request - Service Station	SPS15/0026
7/12/2015	14 Mackley Street, Garbutt QLD 4814 (Lots 40 - 44 RP703609, Lots 67 - 69 RP703609, Lots 70 & 71 RP703609 and Lot 2 RP891356)	Superseded Planning Scheme Request - Sales or Hire Yard	SPS15/0027
13/01/2016	106 Balgal Beach Road, Balgal Beach QLD 4816 (Lot 12 SP177431)	Superseded Planning Scheme Request - Lot Creation - One (1) into Two (2) Lots	SPS15/0028
06/08/2015	40 Texas Road, Jensen QLD 4818 (Lot 32 RP 74244, Lot 2 RP 854023, Lot 57 RP 725245, Lot 24 RP 724568 and Lot 25 RP 725244)	Preliminary Approval Under Section 242 of the Sustainable Planning Act 2009 to Facilitate Use Rights in accordance with a Plan of Development	MI14/0041
07/09/2015	127 Allambie Lane, Rasmussen QLD 4815 (Lot 61 SP 120855)	Preliminary Approval for Development in accordance with a Plan of Development for Residential Land Use	MI14/0011
02/02/2016	158 Hugh Street, Currajong QLD 4812 (Lot 17 RP 703502 and Part Lot 1 SP 286571)	Preliminary Approval under Section 242 of the Sustainable Planning Act 2009	MI15/0036
16/12/2016	829 Bradon Road, Beach Holm QLD 4818 (Lot 267 EP 1719 and Lot 256 SP 196179)	Preliminary Approval for Development in Accordance with a Plan of Development for Residential and Open Space Land Use	MI13/0020
01/02/2017	25 Fulham Road, Pimlico QLD 4812 (Lot 32 RP 703502, Lot 17 RP 703502 and Part Lot 1 SP 286571)	Preliminary Approval under Section 242 of the Sustainable Planning Act 2009 to facilitate the Plan of Development for the Mater Hospital	MI15/0036
11/04/2017	86 Thuringowa Drive, Thuringowa Central QLD 4817 (Lot 1 SP 280601)	Preliminary Approval under Section 242 of the Sustainable Planning Act 2009 to Override the Planning Scheme - Eastbrooke	MI16/0032

04/05/2017	19 Wentworth Avenue, Mundingburra QLD 4812 (Lot 16 and 17 RP 717981)	Preliminary Approval under Section 242 of the Sustainable Planning Act 2009 to Override the Planning Scheme for Use Rights in Accordance with the Community Facilities Zone	MI16/0035
01/08/2017	41 Afton Way, Mount Louisa QLD 4814 (Lot 1 SP 247130)	Preliminary Approval under Section 242 of the Sustainable Planning Act 2009 to Override the Planning Scheme combined with RC16/0043	MI16/0013
20/12/2017	45 Flinders Street, Townsville City QLD 4810 (Lots 47 and 48 T1181, Lots 1 and 2 RP 702069, Lot 1 RP 702069, Lot 2 RP 717290, Lot 2 RP 731759, Lots 2 and 3 RP 745353)	Preliminary Approval under Section 242 of the Sustainable Planning Act 2009 to vary the effect of the Townsville City Plan in accordance with The Hive Master Plan and Preliminary Approval for Building Work for the Demolition of the Criterion Hotel (Local Heritage Place)	MI16/0033
23/01/2018	443 – 481 Ross River Road, Cranbrook QLD 4814 (Lot 2 CP 895233 and Lot 237 CP 895233)	Preliminary Approval under Section 242 of the Sustainable Planning Act 2009 to Override the Planning Scheme in accordance with the Bwgaman Development Scheme.	MI14/0033
11/07/2018	55 Lynham Road, Gumlow QLD 4815 (Lot 26 SP 248803) (formerly described as Lot 26 on Crown Plan E 124278)	Preliminary Approval under Section 242 of the Sustainable Planning Act 2009 to vary the effect of the local planning instrument to allow for development to occur in accordance with the Willowbend Plan of Development	MI10/0026 and AP12/0009 (Final Order)
21/10/2018	35 Toll Street, Mount St John QLD 4818 (Lot 63 SP 209545)	Preliminary Approval – Variation Request under Section 61 of the Planning Act 2016 to Override the Planning Scheme	MCU18/0062

Editor's note—This schedule should include:

- approvals that conflict with the planning scheme;
- a variation approval under the *Planning Act 2016* that varies the effect of any local planning instrument in effect for the premises;
- development approvals under section 242 of the *Sustainable Planning Act 2009* that vary the effect of the scheme;
- decisions agreeing to a superseded planning scheme request.

Editor's note—Development approvals under section 3.1.6 of the *Integrated Planning Act 1997* or section 242 of the *Sustainable Planning Act 2009* that vary the effect of the scheme, but were issued prior to adoption of the Townsville City Plan, are available for information online at www.eplanning.townsville.qld.gov.au.

SC4.2 Notation of resolution(s) under Chapter 4, Part 2, Division 2 of the Act

Table SC4.2.1—Notation of resolutions under Chapter 4, Part 2, Division 2 of the Act

Date of resolution	Date of effect	Details	Contact information
28 June 2011	1 July 2011	Adopted Infrastructure Charges Resolution (01 – 1 July 2011)	A copy of this resolution can be viewed online at www.townsville.qld.gov.au. For more information, contact council's Customer Service Centre on 134 810
24 June 2014	1 July 2014	Adopted Infrastructure Charges Resolution (02 – 1 July 2014)	A copy of this resolution can be viewed online at www.townsville.qld.gov.au. For more information, contact council's Customer Service Centre on 134 810.
23 June 2015	1 July 2015	Adopted Infrastructure Charges Resolution (03 - 1 July 2015)	A copy of this resolution can be viewed online at www.townsville.qld.gov.au. For more information, contact council's Customer Service Centre on 134 810.
28 June 2016	1 July 2016	Adopted Infrastructure Charges Resolution (04 - 1 July 2016)	A copy of this resolution can be viewed online at www.townsville.qld.gov.au. For more information, contact council's Customer Service Centre on 134 810.
27 June 2017	1 July 2017	Adopted Infrastructure Charges Resolution (05 - 1 July 2017)	A copy of this resolution can be viewed online at www.townsville.qld.gov.au. For more information, contact council's Customer Service Centre on 134 810.
26 June 2018	1 July 2018	Adopted Infrastructure Charges Resolution (06 - 1 July 2018)	A copy of this resolution can be viewed online at www.townsville.qld.gov.au. For more information, contact council's Customer Service Centre on 134 810.

Editor's note—This schedule should provide information about the adopted infrastructure charges for the local government and where a copy of the adopted charges can be obtained, including a link to the local government website where a copy of the infrastructure charges resolution can

be viewed or downloaded.

SC4.3 Notation of registration for urban encroachment provisions under section 680ZE of the Act

Table SC4.3.1—Notation of decisions under section 680ZE of the Act

Date of decision	Location of premises (real property description)	Details of registration	Term of registration

Schedule 5 Land designated for community infrastructure

Table SC5.1—Land designated for community infrastructure

Date of designation or repeal	Real property description	Street address	Type of community infrastructure
7 May 1999	Lot 56 EP1573 Lot 57 EP2061	Dwyer Street, Townsville QLD 4810	(e) correctional facilities (Townsville Correctional Centre)
Designation matters Not applicable			
9 July 1999	Lot 513 EP1443	27 Old Common Road, Belgian Gardens QLD 4810	(e) correctional facilities (Cleveland Youth Detention Centre)
Designation matters Not applicable			
10 December 1999	Lots 40 SP116222 Lots 42 SP116222 Lot 1 RP723277 Lot 2 RP723277 Lot 3 RP723277 Lot 4 RP723277 Lot 5 RP723277 Lot 2 RP727842 Lot 1 RP31591	Angus Smith Drive, Townsville City QLD 4810	(f) educational facilities (James Cook University, Douglas Campus)
Designation matters Not applicable			
10 December 1999	Lot 3 RP725384	235 Fulham Road, Vincent QLD 4814	(f) educational facilities (James Cook University, Vincent Campus)
Designation matters Not applicable			
24 December 1999	Lot 41 SP116222	University Drive, Douglas QLD 4814	(h) hospitals and associated institutions (Townsville Hospital)
Designation matters Not applicable			
24 March 2000	Part Lot 9 SP118914	Hunter Street, Stuart QLD 4811	(k) operation works under the *Electricity Act 1994* (Townsville South Substation to Sun Metals Refinery Transmission Line)
Designation matters Not applicable			

24 March 2000	Part Lot 3 SP103580 Part Lot 62 SP103587 Part Lot 65 SP103587 Part Lot 57 EP2061 Part Lot 42 CP905700		(k) operating works under the *Electricity Act 1994* (Townsville South Substation to AES Mt Stuart Power Station Transmission Line)
Designation matters Not applicable			
24 March 2000	Part Lot 1 RP726908		(k) operating works under the *Electricity Act 1994* (Townsville Power Station Switchyard and Transmission Line)
Designation matters Not applicable			
11 August 2000	Lot 1 RP 882869	Corner Veales Road and Bruce Highway, Deeragun QLD 4818	(s) any other facility not in (a) to (r) and intended to accommodate government functions (Deeragun Police Station)
Designation matters Not applicable			
27 October 2000	Lot 561 EP1848	138 Thuringowa Drive, Kirwan QLD 4817	(h) hospitals and associated institutions (Kirwan Hospital)
Designation matters Not applicable			
1 June 2001	Lot 716 T118501	31 Walker Street, Townsville City QLD 4810	(s) any other facility not in (a) to (r) and intended to accommodate government functions (Townsville Magistrates Court)
Designation matters Not applicable			
15 February 2002	Lot 423 EP1979	79 Fulham Road, Pimlico QLD 4812	(f) educational facilities (Barrier Reef Institute of TAFE)
Designation matters Not applicable			
3 May 2002	Lot 4 K1243 Lot 76 RP203473 Lot 77 RP203473	Corner Charters Towers Road and Goldring Street, Mundingburra QLD 4812	(r) storage and works depots and the like including administrative facilities associated with the provision or maintenance of the community infrastructure mentioned in paragraphs (a) to (q) (s) any other facility not in (a) to (r) and intended to accommodate government functions (Mundingburra Police Station)

Designation matters Not applicable			
27 June 2003	Lot 5 K103939 Lot 6 K103939 Lot 7 K103939 Lot 9 K103939 Lot 10 K103939 Lot 12 K103939 Lot 13 K103939 Lot 15 K103939 Lot 16 K103939 Lot 21 K103939 Lot 22 K103939 Lot 23 K103939 Lot 26 K103939 Lot 49 K103939 Lot 206 EP1967 Lot 20 USL51199 Lot 1 USL51604 Lot 1 RP711920 Lot 2 RP721599 Lot 2 RP724555 Lot 2 RP725280 Lot 1 RP730111 Lot 2 RP732944 Lot 1 RP734574 Lot 2 RP737885 Lot 2 RP737886 Lot 1 RP840346 Lot 2 RP840346 Lot 67 EP856 Lot 1 EP930		(m) railway lines, stations and associated facilities (o) transport infrastructure mentioned in Schedule 10 definition “development infrastructure” (Townsville Port Eastern Access Corridor. Being land for the future construction and operation of railway lines, stations and associated facilities and transport in the corridor)
Designation matters Not applicable			
23 April 2004	Lot 534 EP1582 Lot 537 EP1582	Paluma and Thuringowa Streets and 5 Hinchinbrook Drive, Kirwan QLD 4817	(s) any other facility not in (a) to (r) and intended to accommodate government functions (Kirwan Police Facilities)
Designation matters Not applicable			

8 April 2005	Lot 28 EP1249 Lot 466 EP1249	Warburton, Redpath & Burke Street, North Ward QLD 4810	(d) community and cultural facilities, including child care facilities, community centres, meeting halls, galleries and libraries (f) educational facilities (l) parks and recreational facilities (r) storage and works depots and the like including administrative facilities associated with the provision or maintenance of the community infrastructure mentioned in paragraphs (a) to (q) (s) any other facility not mentioned in paragraphs (a) to (r) and intended primarily to accommodate government functions (The land has been designated to accommodate the operations of regional sporting groups, the State agency and other entities associated with provisions of the region's sports and recreation including training, offices, administration facilities and athlete accommodation, associated sporting fields and sporting facilities and car parking)
Designation matters Not applicable			

20 January 2006	Lot 7 SP107219 Lot 6 SP107219 Lot 5 SP107219 Lot 2 SP112189 Lot 91 SP112722 Lot 12 E124328 Lot 272 K124640 Lot 3 SP128466 Lot 4 SP128466 Lot 7 SP150157 Lot 3 SP156430 Lot 56 EP1634 Lot 25 EP1890 Lot 18 EP240 Lot 1 PER6999 Lot 2 RP726908 Lot 1 RP726908 Lot 4 RP727808 Lot 3 RP727810 Lot 2 RP729458 Lot 1 RP731210 Lot 5 RP737005 Lot 6 RP737089 Lot 7 RP737090 Lot 4 RP743037 Lot 3 RP746699 Lot 1 RP882865 Lot 7 RP901162 Lot 6 RP901162 Lot 377 RP912547		(k) operating works under the *Electricity Act 1994* (Operating works under the *Electricity Act 1994*. Specifically, these operating works are the proposed Bohle River to Townsville Gas Turbine Power Station 132 kilovolt transmission line and Yabulu south electrical substation)
Designation matters Not applicable			
20 June 2008	Lot 1 SP199862	The Strand, Townsville City QLD 4810	(s) any other facility not in (a) to (r) and intended to accommodate government functions (Townsville City Council – The Strand police beat – police facilities including but not limited to offices, storage, amenities, interview rooms, air-conditioning plant and car parking)
Designation matters Not applicable			
19 December 2008	Lot 1 T118460 Lot 2 T118460 Lot 11 T118460 Lot 12 T118460 Lot 3 SP137809 Lot 513 EP1443 Lot 100 CP860214 Lot 1 CP86528 Lot 30 CP903570	Old Common Road, Rowes Bay QLD 4810	(f) correctional facilities (f) educational facilities (r) storage and works depots associated and the like including administrative facilities associated with the provision or maintenance of the community infrastructure mentioned in paragraphs (a) to (q) (Townsville City Council – 'Cleveland Youth Detention Centre')

Designation matters Not applicable			
17 April 2009	Haughton River (Easement CIDA AP12418) Lot 11 EP1679 (Easement D SP145193) Lot 11 EP1679 (Easement E SP145193) Unnamed Road (Easement CIDA SR17.500) Lot 17 EP2204 (Easement C SP144887) Unnamed Road (Easement CIDA SR18.500) Lot 10 EP101 (Easement A SP144888) Lot 14 SP101846 (Easement B SP145191) Lot 4 RP865808 (Easement A SP145190) Dingo Park Road (Easement CIDA SR21.500) Lot 134 EP2055 (Easement B SP144890) Unnamed Road (Easement CIDA SR22.500) Lot 135 EP2055 (Easement A SP144890) Unnamed Road (Easement CIDA SR23.500) Lot 49 E124241 (Easement A SP144891) Spring Creek (Easement CIDA AP12419) Lot 50 E124241 (Easement B SP144891) Lot 54 E124329 (Easement C SP144891)		(k) operating works under the *Electricity Act 1994* (Whitsunday Regional Council; Burdekin Shire Council; Townsville City Council – Queensland Electricity Transmission Corporation Limited, trading as Powerlink Queensland, proposes to build community infrastructure)

	Unnamed Road (Easement CIDA SR26.500) Lot 177 EP1118 (Easement A SP144892) Lot 51 EP124241 (Easement D SP144891) Lot 51 E124241 (Easement E SP144891) Lot 480 E12462 (Easement A SP145197) Lot 455 E1243 (Easement F SP144891) Flinders Highway (Easement CIDA AP12420) Lot 181 SP130029 (Easement CIDA SR30.501) Unnamed Road (CIDA AP12421) Lot 442 EP1319 (Easement A SP144893) Double Barrel Creek (Easement CIDA AP12422) Lot 417 E12421 (Easement E SP144894) Lot 64 E124248 (Easement C SP144894) Lot 64 E124248 (Easement D SP144894) Unnamed Road (Easement CIDA SR34.500) Unnamed Road (Easement CIDA SR34.501) Lot 104 E124279 (Easement B SP144894) Lot 65 E124264 (Easement A SP144894) Unnamed Road (Easement CIDA AP12423) Lot 41 E124381			

	(Easement D SP145764) Lot 41 E124381 (Easement E SP145764) Unnamed Road (Easement CIDA SR37.500) Unnamed Road (Easement CIDA SR37.501) Lot 43 RP911427 (Easement B SP145764) Lot 43 RP911427 (Easement C SP145764) Lot 4 USL44323 (Easement A SP145765) Lot 500 E12466 (Easement A SP145764) Unnamed Road (Easement CIDA SR40.500) Lot 1 EP32 (Easement A SP145762) Unnamed Road (Easement CIDA SR41.500) Lot 25 E124347 (Easement C SP145757) Lot 27 EP21 (Easement B SP145757) Lot 29 EP72 (Easement A SP145757) Lot 228 EP115 (Easement N SP145756) Ross River (Easement CIDA AP12424) Lot 2 EP102 (Easement M SP145756) Lot 4 EP1485 (Easement L SP143325) Central Creek (Easement CIDA AP12425) Lot 3 EP1372			

	(Easement B EP1432) Lot 3 EP1372 (Easement D EP2103) Lot 3 EP1372 (Easement C SP143325) Lot 3 EP1372 (Easement K SP143325) Unnamed Road (Easement CIDA SR48.500) Lot 40 EP1309 (Easement A EP1432) Lot 40 EP1309 (Easement B EP2034) Lot 1 RP742612 (Easement A RP725994) Lot 1 RP742612 (Easement C RP729414) Lot 1 RP724660 (Easement A RP725993) Lot 1 RP724660 (Lot B RP742344) Lot 4 RP891360 (Lot C RP725992) Lot 4 RP891360 (Easement D RP742345) Laudham Road (Easement CIDA SR52.500) Lot 1 SP195322 (Easement B RP742343) Lot 2 SP195322 (Easement A RP725991) Kelso Drive (Easement CIDA SR53.500) Lot 4 RP800998 (Easement B RP723119) Lot 2 RP800998 (Easement B RP723119) Lot 4 RP891340 (Easement B RP723119)			

	Lot 1 RP800998 (Easement B RP723119)		
Designation matters The type of community infrastructure for which the above land has been designated is operating works under the *Electricity Act 1994*. Specifically, these operating works are Powerlink Queensland's proposed Strathmore to Ross 275 kilovolt transmission line.			
22 May 2009	Lot 1 SP203854	763 Ingham Road, Mount St John QLD 4818	(f) educational facilities (Townsville City Council - The Trade and Technician Skills Institute, further described as 'a place of higher education and vocational education and training that provides a ranges of courses, utilising associated teaching, social and public support functions; including car parking, conference, cultural, sport and recreational facilities, and engages in commercial activities and alliances that are in support of its educational programs, and as: 'Trade and Technician Skills Institute')
Designation matters Not applicable			
5 June 2009	Part Lot 10 SP143318 Part Lot 105 EP1535 Part Lot 1 SP199852 Part Lot 4 SP199852		(k) operating works under the *Electricity Act 1994* (Townsville City Council – Powerlink Queensland's proposed Mt Stuart Gas Turbine 132 Kilovolt transmission line)
Designation matters Not applicable			
23 September 2009	Lot 18 EP240 (Easement AA SP211707) Lot 18 EP240 (Easement AB SP211707) Unnamed Road (Easement CIDA AP16490) Althaus Creek (Easement CIDA AP13070) Lot 1 RP728417 (Easement AC SP211708) Lot 19 RP746087 (Easement AD SP211709) Lot 19 RP746087 (Easement AE SP211709) Unnamed Road		(k) operating works under the *Electricity Act 1994* (Townsville City Council; Hinchinbrook Shire Council – Powerlink Queensland's proposed Yabulu south to Ingham 275/132 kilovolt double circuit transmission line)

	(Easement CIDA AP16491) Lot 20 RP746087 (Easement AF SP211709) Forestry Road (Easement CIDA AP16492) Lot 20 SP151988 (Easement AG SP211710) Lot 20 SP151988 (Easement AJ SP211710) Lot 18 SP151988 (Easement AH SP211711) Lot 19 SP151988 (Easement AK SP211712) Lot 583 E124155 (Easement AN SP211714) Lot 2 RP742572 (Easement AL SP211713) Lot 2 RP742572 (Easement AM SP211713) Setter Road (Easement CIDA AP16493) Leichardt Creek (Easement CIDA AP16494) Lot 34 FTY1751 (Easement AP SP211715) Bruce Highway (Easement CIDA AP16495) Lot 151 SP112727 (Easement AQ SP211716) Lot 59 NPW935 (Easement CIDA A AP16497) Lot 59 NPW935 (Easement AR SP211717) Lot 59 NPW935 (Easement AS SP211717) Lot 59 NPW935 (Easement AU SP211719) Lot NPW935			

	(Easement AV SP211719) Lot 59 NPW935 (Easement AX SP211719) Lot 59 NPW935 (Easement ASR SP211737) Toomulla Beach Road (Easement CIDA AP16498) Camp Oven Creek (Easement CIDA B AP16496) Lot 59 WG312 (Easement AT SP211718) Saltwater Creek (Easement CIDA B AP16497) Lot 14 USL42237 (Easement AW SP211720) Unnamed Road (Easement CIDA AP16499) Unnamed Road (CIDA AP16500) Lot 1 RP722093 (Easement AY SP211721) Lot 2 RP722093 (Easement AZ SP211722) Lot 1 RP716204 (Easement BA SP211723) Lot 1 RP 716204 (Easement BB SP211723) Lot 422 WG7 (Easement BC SP211724) Lot 2 RP901334 (Easement BD SP211725) Bruce Highway (Easement CIDA AP16507) Lot 182 SP112728 (Easement BE SP211726) Lot 183 SP112728 (Easement BF SP211726) Rollingstone Creek			

	(Easement CIDA AP16508) Lot 2 RP845503 (Lot BG SP211727) Lot 2 RP845503 (Easement BH SP211727) Lot 2 RP845503 (Easement BK SP211727) Bruce Highway (Easement CIDA AP16509) Lot 31 WG800989 (Easement BJ SP211728) Lot 1 RP718150 (Easement BL SP211729) Bruce Highway (Easement CIDA AP13040) Lot 2 RP743374 (Easement BN SP211731) Lot 194 SP112729 (Easement BM SP211730) Gottani Road (Easement CIDA AP13041) Lot 3 RP743374 (Easement BP SP211732) Lot 3 RP743374 (Easement BQA SP211739) Hencamp Creek (Easement CIDA AP13071) Lot 5 WG3 (Easement BQ SP211733) Lot 2 RP735801 (Easement BR SP211734) Unnamed Road (Easement CIDA AP13072) Lot 1 RP735801 (Easement BS SP211738) Lot 12 RP859197 (Easement BY SP211738) Reserved Road (Easement			

	CIDA AP13073) Lot 2 RP744760 (Easement BT SP211735) Lot 2 RP744760 (Easement BU SP211735) Unnamed Road (Easement CIDA AP16501) Unnamed Road (Easement CIDA SP16502) Lot 1 RP744760 (Easement BV SP211735) Lot 23 WG110 (Easement BW SP211736) Lot 23 WG110 (Easement BX SP211736) Lorna Creek (Easement CIDA AP16503) Esplanade (Easement CIDA AP16504) Crystal Creek (Easement CIDA AP16505)		
Designation matters The type of community infrastructure for which the above land has been designated is operating works under the *Electricity Act 1994*. Specifically, these operating works are Powerlink Queensland's proposed Yabulu South to Ingham 275/132 kilovolt double circuit transmission line.			
17 June 2011	Lot 2 SP202064		(11) operating works under the *Electricity Act 1994* (Townsville City Council – The 66kV/11kV Bohle Plains substation)
Designation matters Not applicable			

30 November 2012	Lot 1 SP232890	151 John Melton Black Drive, Garbutt QLD 4814	(4) community and cultural facilities, including facilities where a child care service under the *Child Care Act 2002* is conducted, community centres, meeting halls, galleries and libraries (6) educational facilities (9) hospitals and associated institutions (Salvation Army Recovery Services Facility for the purpose of providing support to community members who are seeking assistance to overcome their addictions to alcohol, drugs or gambling)
Designation matters Not applicable			
5 April 2013	Lot 41 SP116222 Lot 2 SP189854	450 University Drive, Douglas, QLD 4814	(9) hospitals and associated institutions (15) storage and works depots and the like including administrative facilities associated with the provision or maintenance of the community infrastructure mentioned in this part (Townsville Hospital)
Designation matters Not applicable			
20 June 2014	Lot 89 CWL 1621	53 Mount Spec Road Paluma QLD 4816	(4) community; cultural facilities, inc. where a service under the *Child Care Act 2002* is conducted... (6) educational facilities (15) storage and works depots, inc. admin facilities assoc. with provision or maint. of the CID in this part (Paluma Environmental Education Centre)
Designation matters Not applicable			

11 November 2016	Proposed Lot 951 SP263024	205 North Shore Boulevard, Burdell QLD 4818	(4) community and cultural facilities including facilities where an education and care service under the Education and Care Services National Law (Queensland) is operated or a child care service under the *Child Care Act 2002* is conducted, community centres, meeting halls, galleries and libraries; (6) educational facilities; (8) facilities for parks and recreation (11) sporting facilities; and (15) storage and works depots and similar facilities, including administrative facilities associated with the provision or maintenance of the community infrastructure mentioned in this part.
Designation matters Not applicable			
18 August 2017	Lot 543 on EP1747	64 Hudson Street, Kirwan	(4) community and cultural facilities, including facilities where an education and care service under the Education and Care Services National Law (Queensland) is operated or a child care service under the *Child Care Act 2002* is conducted, community centres, meeting halls, galleries and libraries; (6) educational facilities; (15) storage and works depots and similar facilities, including administrative facilities associated with the provision or maintenance of the community infrastructure mentioned in this part. Further to the above, the designation includes: sporting facilities and associated infrastructure, road, vehicle layby and car parking and including commercial activities that support its Educational program.
Designation matters Not applicable			
16 February 2018	Lot 2 on RP724653	Riverway Drive, Kelso	(7) emergency services facilities; (15) storage and works depots and similar facilities, including administrative facilities associated with the provision or maintenance of the community infrastructure mentioned in this part; (16) any other facility not mentioned in this part that is intended primarily to accommodate government functions.

Schedule 6 Planning scheme policies

SC6.1 Planning scheme policy index

The table below lists all the planning scheme policies applicable to the planning scheme area.

Table SC6.1.1 - Planning scheme policy index

Number	Planning scheme policy title
SC6.2	Character residential planning scheme policy
SC6.3	Cultural heritage planning scheme policy
SC6.4	Development manual planning scheme policy
SC6.5	Economic impact assessment planning scheme policy
SC6.6	Emerging community planning scheme policy
SC6.7	Flood hazard planning scheme policy
SC6.8	Mitigating bushfire hazards planning scheme policy
SC6.9	Natural assets planning scheme policy
SC6.10	Parking rates planning scheme policy

SC6.2 Character residential planning scheme policy

SC6.2.1 Introduction

Short Title -The planning scheme policy (PSP) may be cited as the Character residential PSP.

SC6.2.1.1 Purpose

The purpose of the planning scheme policy is to:

(1) provide advice about achieving outcomes in the Character residential zone code; and

(2) identify and provide guidance about information that may be required to support a development application where assessable against the Character residential zone code.

SC6.2.1.2 Legislative authority

This planning scheme policy is made under Chapter 2, Part 3 of the *Planning Act 2016*.

SC6.2.1.3 Relationship to the Townsville City Plan

This planning scheme policy is to be read in conjunction with the assessment provisions specified in the Townsville City Plan, specifically the Character residential zone code.

SC6.2.1.4 Terminology

Terms used in this planning scheme policy are defined in Schedule 1 – Definitions. A term used in the planning scheme policy which is not defined in Schedule 1 – Definitions, is to be interpreted in accordance with Part 1.3.1.

SC6.2.2 Planning scheme policy details

The Character residential zone identifies and defines parts of the city with a unique mixture of architecture and overall streetscape. The Character residential zone code regulates development within identified character precincts. This code ensures that the features of these neighbourhoods that make a positive contribution to each precinct's overall character are retained and appropriately managed.

There are twelve precincts in the Character residential zone code, each with its unique features (such as Workers Cottages, Grand Queenslanders and 1960s Defence Housing). The precincts provide for specific development outcomes over and above the general zone code outcomes. Individual properties are included within a precinct. The character features are described fully in the code.

The purpose of the Character residential PSP is to provide applicants with guidance in meeting the requirements of the Character residential zone code. Appendix 1 of this policy identifies non-contributing properties in the Character residential zone. Properties and buildings identified in the Character residential zone and not listed in Appendix 1 of this policy are considered to be contributing properties and buildings. Appendix 2 of this policy identifies contributing non-residential properties.

SC6.2.2.1 Understanding your precinct and your character building

Each character residential precinct is defined in the Character residential zone code. Townsville has defined character residential precincts; these precincts are rich in diversity, unique in character, and capture Townsville's history and North Queensland lifestyle.

(1) Your precinct

The buildings in your street create the character of your precinct. Properties are defined as either contributing character buildings or non-contributing properties. Non-contributing properties must still comply with certain provisions of the Character residential zone code, however; they are not to be used for comparative assessment.

Your street will provide the majority of the information you need to better understand the types of buildings, design, developments and architectural aspects that will be relevant to any new works on your property.

SC6.2.2.2 Finding your way around the policy

The policy is divided into the following eight sections:

(1) Key contributing character elements (SC6.2.3)

(2) Non-residential contributing character buildings (SC6.2.4)

(3) Reconfiguring a lot (SC6.2.5)

(4) Information that may support a development proposal (SC6.2.6)

(5) Preparing an assessment report (SC6.2.6.2)

(6) Preparing a condition report (SC6.2.6.3)

(7) SC6.2 Appendix 1: Non-contributing properties in the Character residential zone

(8) SC6.2 Appendix 2: Contributing non-residential properties

SC6.2.3 Key contributing character elements

SC6.2.3.1 Roofs

This section of the policy provides design principles and examples that may be considered when addressing the requirements of the Character residential zone code. Applicants may refer to this section for guidance on Character residential zone code outcomes regarding roof forms and pitch, material type and colour and depth of roof overhang.

(1) Figure SC6.2.3.1 below demonstrates acceptable roof pitch in relation to neighbouring properties. This may provide guidance in addressing roof pitch related outcomes of the Character residential zone code requirements in particular, in relationship to PO18, PO21, PO28, PO33, PO40, PO45, PO51, PO56, PO63, PO69, PO74 and PO80.

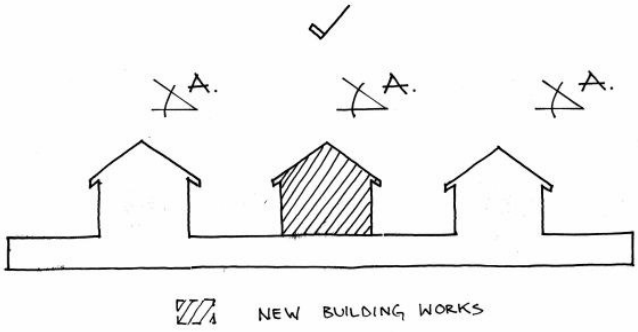


Figure SC6.2.3.1 Illustrates an example of acceptable roof pitch

(2) Figure SC6.2.3.2 below demonstrates an unacceptable roof pitch in relation to addressing roof pitch related outcomes of the Character residential zone code requirements in particular, in relation to PO18, PO21, PO28, PO33, PO40, PO45, PO51, PO56, PO63, PO69, PO74 and PO80.

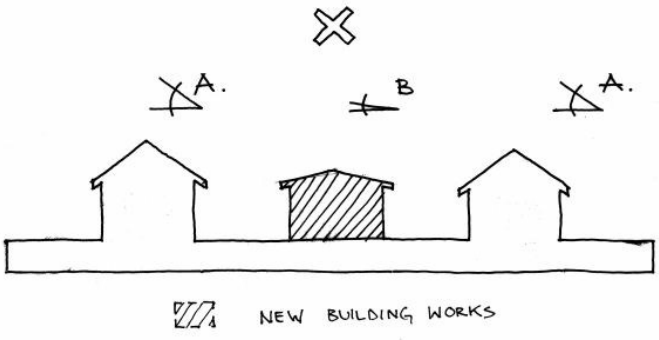


Figure SC6.2.3.2 Illustrates an example of unacceptable roof pitch

(3) Figure SC6.2.3.3a and Figure SC6.2.3.3b identifies some examples of compatible roof pitches found in various character residential precincts. These may be considered in addressing Character residential zone code requirements relating to roof pitch.

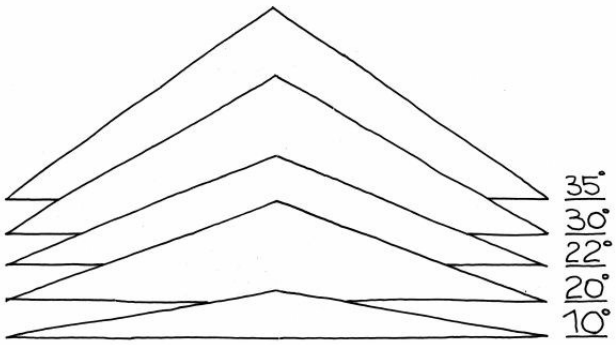
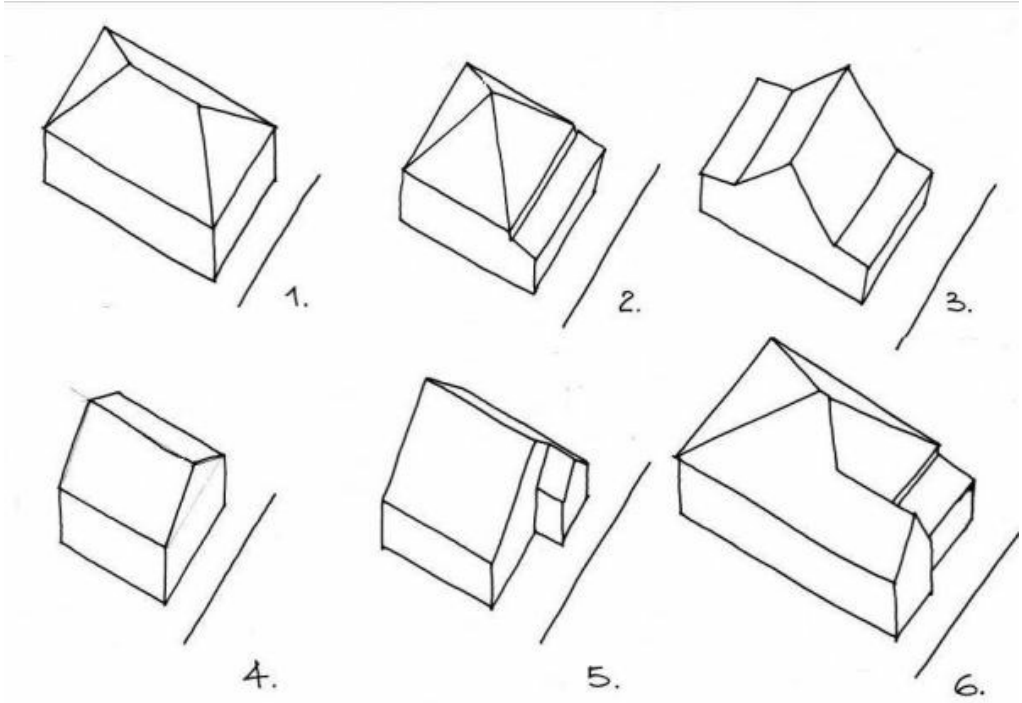


Figure SC6.2.3.3a Illustrates an example of common roof pitches in character residential precincts



Note—the resulting roof may be expressed as a combination of any number of roof forms:

(1) hip roof;

(2) pyramid roof with skillion/lean-to verandah;

(3) side gable roof with skillion/lean-to verandahs;

(4) front gable roof;

(5) double gable roof (sometimes expressed as triple gable roof); and

(6) combination of gable and hip roofs, with skillion/lean-to verandah.

Figure SC6.2.3.3b Illustrates an example of common roof forms in character residential precincts

(4) Figure SC6.2.3.4 provides guidance on the identification of roof eave depth. This figure may assist in the determination of eave depth in particular, in relation to PO19, PO22, PO57, PO64, PO75 and PO81 of the Character residential zone code.

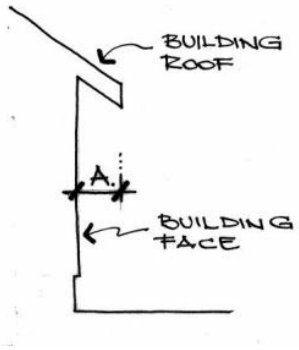


Figure SC6.2.3.4 Illustration of the roof eave depth which is shown by measurement "A"

SC6.2.3.2 Verandahs and front facades

A front verandah or an articulated front façade is commonly observed as a fundamental element of character within some precincts. This section of the policy provides examples of variation in verandah design, including scale (width, depth) enclosure, setback and height above ground level (see Figure SC6.2.3.5 for illustration of terms).

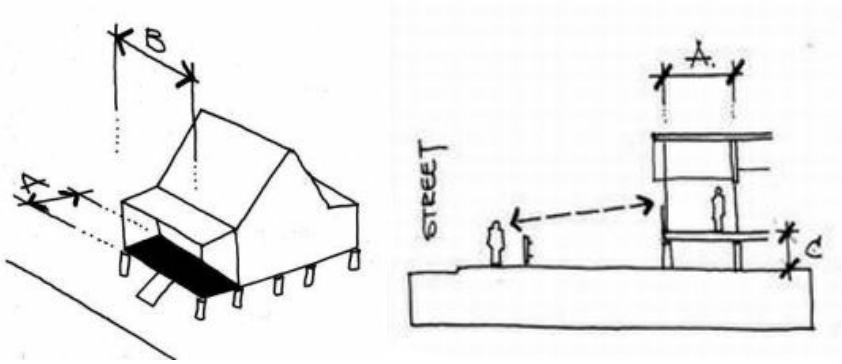


Figure SC6.2.3.5 - Demonstrating the width (B), depth (A), enclosure, setback, and height above ground level (C) of a front verandah

(1) Figure SC6.2.3.6 below illustrates 100% of the front façade width containing a verandah (left), and also an example of a property with a front façade including a verandah for a minimum 60% width of the front façade, wrapping down one side, and includes an asymmetrical projecting front gable (right). Both are open verandahs and are elevated above the natural ground level.

Figure SC6.2.3.6 Illustrates examples of a front verandah

(2) Figures SC6.2.3.7- SC6.2.3.9 illustrate examples of variation in verandah design including open, enclosed, and semi-enclosed and their supporting character elements.

Figure SC6.2.3.7 Illustrates an example of a front verandah, semi enclosed with screening and a door

Figure SC6.2.3.8 Illustrates an example of an open front verandah Workers Cottage style

Figure SC6.2.3.9 Illustrates an example of an open front verandah, Grand Queenslander style

(3) Figure SC6.2.3.10 and SC6.2.3.11 shown below, may be considered as a compatible outcome in relation to PO48, and PO71 and PO 78 of the Character residential zone code. The figures illustrate an example of projecting built forms that may be incorporated into building design in character precincts that do not include a verandah.

Figure SC6.2.3.10 Illustrates an example of a front façade with projecting gable features

Figure SC6.2.3.11 Illustrates an example of a front façade with single asymmetrical projecting gable

SC6.2.3.3 Windows

(1) Figure SC6.2.3.12 shown below, illustrates examples of sympathetic window scale and proportion. These examples provide guidance for addressing outcomes PO20, PO23, PO29 PO34, PO46,PO52, PO58, PO65, PO76 and PO82 of the Character residential zone code.

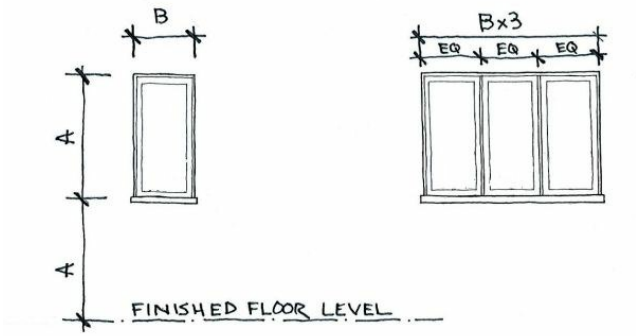


Figure SC6.2.3.12 Illustrates an example of half-height, vertically proportioned windows with one frame (left) and a set of three frames (right)

(2) Figure SC6.2.3.13 shown below, illustrates examples of window hoods in relation to the predominant character of the precinct. This information may be considered in addressing outcomes PO29 and PO34 Character residential zone code requirements regarding sympathetic window scale and proportion.

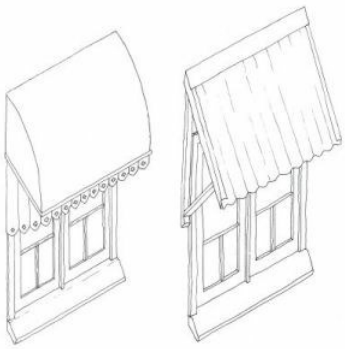


Figure SC6.2.3.13 Illustrates an example of traditional window with hood (left), and an acceptable new window with hood reflecting the same scale and proportions (right)

(3) Figure SC6.2.3.14 - SC6.2.3.17 shown below, illustrates examples of typical windows in character precincts. This information may be considered in addressing outcomes PO20, PO23, PO29 PO34, PO46, PO52, PO58, PO65, PO76 and PO82 of the Character residential zone code.

(a) casement windows and louvers;

Figure SC6.2.3.14 Illustrates an example of two vertically proportioned casements and louvers either side, centrally located under the apex of a gable projection

Figure SC6.2.3.15 Illustrates an example of five vertically proportioned casements located under the apex of a gable projection

(b) bay windows; and

Figure SC6.2.3.16 Illustrates an example of projecting bay window with four casement frames two located centrally and one either side

(c) full height windows.

Figure SC6.2.3.17 Illustrates an example of a full height window, acceptable in 1960's Defence Housing Precinct only

SC6.2.3.4 Building materials

Lightweight construction materials are typical within Townsville's character residential precincts. Lightweight construction materials are traditionally "timber and tin" products. New works within a character residential precinct can replicate lightweight construction using other materials, provided the appearance of lightweight construction is achieved. This section provides guidance on how to achieve PO15 of the Character residential zone code.

(1) Buildings and new works can use materials that are lightweight in appearance and sympathetic with the character of the streetscape. Where traditional lightweight materials are not able to used, non–lightweight materials are acceptable, provided the materials and methods used reflect the appearance of lightweight construction.

An example of an acceptable construction (Figure SC6.2.3.18, left) shows non-lightweight materials that reflect lightweight construction by referencing a raised appearance using textured cladding. An example of an unacceptable construction (right) shows a rendered wall that does not reference a lightweight appearance.

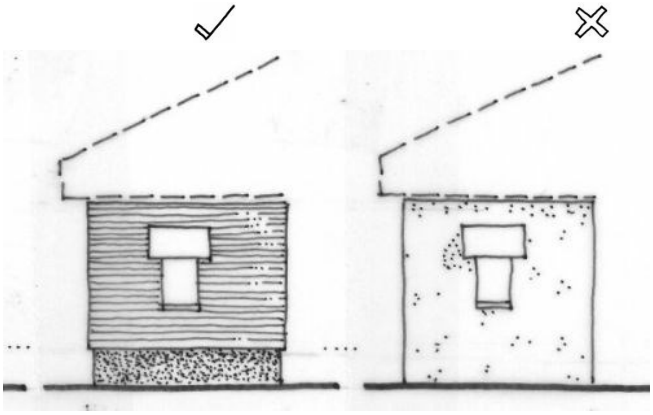


Figure SC6.2.3.18 An example of an acceptable construction (left), and an unacceptable construction (right)

(2) The design materials and principles below provide acceptable examples which can be considered for achieving PO15 of the Character residential zone code.

(a) Typical use of expressive materials in the Character residential zone precincts includes:

(i) chamferboard: A common exterior timber cladding. Several profiles of chamferboard exist, produced in several timber types, such as silky oak, cedar and hardwoods (as shown in Figure SC6.2.3.19);

Figure SC6.2.3.19 Illustrates traditional use of timber chamferboard on external walls

(ii) expressed studwork: Typical of traditional timber framed homes. A practice of fixing the weatherboards to the inner surface of the stud frame and leaving the outer surface uncovered. Evolved to be both functional and decorative (as shown in Figure SC6.2.3.20);

Figure SC6.2.3.20 Illustrates traditional use of expressed studwork walls

(iii) manufactured cladding: Exterior building veneer material. Can be used as an overlay to an existing exterior; some cladding products are known as siding. Manufactured cladding can be used to mimic traditional materials such as chamferboard (as shown in SC6.2.3.21);

Figure SC6.2.3.21 Illustrates new works using manufactured cladding in imitation of traditional lightweight materials

(iv) corrugated galvanised iron: A common roofing material in Australia (as shown in Figure SC6.2.3.22); and

Figure SC6.2.3.22 Corrugated galvanised iron is typical for roofing in Townsville Character buildings

(v) masonry is acceptable for use with external walls where it is finished in the appearance of lightweight construction, and/or used in conjunction with lightweight cladding materials (as shown in Figure SC6.2.3.23).

Figure SC6.2.3.23 Illustrates desirable outcome of a masonry constructed home with a "lightweight appearance"

SC6.2.3.5 Maintaining the street rhythm (scale and proportion)

Maintaining the street rhythm within a character residential precinct is paramount to preserving the character of any particular precinct. Street rhythm can be maintained by repeating the scale and proportions of the character buildings that are predominant in the streetscape. This can be achieved in terms of building heights, setbacks from the street, width of the front facades, and elevation of the floor levels.

Figure SC6.2.3.24 Illustrates an example of an acceptable ground floor enclosure

Figure SC6.2.3.24 illustrates an acceptable example; a raised character building that has been enclosed on the ground level, recessed the full width of the front verandah, using complementary materials and includes a valance in appropriate scale and proportion (this may be considered in addressing numerous Character residential zone code outcomes).

SC6.2.4 Non-residential contributing character buildings

SC6.2.4.1 Non-residential uses

This section of the policy provides guidance in relation to addressing outcome PO35 of the Character residential zone code. In particular, for those properties listed in Appendix 2 - Contributing non-residential properties.

In the South Townsville precinct, non-residential uses and buildings are a contributing element to the precinct's defined character. These non-residential buildings and uses reflect the early settlement and lifestyle of South Townsville.

(1) Typical elements of non-residential contributing character buildings in the South Townsville precinct include:

(a) no setback to street boundaries, and provide an awning and footpath for the full extent of the primary street frontage (as shown in Figure SC6.2.4.1 and Figure SC6.2.4.2); and

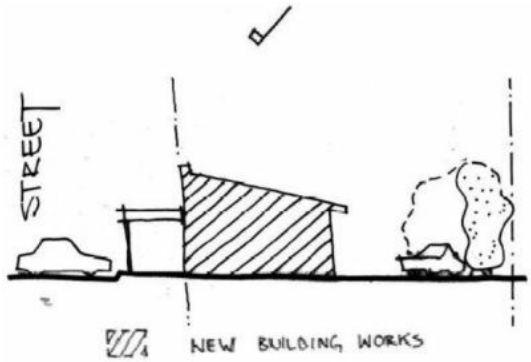


Figure SC6.2.4.1 Non-residential building with no setback to street boundary, awning over the footpath and parking on the street or behind the building

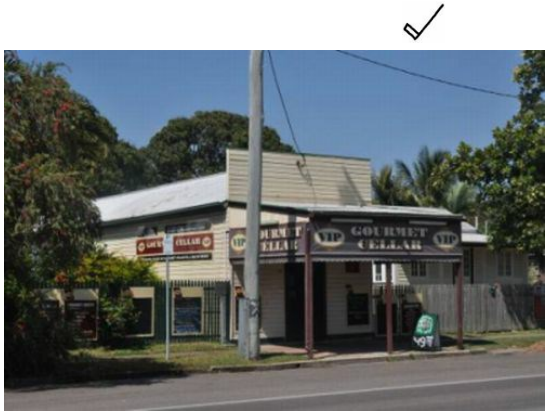


Figure SC6.2.4.2 Existing acceptable example of a non-residential use in an acceptable non-residential building (no setback to street boundary and awning over footpath)

(b) utilise on-street car parking, and/or on-site parking is behind the building and obscured by landscaping screen.

Note—where an existing non-residential non-contributing character building is not retained, the site may be converted to a residential use to match the scale and rhythm of adjacent contributing character residential buildings.

SC6.2.5 Reconfiguring a lot

The following design principle is provided as material for consideration when addressing PO11 of the Character residential zone code.

(1) To maintain the rhythm and consistency of the streetscape, the installation of a fence that is tapered in height from the street front to the front façade of the building may be considered (Figure SC6.2.5.1 illustrates an acceptable outcome).

Figure SC6.2.5.1 Illustrates access strip fencing tapered from the front façade of the building to the street boundary (measurements are provided only as an example)

SC6.2.6 Information that may support a development proposal

SC6.2.6.1 Elevations and streetscape

Development proposals should provide clear representations of the relationship between adjacent contributing character buildings and the proposed works to ensure that the design of development is undertaken with a clear understanding of the surrounding context.

Development applications should provide front/street elevations of the proposed works and of each adjoining contributing character building. References of key elements from adjoining contributing character buildings (roof type/pitch, floor elevations, windows, building materials, building height, setbacks, scale and proportions) should be made in all new works.

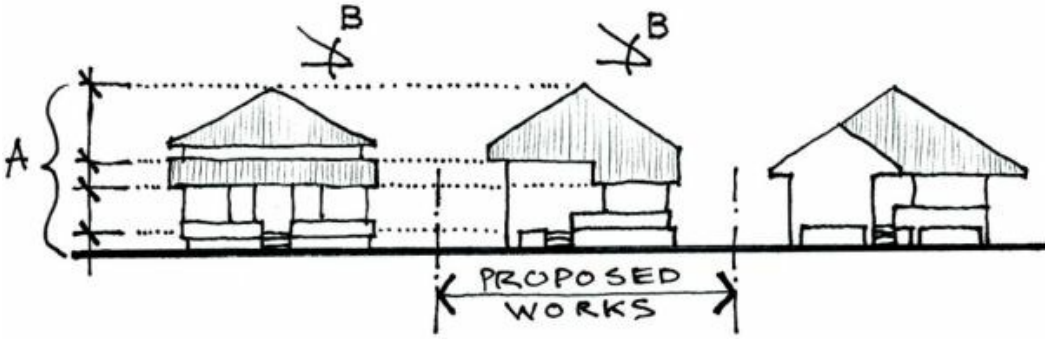


Figure SC6.2.6.1 Illustrates an example of clear elevations of the proposed works and adjoining contributing character buildings, with references made to key elements

SC6.2.6.2 Preparing an assessment report

The following is advice for preparing an assessment report for a property or building within the Character residential zone code. This may be required to demonstrate achievement with the relevant performance outcomes in the Character residential zone code.

An assessment report may provide specific information about how a proposed development will affect the character residential precinct.

The report should include the following:

(1) A brief description of the proposed development including:

- (a) type of development;
- (b) range and scope of work proposed;
- (c) timeframe for carrying out work; and
- (d) location of work in relation to the character residential precinct;

(2) A description of the setting and context of the place, including photographs and maps showing significant features that will be affected. Provide an analysis of the affect the development will have on the streetscape;

(3) A description of proposed changes to character including:

(a) what elements or aspects of streetscape are affected by the change;

(b) assessment of the proposal against the performance outcomes in the zone code;

(c) analysis of the impact of the change on the significance of the precinct;

(d) assessment of potential for detrimental impact on the significance of the precinct; and

(e) where the proposed change is assessed as having potential for detrimental impact, provide information about why the change is required, alternative solutions that were investigated, and what measures are included in the development to reduce detrimental impact that may result from the change; and

(4) References list documents referred to in the assessment report such as conservation policies, conservation management plan, condition report (i.e. demolition report), and specialist consultants' reports. (Adapted from Guideline: *Preparing a Heritage Impact Statement* Department of Environment and Heritage Protection, 2011).

SC6.2.6.3 Preparing a condition report

If an application is proposing demolition of a contributing character building, the applicant may be requested to provide a condition report. The condition report should, at a minimum, include consideration of:

(a) the structural stability of the building in the form of a structural engineer's report. The condition report must include a factual statement from an appropriately qualified structural engineer about the condition of the building; and

(b) a pest inspection report and other supporting documentation may also be provided.

Appendix 1

SC6.2 APPENDIX 1: Non-contributing properties in the Character residential zone

Precinct A – 1950's Post War Expansion

Address	Comments
79 Lancaster Street	Original house that has been re-clad with face brick, including brickwork fence. Original roof form and windows have been retained, however brickwork is out of character
18 Lockheed Street	Contemporary rendered blockwork slab on ground house with double garage facing the street and rendered masonry front fence.
62 Perroux Street	High-set house
10 McHardie Street	Blockwork house
14 McHardie Street	Blockwork house
29 Downs Street	Blockwork house

Precinct B – 1960s Defence Housing and 1960s Housing Commission

Address	Comments
55 Clements Crescent	Substantial tornado damage
2 Lancaster Street	Low-set house
3 Lancaster Street	"Ranch Style" high set house – different style to predominant character
4 Lancaster Street	Low-set house
46 Douglas Street	Oriented to other street – does not relate to rest of precinct

Precinct C – Worker's Cottages

Address	Comments
4 Fifth Street	Vacant Lot
6 Fifth Street	Vacant Lot
3 Fifth Street	High-set horizontally massed house with shallow pitched roof
2 Flowers Street	High-set horizontally massed house
16 Flowers Street	Low-set Blockwork house
26 Flowers Street	Horizontally massed with prominent carport
77 Ninth Avenue	High-set horizontally massed house
1A Doorey Street	Low-set rendered house with prominent carport to front boundary
66 Tenth Avenue	Low-set blockwork duplex
60 Eleventh Avenue	High-set horizontally massed house
63 Eleventh Avenue	High-set horizontally massed house
73 Eleventh Avenue	High-set fibre cement clad house
75 Eleventh Avenue	High-set horizontally massed duplex
12 Fourteenth Avenue	Low-set blockwork house
14 Fourteenth Avenue	Low-set blockwork house
13 Fifteenth Avenue	High-set horizontally massed house
40 Seventh Street	Low-set fibre-cement house with skillion roof
7 Third Street	Low-set blockwork house
9 Third Street	High-set horizontally massed house with shallow pitched roof
14 Third Street	Low-set blockwork house (obscured by garden)
19 Third Street	High-set horizontally massed duplex
31 Flowers Street	Low-set blockwork house
258 Boundary Street	Blockwork Duplex
288 Boundary Street	Horizontally massed high-set house
1 Cape Street	Blockwork House
2 Cape Street	Horizontally massed high-set house
2 Comet Street	Low-set fibre cement house with shallow roof pitch
6 Fourth Avenue	Low-set house with shallow roof pitch
30A Sixth Avenue	Horizontally massed house with blockwork arches
37 Sixth Avenue	Vacant Lot
26 Sixth Street East	Horizontally massed high-set house
52A Sixth Street East	Vacant Lot
53 Sixth Street East	Vacant Lot
55 Sixth Street East	Water Police Office
57 Sixth Street East	Vacant Lot
56-58 Sixth Street East	Vacant Lot
19 Eighth Avenue	Horizontally massed two storey house
26 Perkins Street	Low-set blockwork house
37 Davidson Street	Low-set block house with large setback
40 Davidson Street	Low-set coloured blockwork house
42 Davidson Street	Rendered low-set house with tiled roof and garage door on street
15 Baxter Street	Original character house – raised to two storeys and poorly enclosed front verandah.
21 Baxter Street	Low-set brick block of units
22 Baxter Street	Rendered low-set house with visually prominent garage
7A Garrick Street	High-set fibre cement house with shallow pitched front gable
12 Garrick Street	Low-set brick house
16 Garrick Street	Low-set blockwork house
9-11 Castling Street	High-set “Ranch” style fibro house with shallow pitched roof
8 Castling Street	Blockwork lowest house
15 Estate Street	Modern, unsympathetic new dwelling, inconsistent setback, subdivision not consistent with other blocks

15A Estate Street	Modern, unsympathetic new dwelling, inconsistent setback, subdivision not consistent with other blocks
17 Estate Street	Low-set house with shallow front gable
18 Estate Street	Horizontally massed house
26 Estate Street	High-set 1950s era house
28 Estate Street	Low-set masonry – only visible expression is front double carport
3 Townsville Street	High-set fibre cement clad with shallow pitched front gable
4 Townsville Street	High-set horizontally massed house
5 Townsville Street	Unsympathetically raised house
7 Townsville Street	Character house with blank blockwork wall in front
15A Townsville Street	Rendered low-set house with prominent front carport
27 Townsville Street	Vacant lot
2 Edwards Street	Low-set rendered house with very shallow roof pitch
7 Edwards Street	Recent house with disproportionate front setback and prominent front carport
7A Edwards Street	Recent house with disproportionate front setback and prominent front carport
17 Edwards Street	Gable fronted two storey units
18 Edwards Street	Low-set house with brick walls and single front gable
6 Lamington Road	Brick “six pack” unit block
12-14 Lamington Road	Blockwork units, tiled roof
13 Lamington Road	Blockwork units
6 Humphrey Street	Two storey brickwork units
14 Humphrey Street	Low-set blockwork units
15 Humphrey Street	Low-set blockwork house
25 Humphrey Street	Unsympathetically raised and renovated character house
5 Plant Street	Two storey blockwork “six-pack” units
6 Shaw Street	Oversized modern highest house with gable – out of scale
22 Shaw Street	High-set “Ranch” style
25 Shaw Street	Low-set blockwork duplex
9 Shaw Street	Blockwork units

Precinct D – South Townsville (Residential)

Address	**Comments**
66 Allen Street	Rendered two storey house with prominent carparking
75 Allen Street	Low-set blockwork house
30 Allen Street	Low-set rendered house
10 Bell Street	Low-set fibre cement house
15 Bell Street	Horizontally massed high-set house
17 Bell Street	Brick and tile house
21 Bell Street	St Andrews Villas – Brick low-set
37A Bell Street	Rendered duplex
37B Bell Street	Rendered duplex
183 Boundary Street	Horizontally massed high-set house
283-285 Boundary Street	Low-set blockwork house
1 Cannan Street	Contemporary house under construction
17 Hubert Street	Character house raised on disproportionately high stumps
41 Macrossan Street	Horizontally massed high-set house
55 Macrossan Street	Two storey blockwork house
5 Martin Street	Low-set duplex with very prominent garages
10 Martin Street	Low-set rendered duplex
7 Nelson Street	Brick and tile house
13 Nelson Street	Wide low-set rendered house
18 Nelson Street	Brick duplex with blank gable end facade
21 Nelson Street	Vacant lot
22 Nelson Street	Low-set blockwork house

43-45 Nelson Street	Brickwork units
46 Nelson Street	Contemporary skillion roofed house – lacks front verandah
50 Nelson Street	Brick and tile house
52 Nelson Street	Brick and tile house
54 Nelson Street	Low-set blockwork house
71 Perkins Street	Low-set rendered house
85 Perkins Street	Vacant lot
115 Perkins Street	Unsympathetically converted commercial building
8 Tully Street	Blockwork duplex
42 Tully Street	Two storey brickwork house
44 Tully Street	Mock heritage low-set house
73 Tully Street	Rendered two storey house – lacks shade elements
81 Tully Street	Two storey blockwork house
91 Tully Street	Low-set blockwork house
97 Tully Street	Low-set rendered house
105 Tully Street	Multiple units

Precinct D – South Townsville (Non-Residential)

Address	**Comments**
50 Allen Street	Rendered recent commercial building – built to front boundary, however lacks street activation and awnings to footpath
12-20 Bell Street	Large contemporary warehouse building – Sigma Pharmaceuticals
20A Bell Street	Shades By Prior – rendered recent commercial building built to boundaries, however lacks substantial awnings to footpath
22 Bell Street	Map to Mine – commercial offices with large front setback
8 Cannan Street	Sabre Marine – large light industrial shed with large setback to the street and front hardstand area
10 Cannan Street	Basic commercial building with large front setback and extensive front carparking area
12 Cannan Street	Basic commercial building with large front setback and extensive front carparking area
6 Hubert Street	NSS (Northern Stevedoring Services) Shed with large hardstand area to street
3-7 Macrossan Street	South Townsville Self-Storage – secure self-storage complex
11 Macrossan Street	Portside Self-Storage – secure self-storage complex
13-17 Macrossan Street	U-Store – secure self-storage complex
36 Macrossan Street	Home-grown Hardwoods – large setback to the street and prominent front hardstand and storage area
38 Macrossan Street	SSAF Sheetmetal – Light industrial shed built to front and side boundaries however lacks street activation or awnings to footpath. May be suitable for retrofitting or refurbishment to improve character values.
45 Macrossan Street	Black River Cattle Equipment – light industrial use and rear shed destroys character values of retained house.
47 Macrossan Street	Abraham Steel Fabrications – large light industrial shed.
53 Macrossan Street	C&C Motors Shed – light industrial shed
46 Morey Street	Furniture warehouse with relatively blank blockwork façade to street and lack of shade to footpath. Appears suitable for retrofitting or refurbishment to improve character values.
19 Perkins Street	Light Industrial shed setback from street with hardstand area to front
41 Perkins Street	Murphy Steel Fabrications – Open light industrial shed with general storage in fenced yard.
75 Perkins Street	Dick Yuen Wholesale – Large front setback and extensive front hardstand area
99 Perkins Street	Kirk's Automotive Service – Shed to street frontage – interrupts an otherwise consistent row of character houses. Shed to rear of site may have some character value however is not readily visible from the street.

113 Perkins Street	Hood the Sailmakers Offices – blockwork commercial building. Built to front and side boundaries however lacks street activation and awnings to footpath. Appears suitable for retrofitting or refurbishment to improve character values.
3 Tully Street	U-store – secure self-storage complex
17 Tully Street	Shed with large front setback
50 Tully Street	Commercial complex with relatively blank blockwork façade to street and prominent driveway.
58 Tully Street	Warehouse complex. Built to front and side boundaries, however blank blockwork façade and lack of shade to footpath. Appears suitable for retrofitting/refurbishment.
80 Tully Street	Woodfield Engineering – basic light industrial shed
102 Tully Street	Fenced site – otherwise vacant

Precinct E – Queenslanders

Address	**Comments**
12 The Avenue	3 storey blockwork “Six-pack” units
16 The Avenue	2 storey brick units
7 Ackers Street	Three storey blockwork units
16 Ackers Street	Brickwork units
24 Ackers Street	Blockwork units
26 Ackers Street	Blockwork units
29-31 Ackers Street	Blockwork units
32 Ackers Street	Blockwork units
39 Ackers Street	Brick and tile house
42 Ackers Street	Low-set duplex
57 Ackers Street	Blockwork units
64 Ackers Street	Low-set blockwork duplex
66 Ackers Street	Horizontally massed high-set house
68 Ackers Street	Horizontally massed high-set house
69 Ackers Street	Low-set fibre cement units
2 Ahearne Street	Vacant lot
19 Ahearne Street	Brickwork base, horizontally massed highset house
25 Ahearne Street	Horizontally massed high-set house
27 Ahearne Street	Horizontally massed high-set house
35 Ahearne Street	Blockwork units
36 Ahearne Street	Horizontally massed high-set house
38 Ahearne Street	modern duplex
47 Ahearne Street	Blockwork units
51 Ahearne Street	Two storey contemporary units – some sympathetic elements however overall bulk and prominent garages are detrimental.
52 Ahearne Street	Vacant lot
54 Ahearne Street	Blockwork Units
70 Ahearne Street	Brickwork house
7 Armstrong Street	Blockwork low-set units
16 Armstrong Street	Horizontally massed high-set house
18 Armstrong Street	Three storey blockwork units
27 Armstrong Street	Low-set brick units
28 Armstrong Street	Horizontally massed high-set house
30 Armstrong Street	Low-set brick units
39 Armstrong Street	Two storey brick units
41 Armstrong Street	Fibre cement building with shallow roof pitch – used as offices
44 Armstrong Street	Two storey blockwork with arches
50 Armstrong Street	Blockwork low-set house
54 Armstrong Street	Brickwork units

56-58 Armstrong Street	Blockwork units
64 Armstrong Street	Vacant lot
78 Armstrong Street	Low-set rendered house
36-38 Ackers Street	Two storey brick units
4 Campbell Street	Blockwork units
6 Campbell Street	Blockwork units
2 Marks Street	Horizontally massed high-set house
16 Marks Street	Two storey blockwork units
18 Marks Street	Two storey rendered units
13 Philp Street	Rendered low-set units
16 Philp Street	Blockwork low-set units
19 Philp Street	Two storey brick house
21 Philp Street	Low-set rendered house
27 Philp street	Brick two storey units
37 Philp Street	Vacant Lot, not gazetted address, part of 35 Philip but fenced off
42 Philp Street	Rendered two storey units
9 Campbell Street	Masonry rendered 2 storey house (actually rear of lot at 42 Philip St, but driveway is to Campbell & post-box has number 9 on it.
14 Summerfield Street	Vacant lot
2A Ralston Street	Low-set blockwork units
2 Ralston Street	Low-set blockwork units
16 Ralston Street	Two storey blockwork units
18 Ralston Street	Vacant lot
45 Henry Street	Two storey blockwork units
125-127 Francis Street	Church, modern brickwork
129 Francis Street	Masonry units
146 Francis Street	Low-set blockwork house with very shallow roof pitch
154 Francis Street	Low-set house with stipple render finish
36 Leigh Street	Two storey units – face brickwork with fibre cement chamfer boards
56 Leigh Street	Light industrial building
25 Stagpole Street	Prominent three storey blockwork units
30 Stagpole Street	Horizontally massed high-set house
32 Stagpole Street	Blockwork low-set house with shallow roof pitch
33A Stagpole Street	Newly reconfigured house
40 Stagpole Street	Low-set rendered units (“6 pack”)
43A Stagpole Street	Newly reconfigured house
49 Stagpole Street	Open light industrial shed
52 Stagpole Street	Low-set shallow pitched hipped roof house with high fence and low floor height
82 Stagpole Street	Horizontally massed high-set house
83 Stagpole Street	Shallow pitched skillion roofed fibre cement clad house
86 Stagpole Street	Low-set blockwork units
93 Stagpole Street	Horizontally massed 1960’s era high-set house. Front setback blocks views to “Wolverton”.

Precinct F – Interwar Gables and Queensland Bungalows

Address	**Comments**
14 Chubb Street	Rendered front parapet (addition) and tall rendered fence
16 Chubb Street	Rendered
15 Taylor Street	Horizontally massed high-set house
16 Taylor Street	Vacant lot
20 Taylor Street	Horizontally massed high-set house
12 McKillop Street	Brick house with prominent front carport
3 Mawai Street	Low-set blockwork house with high fence
8 Mawai Street	Horizontally massed high-set house

4 Mears Street	Horizontally massed high-set house
6 Mears Street	Horizontally massed high-set house
11 Mears Street	Horizontally massed high-set house
22 Mears Street	Brick and tile units
24 Mears Street	Street frontage dominated by double carport with roller doors
34 Mears Street	Two storey block of units with shallow pitched roof
30 Hammond Street	Horizontally massed high-set duplex

Precinct G – Interwar to 1950s Asymmetrical Gable

Address	Comments
34 Hooper Street	Low-set blockwork duplex
35 Hooper Street	Low-set skillion roofed house with prominent front carport
26 Hooper Street	Vacant lot
53 Princes Road	Units
14 Princes Road	Two storey units
29 Princes Road	Units
30 Princes Road	Units
16 Sussex Street	Blockwork low-set house
3 Batt Street	Modern rendered with skillion roof
9 Batt Street	Slab on ground, flagstone veneer
3 Purves Street	Slab on ground, rendered modern
21 Kenilworth Street	Low pitch mono gable horizontally massed
22 Kenilworth Street	Low-set render low pitched roof
23 Kenilworth Street	Brick veneer, two storey
24 Kenilworth Street	Not representative of character, but good tropical house
12 Kenilworth Avenue	Two storey unit development
6 Surrey Street	High-set fibre cement clad house
14 Surrey Street	Brick low-set house
16 Surrey Street	Brick low-set house
20 Surrey Street	Brick House
19A Surrey Street	High-set fibre cement clad house
21A Surrey Street	“Six pack” unit block
31 Townsend Street	Rendered blockwork house with prominent front garage
5 Burton Street	Low-set blockwork duplex
34 Townsend Street	Skillion roofed low-set house with rendered walls. Possible 1950s era
7 Burton Street	Low-set brickwork duplex
12 Burton Street	Low-set blockwork house
25 Burton Street	Low-set blockwork duplex
26 Burton Street	Horizontally massed high-set house
5 Ballard Street	Horizontally massed high-set house
11 Ballard Street	Horizontally massed high-set house
13 Ballard Street	Horizontally massed low-set house
15 Ballard Street	Rendered low-set house with shallow front gable
16 Ballard Street	Two storey, two car garage to front
40 Purves Street	Horizontally massed high-set house
51 Purves Street	Two storey unit building
55 Purves Street	Low-set blockwork house
57 Purves Street	Vacant lot
25 Mindham Street	Low-set rendered duplex

Precinct H – Churchill Street

Address	Comments
9 Churchill Street	High-set house with shallow pitched gable roof
11 Churchill Street	Low-set blockwork house with shallow pitched roof and lack of windows oriented towards street

Precinct I – Park Street

Address	Comments
22 Gladstone Street	Terrace Style Unit development. Width of building facing Park Street far exceeds character houses.
24 Gladstone Street	Pre 1946 house, however house faces Gladstone Street and does not contribute to Park Street Precinct streetscape.
20 Park Street	Unit Development. Incorporates some sympathetic features such as front verandah and fence.
21 Park Street	60's era High-set house with fake brick cladding
23 Park Street	Blockwork unit development with blank street frontage and no fence.

Precinct J – Grand Queenslanders

Address	Comment
17 Alexandra Street	3 storey brickwork units
26 Alexandra Street	Rendered house with shallow roof pitch and no front verandah
32 Alexandra Street	Low-set brick and tiled roof house
40 Alexandra Street	Two storey blockwork house
43 Alexandra Street	Two storey 1950s house with flush lower level and dominant rendered front retaining wall.
44 Alexandra Street	4 storey blockwork units
46 Alexandra Street	Rendered two storey units with tiled roof
1 Burke Street	4 storey blockwork units
2 Burke Street	Low-set masonry units
32 Paxton Street	Two storey rendered units with blank façade and prominent parking
21 Cleveland Terrace	Rendered Units – wide form/bulk, Mediterranean style
19 Cleveland Terrace	Brick unit building. Wide, horizontal massing.
11 Cleveland Terrace	Brick unit building. Setback from street does not align with neighbours
27 Cleveland Terrace	Building site – design appears to be modern house with materials that are not related to surrounding context.
34 Cleveland Terrace	Shallow gabled low-set house. Overly large front setback. Fibre cement wall cladding.
7-11 Hamilton Street	Very large site – Vacant apart from small 70s/80s era fibre cement clad dwelling.
3-5 Hamilton Street	Vacant
25 Melton Terrace	70's era fibre cement clad units. Dilapidated.
7 Victoria Street	Two storey rendered house with shallow roof pitch and prominent double garage
18-20 Victoria Street	Blockwork and tile duplex
15-19 Victoria Street	Ridgemont Motel – Blockwork and tiled roof
26-28 Victoria Street	Skillion roofed house
273 Stanley Street	Skillion roofed cottage
277 Stanley Street	Derelict cottage
279 Stanley Street	Brick units
37 Hale Street	Two storey fibre cement clad unit building – lacks front verandah.
39 Hale Street	Modest low-set house with large street setback and no front verandah.

Precinct K – French Street

Address	Comments
18 French Street	Blockwork unit block with large setback
16 French Street	Blockwork House with tiled roof
20 French Street	Modern unsympathetic units
27 French Street	Enclosed block work on ground floor and the removal of external front staircase
13 French Street	Low-set rendered masonry units

Precinct L – Mixed 1950's

Address	Comments
2 Goodwin Street	Blockwork low-set house
28 Goodwin Street	1960's era high-set house
56 Goodwin Street	Rendered contemporary low-set house
66 Goodwin Street	Horizontally massed high-set duplex
69 Goodwin Street	Blockwork low-set house
101 Goodwin Street	Blockwork low-set with tiled roof
3 McDougall Street	Horizontally massed high-set duplex
4 McDougall Street	Horizontally massed high-set duplex
27 Haig Street	3 storey unit development
3-5 Haig Street	Unit Development
2B Haig Street	Unsympathetic modern dwelling
6 Haig Street	Low-set house with prominent flat roofed extension facing Haig Street
10 Isley Street	Brick veneer, timber floor low-set house
12 Isley Street	Brick veneer on slab
146 Howitt Street	Three storey apartment complex
146 Mitchell Street	Two storey units

SC6.2 APPENDIX 2: Contributing non-residential properties

Address	Comments
38-42 Allen Street	Former Petrol Station – currently Motolec Auto Electrical. Current use of forecourt for fenced general storage is detrimental to precinct character; however, site contains former petrol station buildings that are part of the mixed precinct character. Site would benefit from refurbishment and new use with greater street activation.
39 Allen Street	Pre1941 commercial building built to front boundary with 2 shopfronts and awning over footpath.
34 Archer Street	Former basic light industrial shed – patina of weathered corrugated iron and surrounding gardens contributory.
25 Bell Street	Character house converted into two storey commercial building. No setback to front boundary and includes awning to footpath.
33 Bell Street	Pre 1941 commercial building built to front boundary. Character value reduced by added blockwork façade and lack of awning to footpath.
173 Boundary Street	Pre 1941 small chamferboard shop to street with awning. High chainlink fence to property boundary is detrimental to the character.
265 Boundary Street	Small row of shopfronts with awning to footpath. Parts appear to be pre1941. Unusual 1960's era two storey units on the same parcel of land – units appear to have potential for retrofitting/refurbishment.
32 Hubert Street	St Patrick's Catholic Church and former school building.
20 Macrossan Street	Commonwealth Hotel. Two storey corner hotel with wraparound verandahs over footpath. Very important contributor to local character.
30 Macrossan Street	St Johns Anglican Church
65 Morey Street	Bahai Community Centre
25 Perkins Street	Building materials site with pre 1941 twin gabled sheds built to Perkins Street Boundary. Current use of site for open storage is detrimental to precinct character however sheds have character value and appear suitable for retrofitting or refurbishment.
45 Perkins Street	South Side Engineering – light industrial gabled shed with some character values and appears suitable for retrofitting or refurbishment.
89 Perkins Street	Former 1950s era Art Deco influenced brick and tile house. Features curved walls and unusual plan. Currently used as offices for Family Emergency Accommodation Townsville – generally retains residential appearance.
115-147 Perkins Street	Heritage listed Warehouse building with brick components dating from 1899. Property is in relatively poor condition. Site is very large and mainly open hardstand – the heritage building occupies the Cannan Street end only. Sympathetic retrofitting or refurbishment will be required to retain the character values of this property.

SC6.3 Cultural heritage planning scheme policy

SC6.3.1 Introduction

Short Title -The planning scheme policy (PSP) may be cited as the Cultural heritage PSP.

SC6.3.1.1 Purpose

The purpose of the planning scheme policy is to provide applicants with additional information and guidance in meeting the requirements of the Cultural heritage overlay code and the Advertising devices code for signage in Flinders Street East.

SC6.3.1.2 Legislative authority

This planning scheme policy is made under Chapter 2, Part 3 of the *Planning Act 2016*.

SC6.3.1.3 Relationship to the Townsville City Plan

This planning scheme policy is to be read in conjunction with the assessment provisions specified in the Townsville City Plan, specifically the Cultural heritage overlay code and Advertising devices code.

SC6.3.1.4 Terminology

Terms used in this planning scheme policy are defined in Schedule 1 – Definitions. A term used in the planning scheme policy which is not defined in Schedule 1 – Definitions, is to be interpreted in accordance with Part 1.3.1.

SC6.3.2 Planning scheme policy details

The cultural heritage of Townsville continues to be a major contributor to the identity of the City and local communities. The Citation of Heritage Places Report provides information about each heritage place in Townsville. It highlights the criteria that were originally identified for each place and indicates its significant heritage features and eligibility for entry into Schedule 7 Places of cultural heritage value.

This planning scheme policy contains information to help individuals and groups identify, conserve and protect heritage places in Townsville. This policy provides applicants with guidance in meeting the requirements of the Cultural heritage overlay code and the Advertising devices code (where it relates to advertising devices for heritage places in Flinders Street East). The policy also details how to nominate to add a place to Schedule 7 Places of cultural heritage value and how to nominate to remove a place from Schedule 7 Places of cultural heritage value.

SC6.3.2.1 Finding your way around the policy

The policy is divided into the following nine sections:

(1) Information that may support a development proposal (SC6.3.3);

(2) Development adjoining a heritage place (SC6.3.4);

(3) Development within a heritage place, including advertising devices (SC6.3.5);

(4) Preparing a heritage impact statement report (SC6.3.6);

(5) Preparing a condition report (SC6.3.7);

(6) Preparing archival recording of a heritage place (SC6.3.8);

(7) Interpretive signage for the loss of a heritage place (SC6.3.8.3);

(8) Preparing an archaeological management plan (SC6.3.9); and

(9) Adding or removing a place to Schedule 7 Places of cultural heritage value (SC6.3.10).

SC6.3.3 Information that may support a development proposal

The information required for any development application will depend on the heritage significance of the heritage building, site or element and the proposed development. In addition to the requirements for development applications under the *Planning Act 2016* (PA) and the relevant Integrated Development Assessment System forms, the following additional information should generally be provided to council.

(1) To ensure that the design of the proposed development is undertaken with a clear understanding of the surrounding context and significance of "place", the proposed application should submit clear representations of the relationship between the heritage buildings and the proposed works.

(2) The applicant should submit a street elevation of the proposed development. The elevation is to be

(a) drawn to 1:200 scale;

(b) include the full width of the street frontage of the proposed development and the two adjacent neighbouring buildings (as shown in Figure SC6.3.3.1);

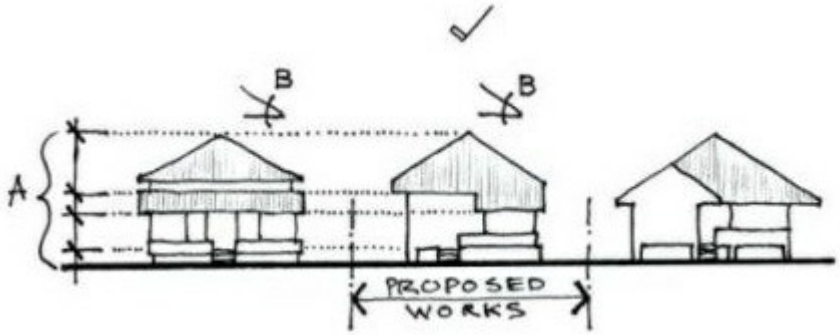


Figure SC6.3.3.1 Illustrates desirable outcome. 'A' denotes key building lines and 'B' is the referenced roof pitch. This may provide clear representations of relationship between the heritage place and the proposed works such as floor heights, dominant fascia lines, roof lines, roof pitch etc.

(c) provide accurate representations of the primary design considerations: setbacks, form, massing, height, materials, finishes, and key detail elements that contribute to the significance of the heritage place;

(d) for new buildings adjoining a heritage place, indicate key building lines in relation to the heritage place (as shown in Figure SC6.3.3.2); and

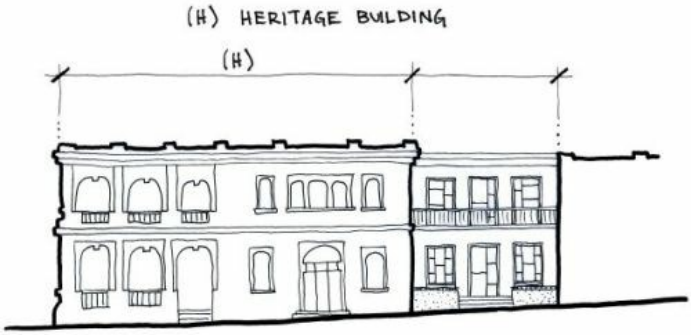


Figure SC6.3.3.2 Key building lines in relation to the heritage place

(e) for new works that are proposed to be visually obscured by a heritage feature, consider demonstrating view lines using a cross section drawing (as shown in Figure SC6.3.3.3).

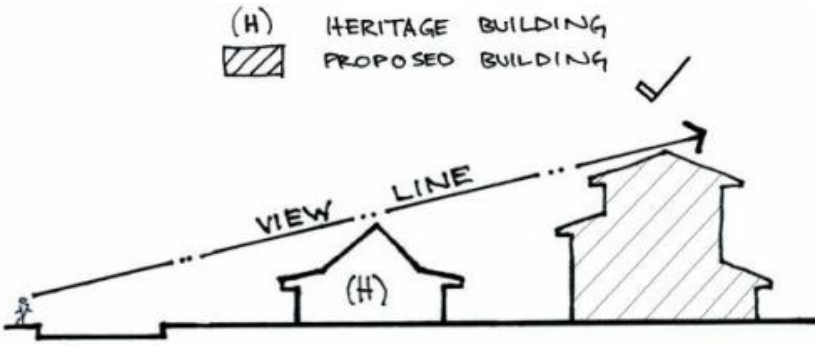


Figure SC6.3.3.3 View lines using a cross-section drawing

(3) In addition to the requirements above, for buildings with a height greater than 2 storeys, the applicant may be requested to submit:

(a) three dimensional perspective images inclusive of the adjacent neighbouring buildings; and

(b) in urban contexts in which the streetscape is of uniform height consistent with the height of the heritage place, provide an elevation drawing of the full width of the street block and nominate a "reference height".

SC6.3.4 Development adjoining a heritage place

This section of the policy provides guidance in achieving performance outcome PO13 of the Cultural heritage overlay code associated with setbacks for development, building height and scale and form of development adjoining a heritage place.

SC6.3.4.1 Setback for development

PO13 of the Cultural heritage overlay code requires that new buildings be consistent with the significant features and values of the heritage place, including, but not limited to, built form and setbacks, maintain significant views to and from the heritage place and ensure that new buildings are visually subservient.

(1) To achieve the requirements of the performance outcomes in the code and allow for significant views to and from a heritage place to be maintained, the following design guidance should be considered.

(a) in instances where the significance of the heritage place includes its setback in common with the established street pattern, the setback of new works ought to maintain this significance (as shown in Figure SC6.3.4.1);

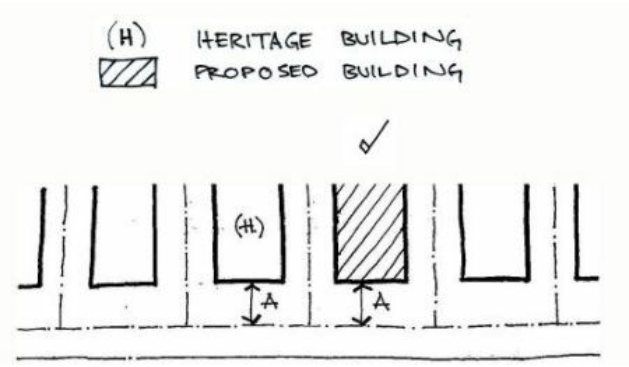


Figure SC6.3.4.1 Illustrates appropriate front setbacks for development adjoining a heritage place. "A" is the street setback distance.

(b) in instances where the significance of the heritage place includes its difference in setback to the established street pattern, the setback of new works ought to maintain this significance (as shown in Figures SC6.3.4.2- SC6.3.4.6); and

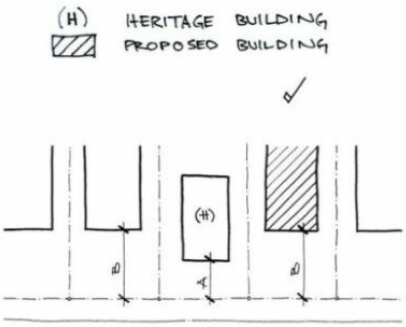


Figure SC6.3.4.2 Illustrates appropriate front setbacks for development adjoining a heritage place. "A" and "B" is the street setback distance.

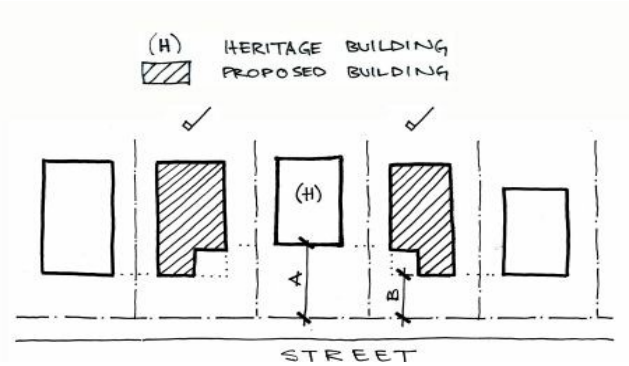


Figure SC6.3.4.3 Illustrates appropriate front setbacks for development adjoining a heritage place. "A" and "B" is the street setback distance

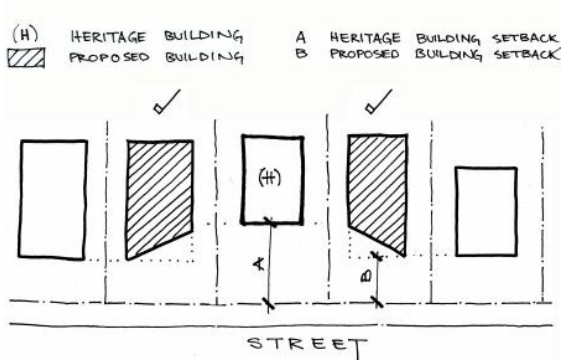


Figure SC6.3.4.4 Illustrates appropriate front setbacks for development adjoining a heritage place. 'A' and 'B' is the street setback distance

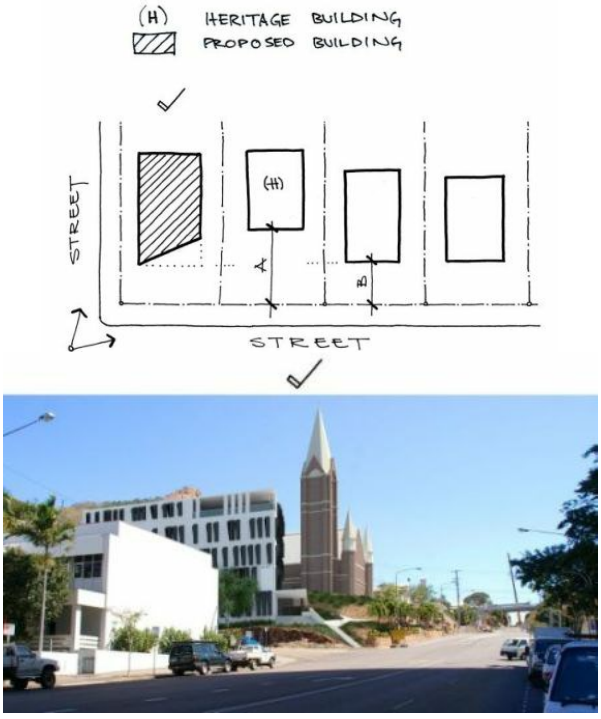


Figure SC6.3.4.5 Illustrates appropriate corner block front setback for development adjoining a heritage place. "A" and "B" is the street setback distance. The setback of new development is tapered to allow improved views to the heritage place.

(c) in order to achieve visual subservience to a heritage place in accordance with PO13, building form ought to be articulated into smaller elements to relate to scale, rhythm and spacing of the heritage place and its context (as shown in Figure SC6.3.4.6).

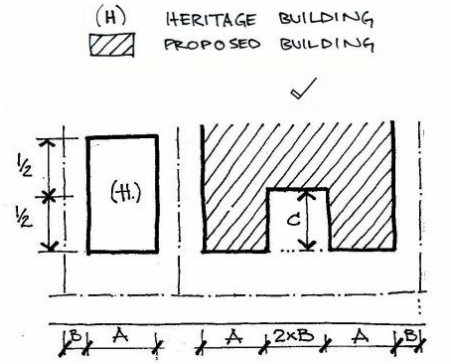


Figure SC6.3.4.6 Illustrates sympathetic building frontage rhythm. "B" is side setback; "C" (being the depth separation to get sympathetic building frontage rhythm) is 6m or ½ of "H" (heritage building depth)

SC6.3.4.2 Building height

(1) Where parts of the development are proposed to be taller than adjacent significant heritage elements, the following design guidance may be considered to demonstrate achievement of performance outcome PO13 of the Cultural heritage overlay code:

(a) proposed taller elements of the proposed new building are to be setback to diminish their impact (as shown in Figure SC6.3.4.7);

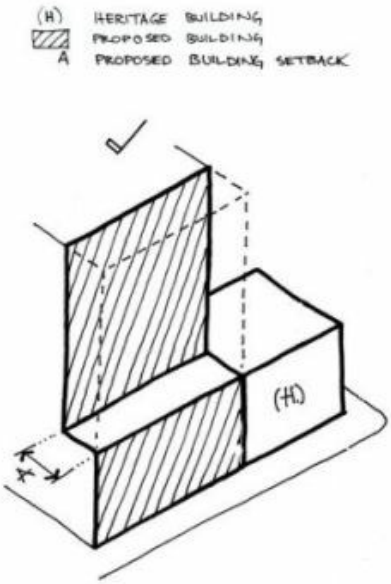


Figure SC6.3.4.7 Illustration of building setback of taller new building. "A" is equal or greater than 3m

(b) setback upper levels of the proposed new building to provide a transition between adjacent buildings of different scales (as shown in Figure SC6.3.4.8);

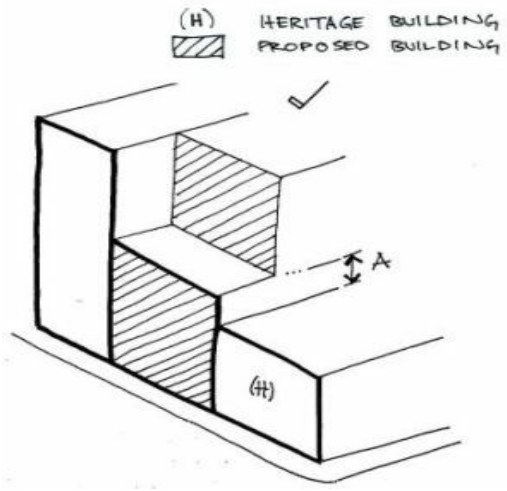


Figure SC6.3.4.8 Illustration of new building upper level setbacks. Dimension "A" is within 20% of the adjacent heritage building height

(c) provide an appropriate separation gap between the significant heritage elements and taller new elements (as shown in Figure SC6.3.4.9);

(d) building elements in the separation gap may be recessed and of lower height and/or different material than the heritage building, (as shown in Figure SC6.3.4.9); and

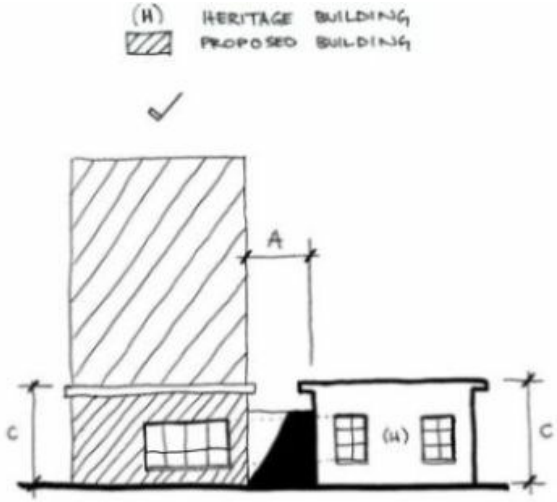


Figure SC6.3.4.9 Illustration of separation gap between contributing heritage elements and taller new buildings. "A" is Separation and "C" is the Common Reference Height

Figure SC6.3.4.10 An example of a desirable outcome – free standing tower provides a significant landscaped public piazza which acts as a separation adjacent to the heritage place

(e) new building works reflect a ‘reference height’ for the full width of the street frontage where the ‘reference height’ is consistent with the height of the adjacent heritage building (as shown in Figure SC6.3.4.11).

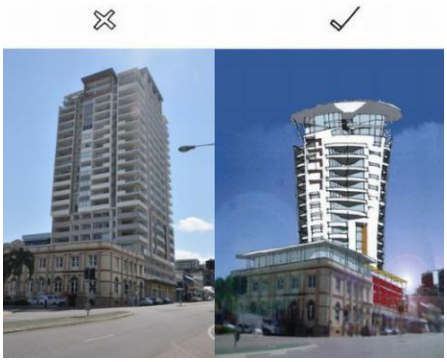


Figure SC6.3.4.11 An example of an undesirable outcome (left): tower element with no setbacks to the street boundary or adjacent heritage building which is detrimental to the otherwise uniform streetscape heights and the adjacent heritage building. An example of a desirable outcome (right): tower element setback from the street boundary and the adjacent heritage building to reduce the impact of its height and bulk. Podium element references the heights of the adjacent heritage building and streetscape.

SC6.3.4.3 Scale and form of development adjoining a heritage place

(1) The following design examples are associated with building scale and form and may be considered to demonstrate achievement of performance outcome PO13 of the Cultural heritage overlay code.

(a) in instances where the significance of the heritage place form includes its difference in scale to its setting, the scale of new works is to maintain this significance (as shown in Figure SC6.3.4.12); or

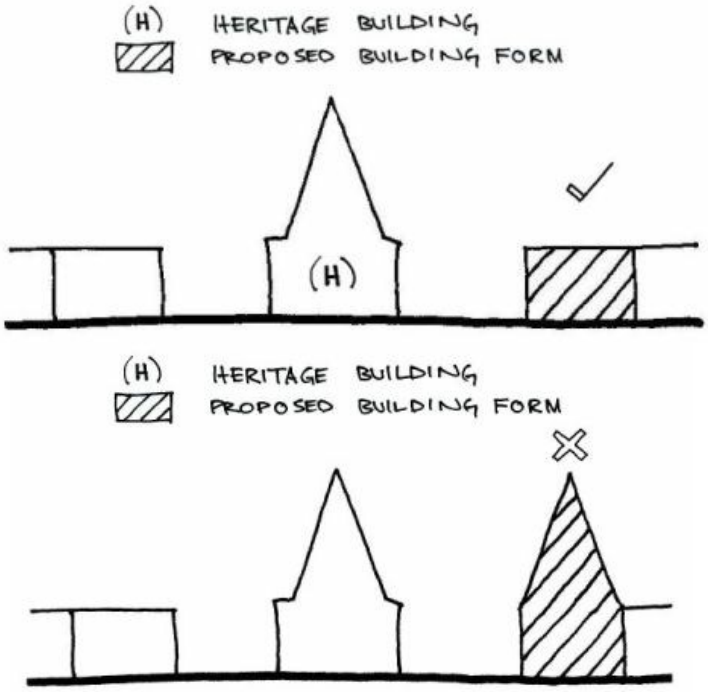


Figure SC6.3.4.12 Illustration of desirable and undesirable outcome

(b) in instances where the significance of the heritage place form includes its common scale and form to its setting, the scale and form of new works is to maintain this significance (as shown in Figure SC6.3.4.13); and

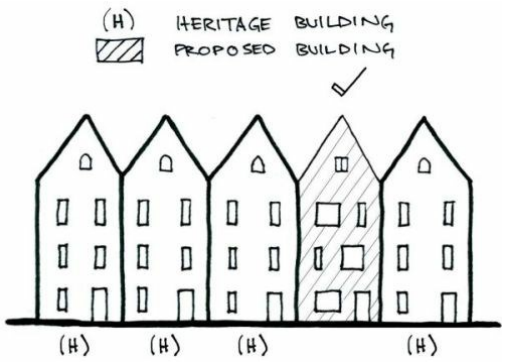


Figure SC6.3.4.13 Illustration of development maintaining common scale

(c) new building works should generally not directly copy the heritage place and as an example, should be readily distinguishable from it. Use of similar overall form, scale, proportions and materials is appropriate (as shown in Figure SC6.3.4.14 and SC6.3.4.15);

Figure SC6.3.4.14 Illustrates an example of appropriate scale and form

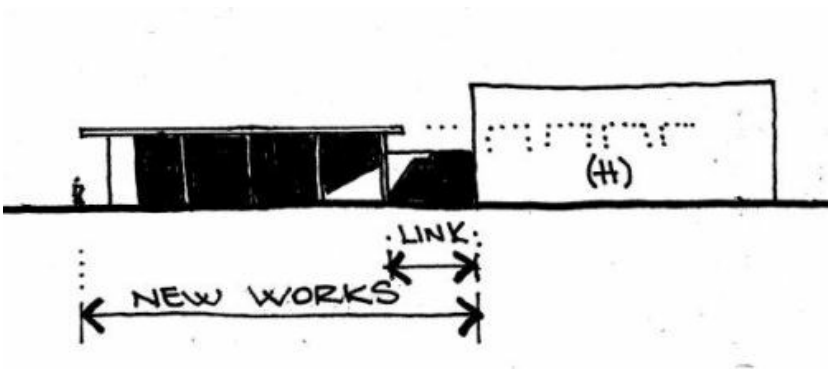


Figure SC6.3.4.15 Illustrates desirable outcome – pavilion type addition

(d) new building works should not reference non-significant features and atypical elements (as shown in Figure SC6.3.4.16 to SC6.3.4.17); and

Figure SC6.3.4.16 Illustrates desirable outcome

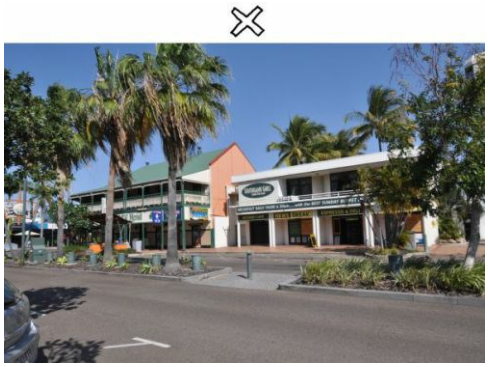


Figure SC6.3.4.17 Illustrates undesirable outcome - new building adjacent to a heritage place does not recognise characteristic articulation of materials, textures and colours (Palmer Street, Townsville)

Figure SC6.3.4.18 An example of an undesirable outcome: design of the new building referenced non-contributory features of the former streetscape, such as angled light poles that have subsequently been removed (Flinders Street East, Townsville)

(e) the quality of new materials is commensurate with those of the heritage place.

SC6.3.5 Development within a heritage place

This section of the policy provides guidance in achieving performance outcomes PO1, PO3 – PO6, PO8 – PO10 of the Cultural heritage overlay code associated with setbacks for development, building height, the scale and form of development, the heritage setting, landscaping and open space, building elements and advertising devices associated with development within a heritage place.

SC6.3.5.1 Setbacks for development

PO3 and PO4 of the Cultural heritage overlay code require that new buildings to be consistent with the significant features and values of the heritage place, including, but not limited to, built form and setbacks, maintain significant views to and from the heritage place and ensure that new buildings are visually subservient.

(1) To achieve the requirements of the performance outcomes in the code and allow for significant views to and from a heritage place to be maintained, the following design guidance should be considered.

(a) in instances where the significance of the heritage place includes its setback in common with the established street pattern, the setback of new works ought to maintain this significance (as shown in Figure SC6.3.5.1);

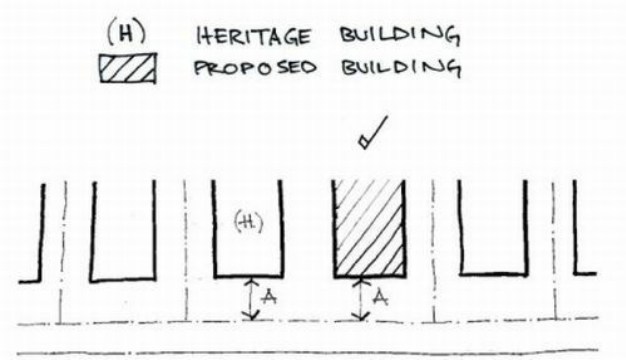


Figure SC6.3.5.1 Illustrates appropriate front setbacks for development within a heritage place, "A" is the street setbback distance

(b) in instances where the significance of the heritage place includes its difference in setback to the established street pattern, the setback of new works ought to maintain this significance (as shown in Figures SC6.3.5.2 to SC6.3.5.3); and

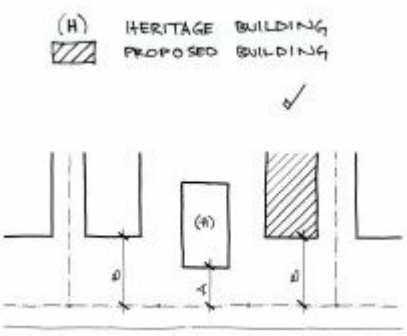


Figure SC6.3.5.2 Illustrates appropriate front setbacks for development within a heritage place, "A" and "B" is the street setbback distance

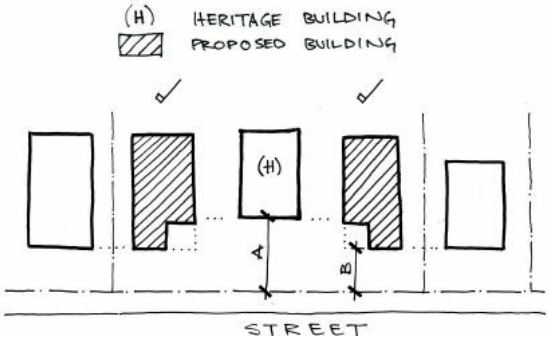


Figure SC6.3.5.3 Illustrates of appropriate front setbacks for development within a heritage place, "A" and "B" is the street setbback distance

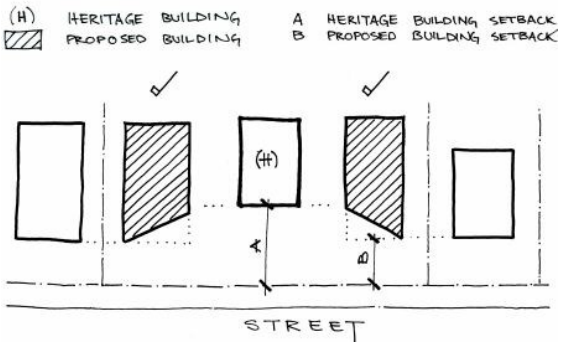


Figure SC6.3.5.4 Illustrates appropriate front setbacks for development within a heritage place and development adjoining a heritage place. "A" and "B" is the street setback distance

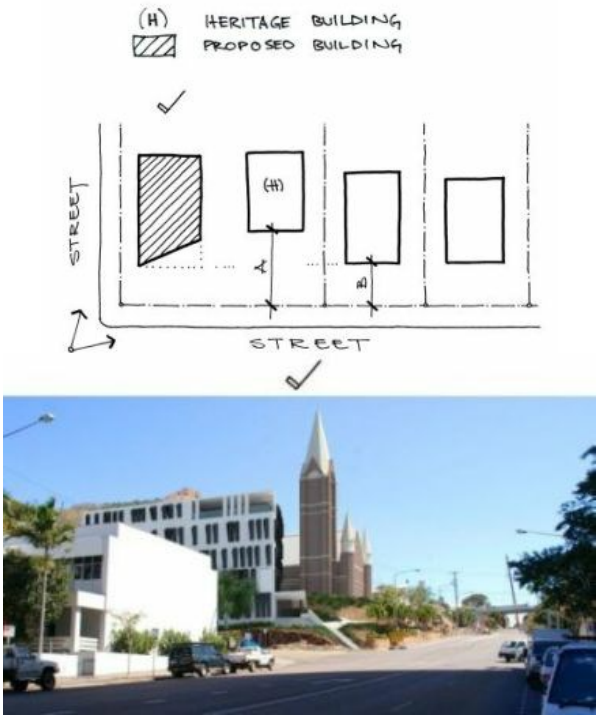


Figure SC6.3.5.5 Illustrates appropriate corner block front setback for development on a heritage place. "A" and "B" is the street setback distance. The setback of new development is tapered to allow improved views to the heritage place.

(c) new developments should adopt side setbacks that are common with the heritage place, unless this would diminish a significant feature of the heritage place (as shown in Figure SC6.3.5.6).

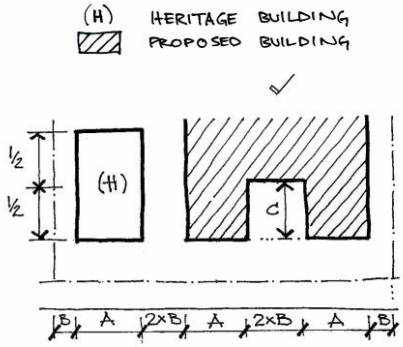


Figure SC6.3.5.6 Illustrates sympathetic building frontage rhythm, "B" is side setback and "C" (being the depth separation to get sympathetic building frontage rhythm) is 6m or ½ of "H" (heritage building depth).

SC6.3.5.2 Building height

(1) Where parts of the development are proposed to be taller than adjacent heritage elements, the following design guidance may be considered to demonstrate achievement of performance outcome PO3, PO4 and PO5 of the Cultural heritage overlay code.

(a) proposed taller elements of the proposed new building are to be setback to diminish their impact (as shown in Figure SC6.3.5.7); or

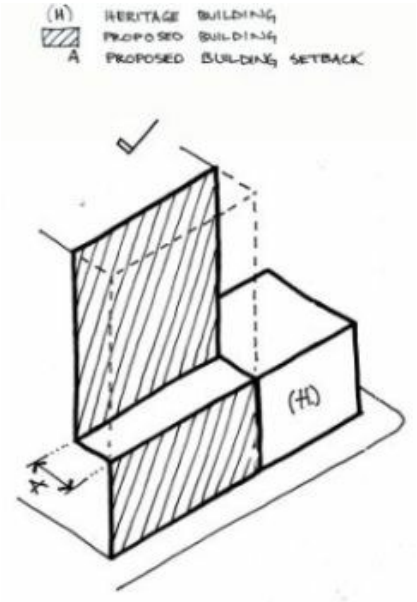


Figure SC6.3.5.7 Illustrates building setback of taller new building. "A" is equal or greater than 3m

(b) setback upper levels of the new building to provide a transition between adjacent buildings of different scales (as shown in Figure SC6.3.5.8);

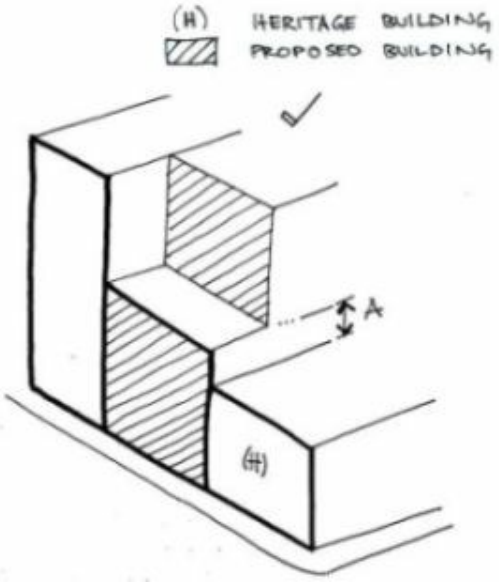


Figure SC6.3.5.8 Illustrates new building upper level setbacks. Dimension "A" is within 20% of the adjacent heritage building height

(c) provide an appropriate separation gap between the significant heritage elements and taller new elements (as shown in Figure SC6.3.5.9);

(d) building elements in the separation gap may be recessed and of lower height and/or different material than the heritage building (as shown in Figure SC6.3.5.9); and

(e) new building works may reflect a "reference height" for the full width of the street frontage where the "reference height" is consistent with the height of the adjacent heritage building (as shown in Figure SC6.3.5.9).

Figure SC6.3.5.9 Illustrates separation gap between contributing heritage elements and taller new buildings. "A" is the separation gap. "C" is the common reference height.

SC6.3.5.3 Scale and form development

(1) The following design examples are associated with building scale and form and may be considered to demonstrate achievement of performance outcome PO3 – PO6 of the Cultural heritage overlay code.

(a) in instances where the significance of the heritage place form includes its difference in scale to its setting; the scale of new works is to maintain this significance (as shown in Figure SC6.3.5.10); or

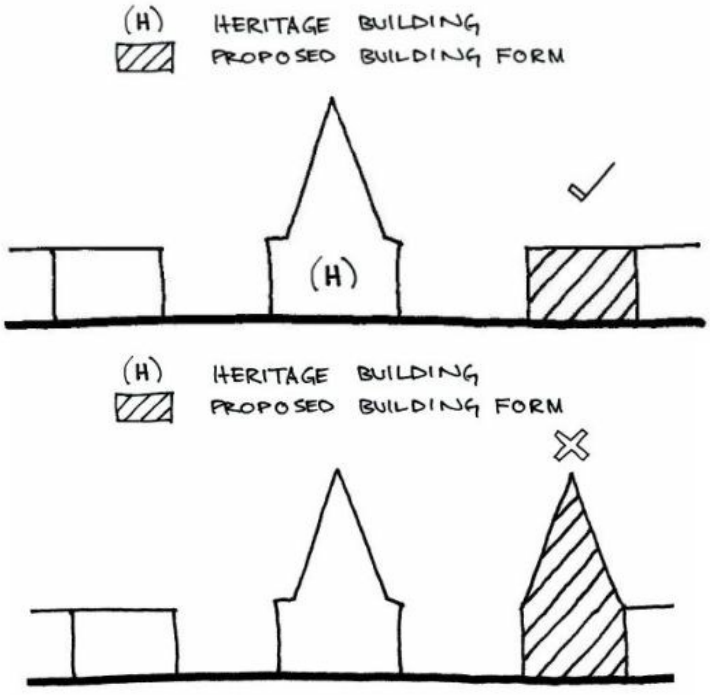


Figure SC6.3.5.10 Illustrates desirable and undesirable outcome

(b) in instances where the significance of the heritage place form includes its common scale, proportions and form to its setting, the scale, proportions and form of new works is to maintain this significance (as shown in Figure SC6.3.5.11);

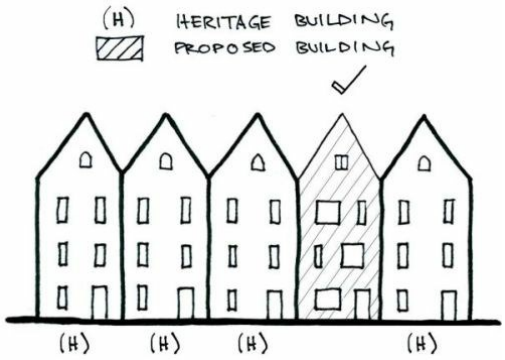


Figure SC6.3.5.11 Illustrates an example of appropriate scale and form

(c) the scale of new works should be compatible with, and not diminish the setting of the heritage place (as shown in Figures SC6.3.5.12 – SC6.3.5.14);

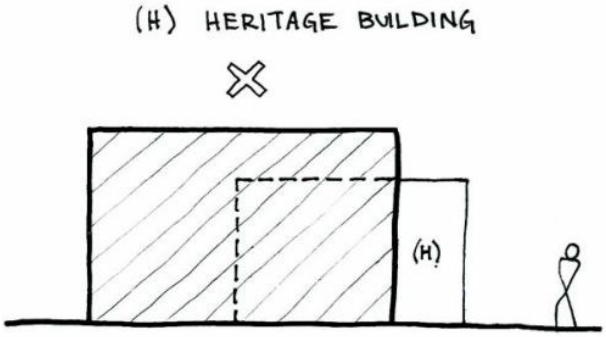


Figure SC6.3.5.12 Illustrates an example of an undesirable outcome – new works obscures the heritage place

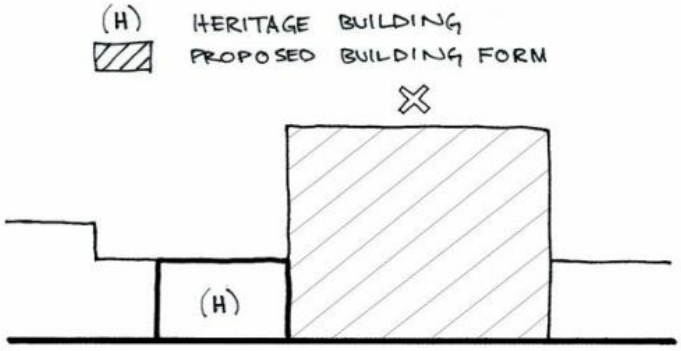


Figure SC6.3.5.13 Illustrates an example of an undesirable outcome: scale of new works dominates the heritage place and is detrimental to the settings of the heritage place

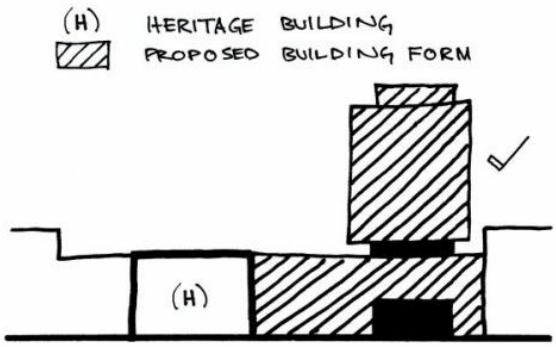


Figure SC6.3.5.14 Illustrates an example of a desirable outcome with regard to scale and form

(d) in order to achieve visual subservience to a heritage place in accordance with PO4, building form ought to be articulated into smaller elements to relate to scale, rhythm and spacing of the heritage place and its context (as shown in Figure SC6.3.5.15);

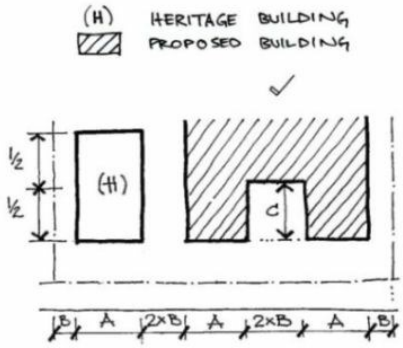


Figure SC6.3.5.15 Illustrates sympathetic building frontage rhythm, "B" is side setback and "C" (being the depth separation to get sympathetic building frontage rhythm) is 6 m or ½ of "H" (heritage building depth).

(e) new buildings should respond to existing ridge or parapet lines, roof slopes or other significant features of the heritage place (as shown in Figure SC6.3.5.16);

Figure SC6.3.5.16 Illustrates an example of an appropriate outcome. The proposed new development adopts ridge and parapet lines of the heritage place and enhances the continuity of the streetscape

(f) new building works should not reference non-significant features and atypical elements;

(g) new works should provide elements of design that are clearly distinguishable from heritage elements and that assist in representing the historical form of the heritage place (as shown in Figure SC6.3.5.17); and

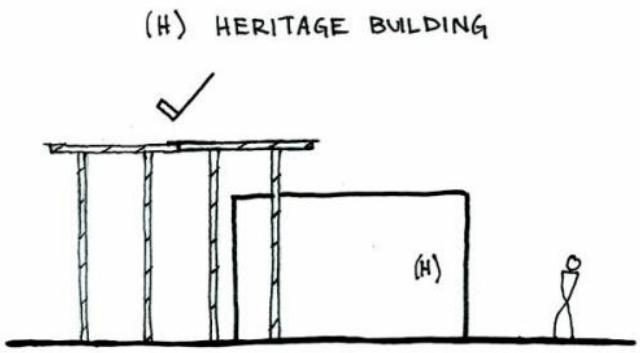


Figure SC6.3.5.17 Illustrates an example of an appropriate outcome, where new works are detached and expressed as a lightweight addition

(h) architectural expression of new works should avoid diminishing the setting of the heritage place (as shown in Figure SC6.3.5.18 and Figure SC6.3.5.19).

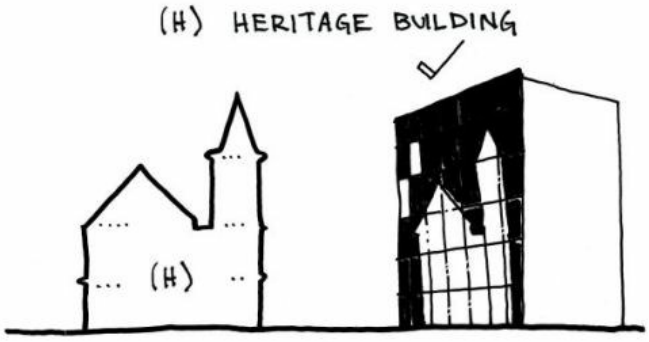


Figure SC6.3.5.18 Illustrates an example of a desirable outcome, in which a glazed or glass façade reflects the heritage place

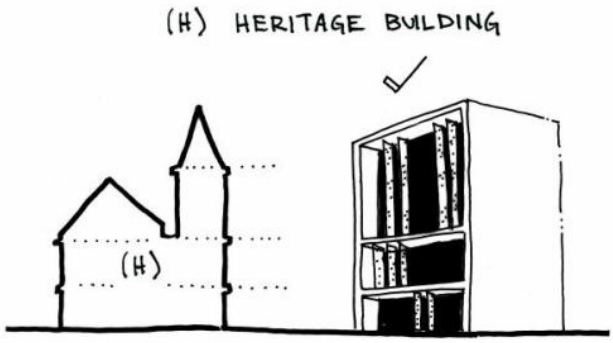


Figure SC6.3.5.19 Illustrates an example of an undesirable outcome, in which the contemporary expression of new works reference the heights of the heritage place

SC6.3.5.4 The heritage setting

The following is advice for achieving PO3, PO4 and PO5 of the Cultural heritage overlay code associated with the heritage setting.

(1) New buildings or works minimise visual impacts to the heritage place by:

(a) new buildings are set apart in a separate building (as shown in Figure SC6.3.5.20);

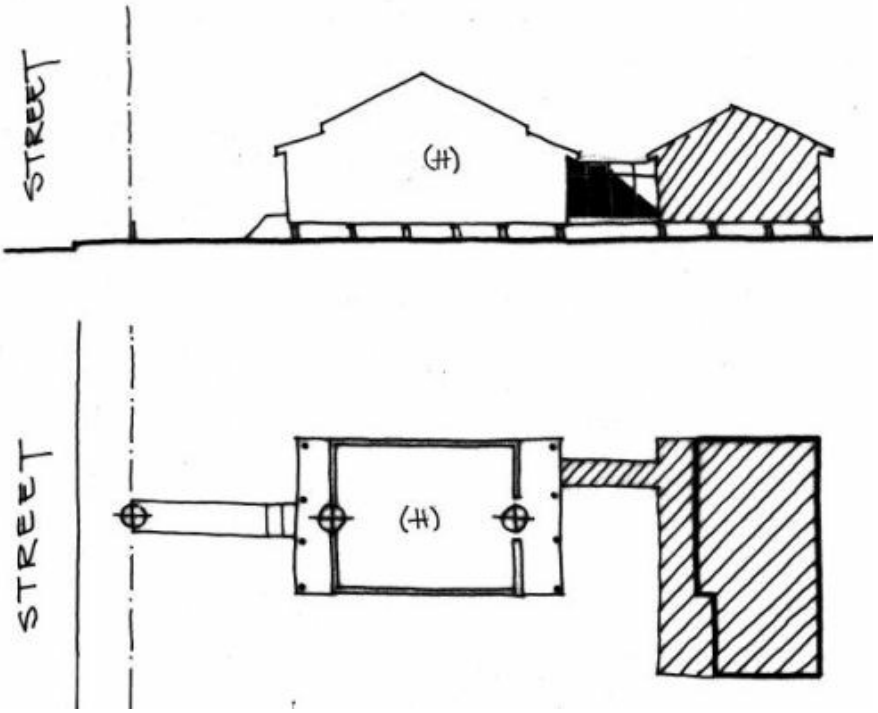


Figure SC6.3.5.20 Illustrates an example of a desirable outcome

(b) new works should design junctions between new and old fabric to be legible, reversible and may be incorporated into the overall architectural design (as shown in Figure SC6.3.5.21 and Figure SC6.3.5.22); and

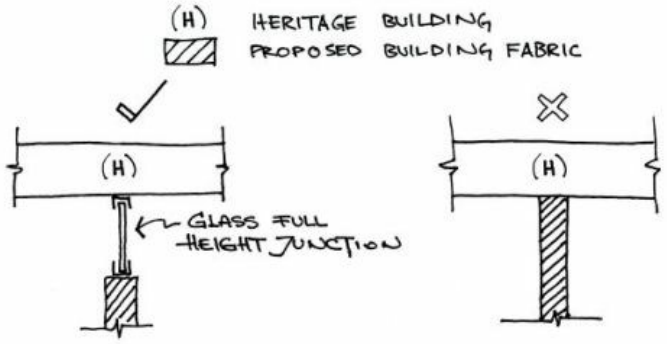


Figure SC6.3.5.21 Illustrates desirable and undesirable outcome: plan detail of old and new wall junction separation of new and old fabric using glass or other translucent light weight material

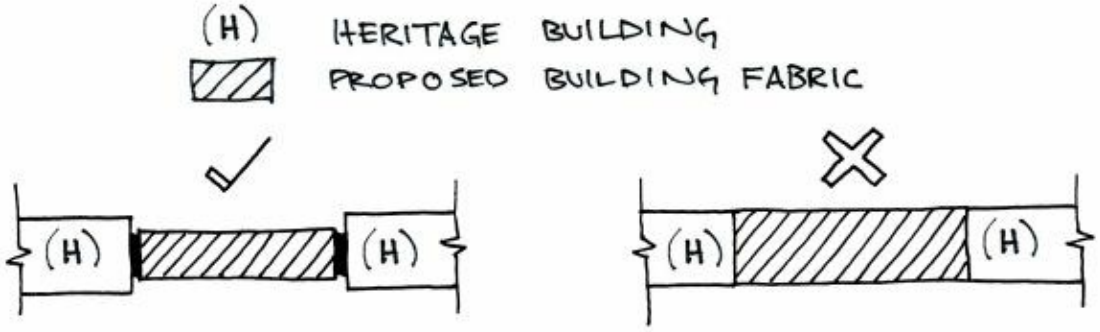


Figure SC6.3.5.22 Illustrates desirable and undesirable outcome - plan detail of the junction between the proposed/new development to the existing heritage wall opening. The new development requires a reduced wall depth to maintain the legibility of the original opening

(c) works are located within areas that are not visible from the dominant street views or other significant views, and do not diminish any significant features of the heritage place (as shown in Figure SC6.3.5.23 and SC6.3.5.24).

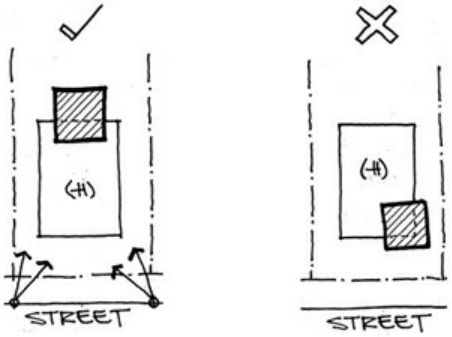


Figure SC6.3.5.23 Illustrates an example of desirable and undesirable outcome

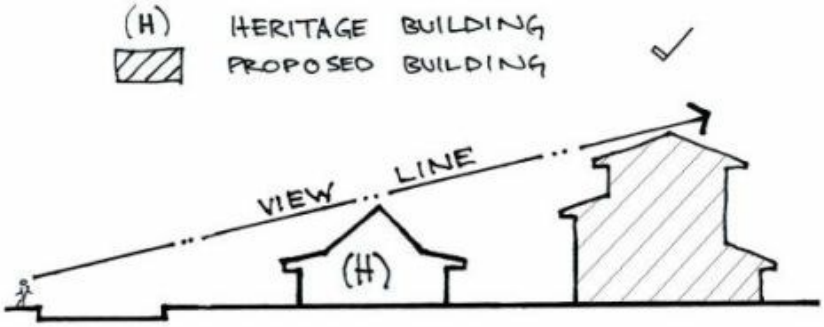


Figure SC6.3.5.24 Illustrates view line from the street. The new building at the back cannot be seen by a person standing across the street, which means that the view of the heritage building is not diminished

SC6.3.5.5 Landscaping and open space

The following advice is for demonstrating achievement of performance outcome P03 and PO8 of the Cultural heritage overlay code associated with landscaping and open space.

(1) Open space and landscaping features should maintain views to and from the significant heritage features of the heritage place (as shown in Figure SC6.3.5.25– SC6.3.5.28).

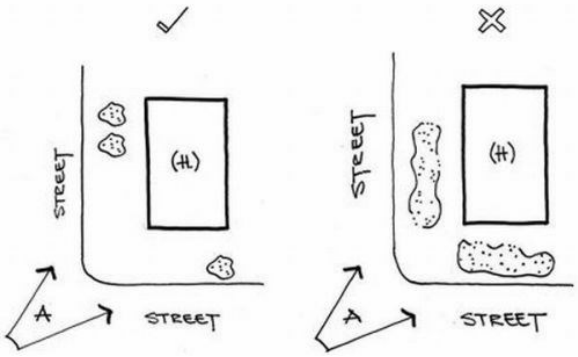


Figure SC6.3.5.25 Illustrates an example of desirable and undesirable outcome. "A" is principal view to and from heritage place

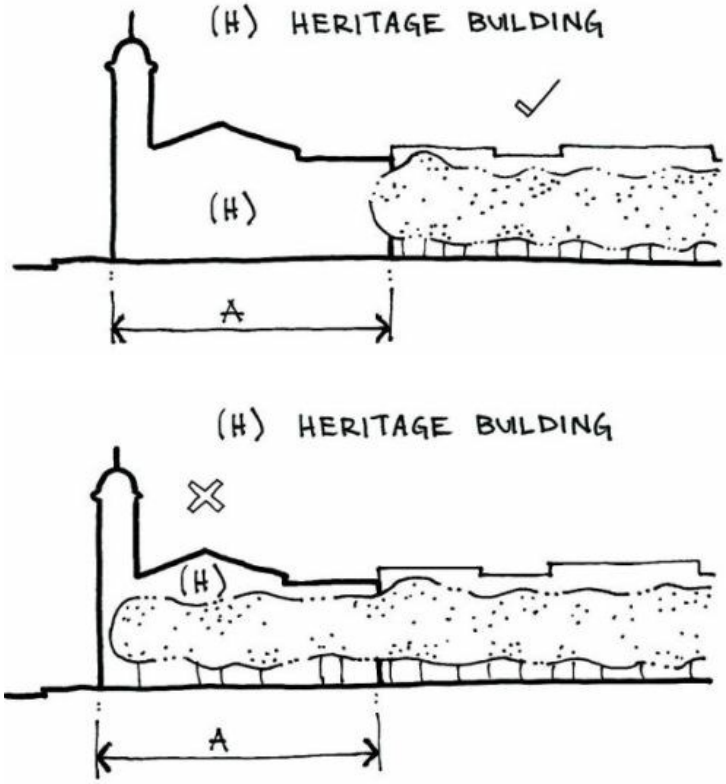


Figure SC6.3.5.26 Illustrates an example of desirable outcome "A" is street width

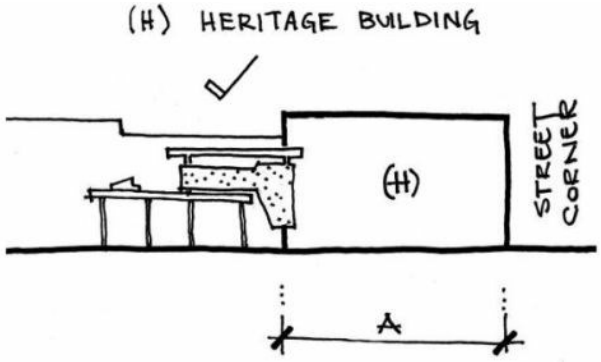


Figure SC6.3.5.27 Illustrates an example of a desirable outcome, tall street shelter element does not block views to and from the heritage place. "A" is street width of "H"

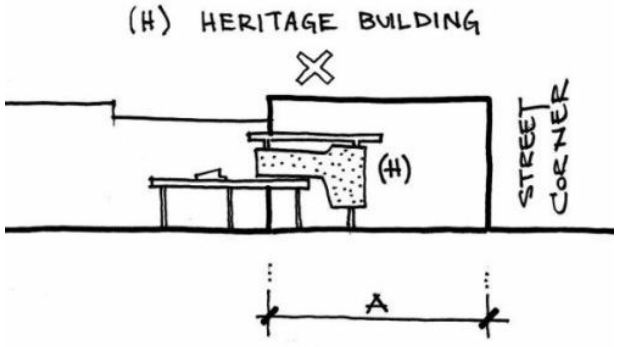


Figure SC6.3.5.28 Illustrates an example of an undesirable outcome, where a tall street shelter element blocks views to and from the heritage place. A' is street width of "H" (heritage place)

SC6.3.5.6 Heritage fabric

In order to protect the cultural significance of a heritage place, retaining the original fabric and significant fenestration patterns, finishes and decorative details should be a primary aim.

(1) The following should be considered in demonstrating achievement of performance outcomes PO1 and PO6 of the Cultural heritage overlay code.

(a) alteration or partial demolition of elements that do not contribute to cultural significance may be appropriate where there is no detrimental impact on significant features;

(b) buildings are to be retained in their three dimensional form. The inadequate retention of only the front façade may result in "facadism" and should be avoided (as shown in Figure SC6.3.5.29 and SC6.3.5.30);

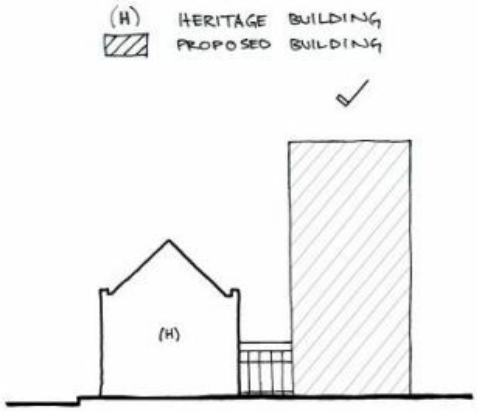


Figure SC6.3.5.29 Illustrates an example of a desirable outcome, new works with adequate retention of the three dimensional form. New works set back as a detached form.

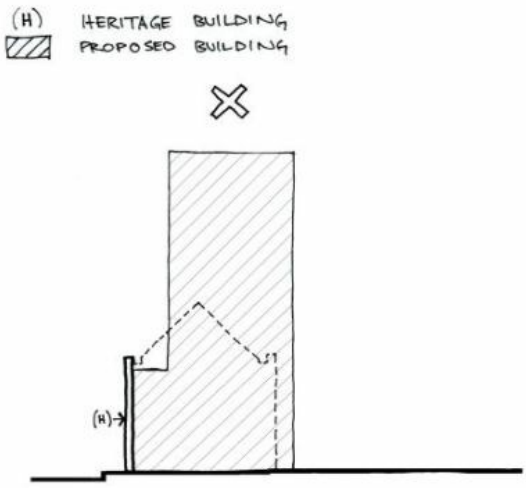


Figure SC6.3.5.30 An example of an undesirable outcome; new works have inadequate retention of the three dimensional form (only the front façade has been retained)

(c) the building fabric that contributes to the significance of the heritage place should be retained whether visible or not from the public realm (as shown in Figure SC6.3.5.31);

Figure SC6.3.5.31 "The Brewery", former Post Office (Flinders Street, Townsville). Significant features of the interior have been retained. This is an example of maintaining original building fabric.

(d) significant associations and meanings of the heritage place ought to be maintained (as shown in Figures SC6.3.5.32 and SC6.3.5.33); or

(e) new works provide interpretations for, associations and meanings of the heritage place, and its original use;

(f) where a new use is proposed for a heritage place, the new use is compatible with the cultural significance, significant features and values of the heritage place (as shown in Figures SC6.3.5.32 and SC6.3.5.33);

Figure SC6.3.5.32 Illustrates a desirable outcome: former Post Office building (Flinders Street, Townsville)

Figure SC6.3.5.33 Illustrates a undesirable outcome: former Customs House (The Strand, Townsville). Change of use to a private residence diminishes the associations and meanings of the heritage place

(g) building services may be concealed to render them not readily visible from the street or any significant views of the heritage place. If services are by necessity visible, they may be constructed using materials and details sympathetic to those of the heritage place (as shown in Figure SC6.3.5.34); and

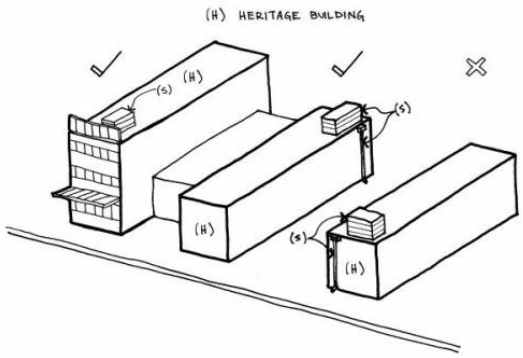


Figure SC6.3.5.34 Examples of desirable and undesirable outcome, "S" are air conditioning and drainage locations. An example of an undesirable outcome is at right, with air conditioning and drainage services positioned to the front of the building, which has a detrimental impact on visual amenity of the heritage place

(h) any changes to significant fabric necessary to accommodate a new use are reversible.

SC6.3.5.7 Building elements

This section will assist you to demonstrate achievement with PO3, PO5 and PO6 of the Cultural heritage overlay code.

Building elements refer to the components of a building which contribute to the overall character and heritage significance of the building, site or area, and may include the materials, colours and details used.

(1) Materials, colours and details used in a development should complement rather than reproduce the heritage place. The following design guidance illustrates how this might be achieved:

(a) the design of new works recognises characteristic materials, textures and colours used locally and in adjacent buildings. These may be re-interpreted and incorporated in the design of the new building (as shown in Figure SC6.3.5.35);

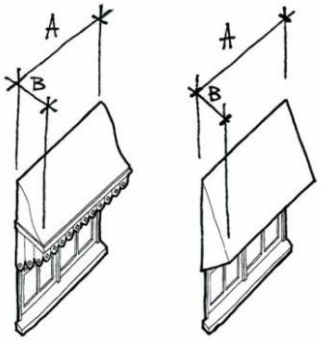


Figure SC6.3.5.35 Illustrates (left) contemporary interpretation of a typical heritage awning hood (right) where dimensions "A" and "B" have similar proportions.

(b) materials and colours of surrounding buildings generally should not be copied but used as a point of reference. Modern materials may be used if their proportions and details are sympathetic within the adjacent heritage place;

(c) colour, texture and tonal contrast of new building elements may be utilised as a unifying element with heritage features. Details that contribute to the significance of the heritage place may inform or inspire the design of new building works;

(d) modern details may be designed to reinterpret traditional details and create new relationships between new and old; and

(e) the quality of new materials is of the same quality as those of the heritage place.

(2) New materials introduced to a heritage place should generally be intentionally varied from the original and be distinguishable from the original fabric by a date stamp (as shown in Figure SC6.3.5.36).

Figure SC6.3.5.36 Illustrates an example of a desirable outcome - date stamp on new or introduced fencing panel

SC6.3.5.8 Advertising devices

(1) Advertising devices should be designed to ensure that they do not dominate the heritage place or obscure significant views or features of the heritage place. The following is advice for achieving performance outcome PO8, PO9 and PO10 of the Cultural heritage overlay code associated with advertising devices.

Note— there are specific requirements when dealing with State Heritage listed buildings. Advertising devices on heritage buildings listed on the Queensland State Heritage Register is subject to the provisions of the *Queensland Heritage Act 1992*.

(a) advertising devices should be readily removable without damaging the building fabric, (as shown in Figure SC6.3.5.37);

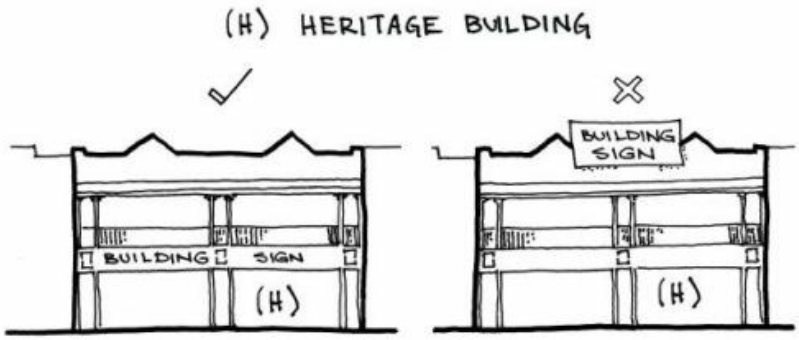


Figure SC6.3.5.37 Illustrates a desirable outcome (left) and undesirable outcome (right)

(b) advertising devices may be clearly modern yet respectful of the heritage context, associations and meanings of the heritage place;

(c) advertising devices should consider enhancing a building's architecture and setting;

(d) integrate advertising devices with architectural features of the building wherever possible;

(e) unless there is adequate evidence – physical and documentary – to reconstruct original advertising devices, new advertising devices on a heritage place should complement, not replicate, a "period" style. "Old fashioned" imitation signage would be inappropriate. Any form of signage may be considered, as long as visual and physical impacts on the heritage building are minimised;

(f) the appropriate size of signage may be relative to the specific architectural characteristics of the heritage place (as shown in Figure SC6.3.5.38); and

(g) table SC6.3.5.1 identifies advertising devices which are not suitable on a heritage building.

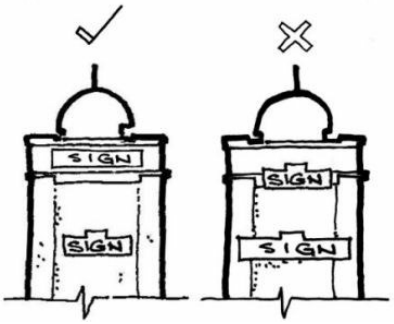
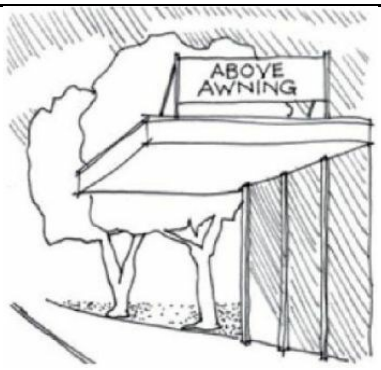
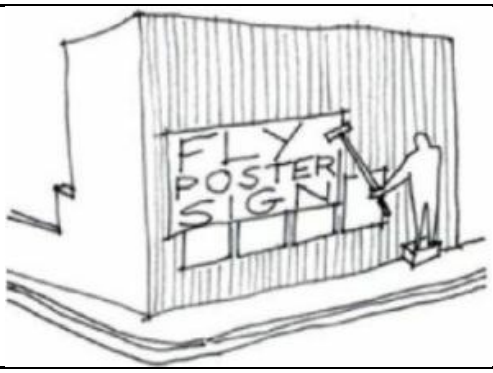
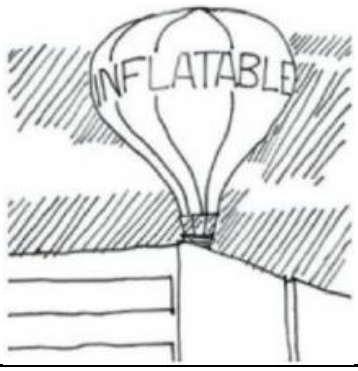


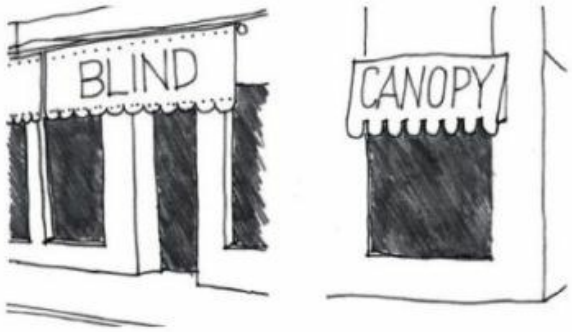
Figure SC6.3.5.38 Illustrates a desirable outcome (left) and undesirable outcome (right)

Table SC6.3.5.1 Advertising devices which are not suitable on a heritage building

Device type	An example of an undesirable outcome
Roof signs	
Above awning signs	
Wall sign	
Inflatable sign	

In accordance with AO3 of the Advertising devices code, Table SC6.3.5.2 identifies the desirable outcomes for heritage places on Flinders Street East. Advertising devices are in accordance with the advertising device types and design parameters set out within Table SC6.3.5.2.

Table SC6.3.5.2 Design parameters for supported advertising devices on Flinders Street East

Device type	Design Parameters additional to those set out in the advertising devices code	An example of an desirable outcome
Awning fascia sign		
Blind/canopy		
Under awning sign		
Under Awning sign (where an under-awning sign is affixed between posts of a footpath awning)	The under-awning sign must be contained within the spacing of posts and must not exceed 600mm in height.	

Wall sign		
Window sign		

SC6.3.6 Preparing a heritage impact statement report

A heritage impact statement may be required to demonstrate compliance with the Cultural heritage overlay code, in particular performance outcomes PO1, PO3, PO4, and PO7.

A heritage impact statement provides specific information about how a proposed development will affect the heritage place. The purpose of a heritage impact statement is to identify any potential detrimental impacts that the development may have on the significance of the place. Ultimately, a heritage impact statement should demonstrate compliance with the Cultural heritage overlay code.

A heritage impact statement is to be produced by a suitably qualified architect or cultural heritage professional, and should include the following at a minimum:

(1) Description of the proposed development
Provide a brief description of the proposed development including:

- (a) type of development;
- (b) range and scope of work proposed; and
- (c) timeframe for carrying out work.

(2) Setting and context of the place
Describe the setting or context for the place, including photographs and maps showing significant features that will be affected. Provide an analysis of the affect the proposed development will have on the setting of the heritage place.

(3) Proposed changes to the heritage place
List the changes required to the heritage place as a consequence of the proposed development and provide the following information about each change:

- (a) what elements or aspects of the heritage place are affected by the proposed change;
- (b) list the work required to effect the proposed change;
- (c) analysis of the impact of the change on the cultural heritage significance of the place;
- (d) assessment of potential for detrimental impact on the cultural heritage significance;

(e) if the proposed work will directly affect a heritage element of the place – provide details of proposed work methods; and

(f) where the proposed change is assessed as having potential for detrimental impact, provide information about the following:

(i) why the proposed change is required;

(ii) alternative solutions that were investigated; and

(iii) what measures are included in the proposed development to reduce detrimental impact that may result from the change.

(4) Applicable conservation policies

(a) some heritage places already have conservation management plans that include conservation policies. Where a heritage building has a current conservation management plan, the heritage impact statement will need to list the conservation policies that relate to the proposed development and describe how they have guided the development;

(b) where conservation policies have not been followed, give reasons why the conservation policies were not used and describe the process that is proposed to be followed; and

(c) where conservation policies are not already available, an architect or heritage consultant can provide conservation advice to help inform the planning and guide development of places.

(5) References
List documents referred to in the heritage impact statement such as conservation policies, conservation management plans, condition report (i.e. demolition reports), and specialist consultants' reports.

(Adapted from *Guideline: Preparing a heritage impact statement' Department of Environment and Heritage Protection*, 2011).

SC6.3.7 Preparing a condition report

If an application is proposing the demolition of a structure of heritage significance the applicant may be requested to provide a condition report. The condition report should, at a minimum, include consideration of:

(1) the structural stability of the building in the form of a structural engineers report. The condition report must include a factual statement from an appropriately qualified structural engineer about the condition of the building; and

(2) a pest inspection report and other supporting documentation may also be provided.

SC6.3.8 Preparing archival recording of heritage place

Archival recording may be required to demonstrate achievement of performance outcome PO2 of the Cultural heritage overlay code. Where demolition, change or relocation of a heritage building is allowed, a photographic record and measured drawings in accordance with the following of the place should be submitted to council prior to the commencement of the demolition works or relocation of the heritage building.

SC6.3.8.1 Guideline for photographic recording

The following guidelines are intended as a checklist for making an accurate photographic record of sites, buildings, objects, gardens or structures of heritage significance prior to major alterations or demolition. The recording process must be comprehensive and cover the parts specified in the approval conditions.

(1) Aim
The aim of the photographic record is to provide a sufficient number of photographs to fully illustrate the subject for which the photographic archival record is required. The purpose of the record is to provide permanent documentation of places so that future generations can benefit from and gain an understanding of Townsville’s cultural history that is no longer possible to pass on to them.

(2) Method
The photographer should be informed by any available plans and documentary evidence and should have an

understanding of the history and operations of the place. If necessary the photographer should be accompanied on the site by a person familiar with the site's heritage significance and the processes related to it. The project should be planned before commencement and the photographer aware of the appropriate sequence.

The preferred shooting method is to proceed from the overall or general through to the detailed or specific. The photographic record should consist of:

(a) general views of the place.
Note—to provide its context and overall coverage of all slides – oblique shots are useful for general reference;

(b) elevation of all sides;

(c) details of all key elements including windows, doors, eaves, cornices, rainwater goods, skirtings and decorative elements;

(d) interior elevations of each space to include floor and ceiling finishes;

(e) the relationship of the elevations to any equipment or relics housed in each space;

(f) any significant items should be photographed;

(g) any features particular to the place internally and externally should be fully recorded; and

(h) when photographing landscape elements:

(i) an overall photograph is required; and

(ii) any unusual or distinguishing features should be fully recorded.

(3) Key plans
The photographic record shall include a plan or plans indicating the direction in which the photographs were taken. The positions, with a direction arrow, should be numbered and cross referenced to the photographs.

(a) The following information should be included:

(i) date of record production;

(ii) name of photographer; and

(iii) description of place (e.g. building, name, species of tree, etc.).

(b) Form

(i) photographs are to be colour and of professional quality. Digital format will be accepted. An electronic copy on CD, USB or of the like format acceptable to council, are to be submitted;

(ii) archival quality ink should be used for annotation and cross referencing. A 6B pencil should only be used for annotating on the back of prints; and

(iii) the photographic record should be submitted in an A4 archival album with photographs in archival quality plastic sleeves or pockets.

(c) Size

(i) minimum size of prints should be 100 x 150 mm, to a maximum A4 size.

(d) Report

(i) a very brief report or introduction explaining the purpose of the report, a brief description of the subject and detailing the sequence in which the photographs were taken should be included;

(ii) the report may also address the limitations of the photographic record and make recommendations for future work; and

(iii) sources of original work should be acknowledged.

SC6.3.8.2 Guideline for measured drawings
Measured drawings provide an accurate record of buildings, structures or objects and depict the physical features that contribute to their heritage significance. Measured drawings should be easy to read and suitable for reproduction. Australian Standard AS 1100 *Technical Drawing*, Part 301 and *Supplement 1*, *Architectural Drawing* provides a guide to suitable graphics.

The following guidelines are intended as a checklist for making an accurate record of a building, part of a building, or other subject at the time of production. The recording process must be comprehensive and cover the parts specified in the approval conditions.

(1) Aim

The aim of producing a measured drawing is to provide a record that is measured and drawn accurately to scale. It should be a true reflection of the existing condition and not an interpretation of a previous state (i.e. missing elements should not be included and elements which are not plumb should be recorded as such).

(2) Drawings:

(a) the measured drawings should be cross-referenced to each other, clearly titled and show scale, orientation and date of execution;

(b) drawings should not include any conjectural detail such as inaccessible elements that cannot be measured such as footings or framing;

(c) the drawings can also be annotated or hatched to reveal more about the heritage significance of the site or object – to differentiate between dates of construction, materials and finishes;

(d) record to the same standard all major fixtures such as machinery or building services; and

(e) for industrial sites, recording the position, relationship and function of all fixtures, machinery and services is particularly important and maker's names, model numbers etc. should be included.

For further information refer to *Measure for Measure: A Practical Guide for Recording Buildings and Landscapes*, published by the RAIA in 1990.

(3) Requirements

A typical measured drawing package for a build structure should include:

(a) location plan;

(b) site plan (1:500 or 1:200);

(c) floor plan/s (1:1:100 or 1:50) including basement or mezzanine levels;

(d) roof plan/s (1:100 or 1:50);

(e) elevations – showing all sides of the building (1:100 or 1:50);

(f) sections – two sections, through the building in different planes (not parallel) (1:100 or 1:50);

(g) ceiling and joinery details (1:20 or 1:10) – cornice, verandah posts, skirtings, mouldings;

(h) other significant details (rainwater heads, construction joints); and

(i) machinery and services details.

(4) Sheet sizes

Drawings should be on standard metric sheet sizes – A1, A2, A3 or A4.

SC6.3.8.3 Interpretive signage for the loss of a heritage place

In addition to archival recording, where a heritage place is to be lost, interpretive signage is to be provided. In particular:

(1) the sign should be placed at the front of the property boundary, integrated with a wall or fence;

(2) the sign should provide a photographic record and brief history of the heritage place;

(3) the sign should have a 330 mm diameter, a 3 mm thick aluminium plate with weatherproofed finish, refer to Figure SC6.3.8.57; and

(4) sign production i.e. colours used and branding should be consistent with the Townsville Heritage Trail Signage.

Figure SC6.3.8.1 Illustrates an example of a desirable outcome, an example of a Heritage Trail sign (Flinders Street, Townsville)

SC6.3.9 Preparing an archaeological management plan

The following is advice for demonstrating achievement of performance outcome PO11 of the Cultural heritage overlay code associated with archaeology.

(1) Any development with potential impact on archaeological values should provide for the following at a minimum:

- (a) the potential impact on archaeological deposits on the site is to be monitored and assessed during earthworks by an appropriately qualified person;
- (b) where archaeological deposits are identified, an archaeological management plan is to be prepared by an appropriately qualified person and approved to the satisfaction of the relevant authority, prior to the commencement of ground works; and
- (c) any archaeological management plan that is prepared should follow best practice.

SC6.3.10 Adding or removing a place from Schedule 7 Places of cultural heritage value

(1) The places of cultural heritage value in Townsville are contained in Schedule 7 Places of cultural heritage value and overlay map OM04.1 – OM04.4 of the Townsville City Plan. The process of entering and removing a heritage place from Schedule 7 and the overlay involves:

- (a) identification;
- (b) application;
- (c) assessment; and
- (d) notification.

(2) Council assesses a place based on the place fulfilling one or more cultural heritage criteria listed below. There are approximately 325 places in Townsville that meet one or more of the cultural heritage criteria stated below. These places have been incorporated into Schedule 7 Places of cultural heritage value of the Townsville City Plan. The Citation of Heritage Places Report provides information about each heritage place in Townsville. It highlights the criteria that were originally identified for each place and indicates its heritage significance and eligibility for entry into Schedule 7 Places of cultural heritage value. It should be noted that a building, site or place may be entered into Schedule 7 Places of cultural heritage value of the Townsville City Plan if it meets one or more of the cultural heritage criteria listed below.

- (a) It is important in demonstrating the evolution or pattern of Townsville's history.
- (b) It demonstrates rare, uncommon or endangered aspects of Townsville's cultural heritage.

(c) It has potential to yield information that will contribute to the knowledge and understanding of Townsville's history.

(d) It is important in demonstrating the principal characteristics of a particular class or classes of cultural places.

(e) It is important because of its aesthetic significance.

(f) It is important in demonstrating a high degree of creative or technological achievement at a particular period.

(g) It has a strong or special association with the life or work of a particular community or cultural group for social, cultural or spiritual reasons.

(h) It has a special association with the life or work of a particular person, group or organisation of importance in Townsville's history.

(i) It was constructed prior to 1910.

(3) For a heritage place to be removed from Schedule 7 Places of cultural heritage value of the Townsville City Plan the applicant must highlight that there is evidence to sufficiently demonstrate that a place has no cultural heritage significance, based on the Criteria listed Schedule 7 Place of cultural heritage value in the Townsville City Plan.

Following the lodgement of the application form titled, "Application form to add or remove a place from Schedule 7 Places of cultural heritage value of the Townsville City Plan," council will make a decision as to whether to enter, not enter, or remove a place from Schedule 7 Places of cultural heritage value. It should be noted that if a place is nominated to be included on, or to be removed from Schedule 7 Places of cultural heritage value, council will be required to undertake an amendment to the Townsville City Plan as required by the *Planning Act 2016*.

For more information refer to:

(a) Application Guide: Entering a place to Schedule 7 Places of cultural heritage value.

(b) Application Guide: Removing a place from Schedule 7 Places of cultural heritage value.

(c) Application form to add or remove a place from Schedule 7 Places of cultural heritage value of the Townsville City Plan.

SC6.4 Development manual planning scheme policy

SC6.4.1 Introduction

The twenty-four major schedules of SC6.4 are:

SC6.4.1 Introduction
SC6.4.2 Development application guidelines
SC6.4.3 Standard drawings
SC6.4.4 Active transport infrastructure
SC6.4.5 Road transport network
SC6.4.6 Road works and traffic control
SC6.4.7 Clearing, grubbing, and earthworks
SC6.4.8 Stormwater management
SC6.4.9 Stormwater quantity
SC6.4.10 Stormwater quality
SC6.4.11 Water and sewerage
SC6.4.12 Landscaping and open space
SC6.4.13 Irrigation
SC6.4.14 Public utilities and building over/near services
SC6.4.15 Steep land development
SC6.4.16 Geotechnical investigations
SC6.4.17 Structures
SC6.4.18 Concrete works
SC6.4.19 Noise and vibration
SC6.4.20 Footpath treatment and outdoor dining design
SC6.4.21 Rear lanes
SC6.4.22 Waste management
SC6.4.23 Construction management, quality management, inspection and testing
SC6.4.24 Acceptance of completed works

Each major schedule of the Development manual planning scheme policy contains an index.

Index

SC6.4.1.1 Introduction

(1) Purpose

(2) Legislative authority

(3) Relationship to the Townsville City Plan

(4) Impacts of development on local government infrastructure

(5) Terminology

(6) Structure

SC6.4.1.1 Introduction

Short title - The planning scheme policy may be cited as the Development manual PSP.

(1) Purpose

The purpose of the Development manual PSP includes:

(a) specifying standards for the design and construction of development infrastructure;

(b) providing guidance and advice regarding administrative arrangements for development and development infrastructure;

(c) providing information the Council may request for development applications, including standards and guidance on the preparation of specialists' reports; and

(d) providing guidance or advice about satisfying an assessment benchmark in the Townsville City Plan which identifies this planning scheme policy as providing that guidance and advice.

(2) Legislative authority

This planning scheme policy is made under Chapter 2, Part 3 of the *Planning Act 2016*.

(3) Relationship to the Townsville City Plan

This planning scheme policy is to be read in conjunction with the assessment provisions specified in the Townsville City Plan. This planning scheme policy applies to the whole of the Townsville City Council planning scheme area and specifically relates to the assessment of any relevant development application.

(4) Impacts of development on local government infrastructure

Development and development infrastructure will impact on part, or all of the local government infrastructure provided in the Townsville City Plan.

Local government infrastructure is infrastructure which is described in Part 4 Local government infrastructure plan and Schedule 3 Local government infrastructure plan mapping and tables.

Local government infrastructure can be described as "trunk" and "non-trunk" infrastructure and includes:

(a) water supply network infrastructure;

(b) sewerage network infrastructure;

(c) stormwater network;

(d) road network infrastructure including road public transport;

(e) active transport infrastructure including pathways and cycleways; and

(f) parks and community facilities infrastructure.

(5) Terminology

Terms used in this Planning Scheme Policy (PSP) are as defined in Schedule 1 Definitions of Townsville City Plan. A term used in this planning scheme policy which is not defined in Schedule 1 Definitions is to be interpreted in accordance with Part 1.3.1 Definitions of Townsville City Plan.

In addition to the definitions presented in Part 1.3.1 of the Townsville City Plan, each section of the Development Manual PSP may contain a list of terminology that is referenced in support of that specific policy section.

For clarity, a reference in the Development Manual PSP to any act includes any regulation or instrument made under it and where the act or regulation is amended or replaced, means the amended or replaced act. A reference in the Development Manual PSP to a specific resource document or standard means the latest version of the resource document or standard.

(6) Structure

The policy is arranged around twenty-four major discipline and administrative sections. Each major section is designed to group common themed discipline sections to improve usability of the entire document.

Each major discipline section contains:

(a) technical standards for the design of infrastructure and development;

(b) design criteria and standard drawings;

(c) auditing responsibilities of Council;

(d) setting out procedural matters of development and the standards for construction management for development works covering pre-construction;

(e) construction and quality management systems for the construction of development works; and

(f) standards, advice, and guidance to manage the donation of completed assets and works to Council.

Development manual planning scheme policy (PSP)
SC6.4.2 Development application guidelines

Index

SC6.4.2.1 Introduction

SC6.4.2.2 Major and minor development

(1) Definition of major developments
(2) Definition of minor developments

SC6.4.2.3 General procedures

SC6.4.2.4 Pre-lodgement advice guidelines

(1) Pre-lodgement meetings and discussions

SC6.4.2.5 Design requisites and quality assurance guidelines

(1) Engagement of appropriately qualified persons
(2) Design records and calculations
(3) Council audit

SC6.4.2.6 Documentation guidelines

(1) Portable Long Service Leave (PLSL)
(2) Certification and design reports
(3) Design drawings and works requirements
(4) Minimum documentation required with application

SC6.4.2.7 Council's acceptance of design – advice

SC6.4.2.8 Preparation of design drawings - guidelines

SC6.4.2.9 Conduit assessment

(1) CCTV inspection

(2) Qualification of CCTV operators and supervisors

(3) Site establishment

(4) Inspection report

(5) Inspection software

(6) Data ownership

SC6.4.2.10 Conceptual and preliminary erosion and sediment control plans

SC6.4.2.11 Details on drawings guidelines

(1) General requirements guidelines

(2) Layout and stage plan guidelines

(3) Roadworks and associated drainage drawings

(4) Pathway and cycleways drawing guidelines

(5) Sewerage drawings guidelines

(6) Water drawings guidelines

(7) Landscape drawings guidelines

(8) Irrigation drawings guidelines

SC6.4.2.12 Attachments, forms and checklists

Online Form A – Pre-lodgement Meeting Request

Form A – Engineering Certification

Well-made development application Checklists

Checklist A - Material Change of Use

Checklist B - Reconfiguring a Lot

Checklist C - Operational Works

Checklist D – Compliance Assessment

Design checklists

Checklist E – Base Plot of Existing Features

Checklist F – Horizontal Road Alignment

Checklist G – Vertical Road Alignment

Checklist H – Road Cross Sections

Checklist I – Road and Inter-Allotment Drainage

Checklist J – Signs and Markings

Checklist K - Pavement Design

Checklist L – Bridge and Major Culvert Design

Checklist M – Landscape and Irrigation Plans

Checklist N – Erosion and Sediment Control Plans

Checklist O – QAF0476 Sewage Pump Station and Pressure Main

Checklist P – QAF0477 Sewer Reticulation

Checklist Q – QAF0478 Water Reticulation

Checklist R – QAF0479 Water and Sewer Model

Checklist S – QAF0480 Public Transport

SC6.4.2.1 Introduction

This section provides standards, advice, and guidelines for development applications, including well-made application details along with design requirements to assist applicants in achieving Council's design objectives.

SC6.4.2.2 Major and minor developments

(1) Definition of major developments

A major development consists of a combination of some or all of the following:

(a) more than six residential, commercial, or industrial lots; or

(b) a single or multi-storey mixed/high density dwelling unit complex of more than six dwellings; or

(c) a multi-storey development of more than three stories; or

(d) a commercial structure where the ultimate Gross Floor Area (GFA) exceeds 2,000 m^2 and is two equivalent stories or more; or

(e) a development where site filling and/or excavation exceeds 2,500 m^3; or

(f) a development where site filling impacts on a known or designated 'floodplain' and requires compensatory earthworks to cater for the flows from the defined flood event in the adjacent or nearby watercourse without increasing flood levels upstream and downstream of the development site; or

(g) a development that requires more than 300 carparking spaces.

(2) Definition of minor developments

A minor development consists of a combination of some or all of the following:

(a) more than two and less than six residential, commercial, or industrial lots; or

(b) a single storey (or higher) mixed/high density dwelling unit complex of six or less dwellings; or

(c) a multi-storey development of not more than three stories of approved use; or

(d) development where site filling and/or excavation is less than 100m^3; or

Editor's Note—where the site filling/excavation exceeds 100 m^3, but is less than 2500 m^3, the combination with other criteria will determine whether the development is classified as major.

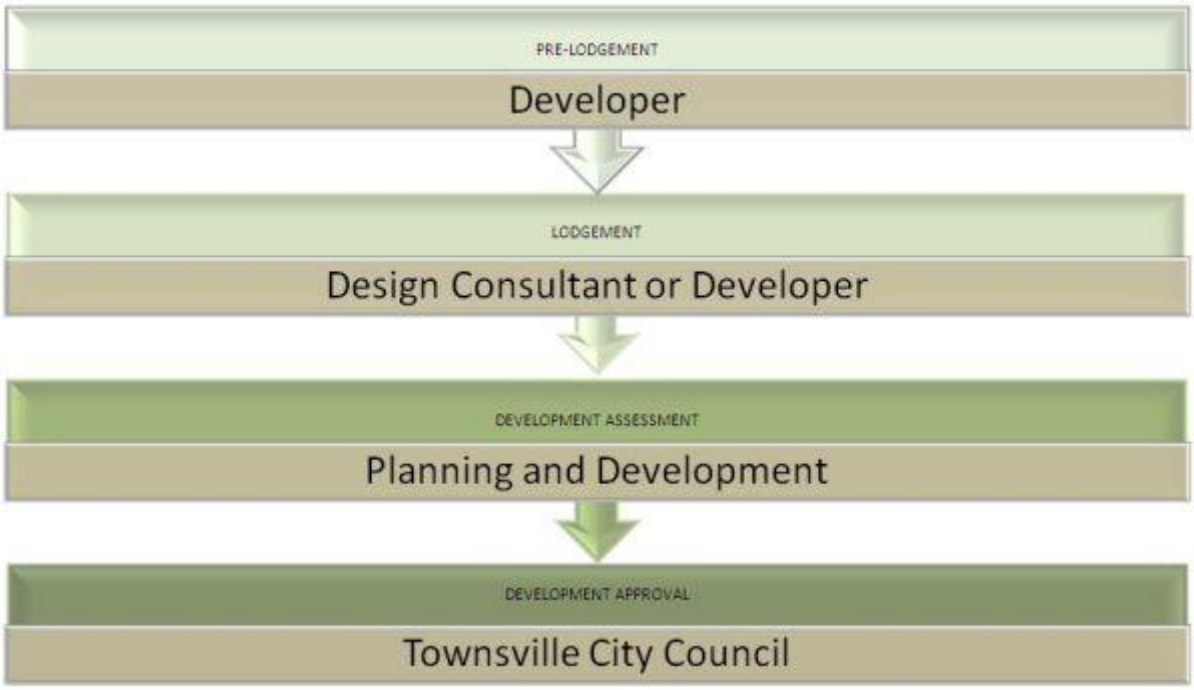
(e) a development where twenty or less carparking spaces are required.

Editor's Note—where required carparking spaces exceeds 20, but is less than 300, the combination with other criteria will determine whether the development is classified as major.

Editor's Note–where a development does not meet any or only one of the criteria listed in major or minor development above, Council retains the prerogative to determine whether the development is major or minor.

SC6.4.2.3 General procedures

Council's general procedures when lodging development applications are set out in the diagram below.



SC6.4.2.4 Pre-lodgement advice guidelines

(1) Pre-lodgement meetings and discussions

Council encourages pre-lodgement meetings to discuss development proposals prior to lodgement. Pre-lodgement meetings can comprise of informal discussions or alternatively a formal discussion can be arranged for more complex applications.

Pre-lodgement meetings are conducted by appointment only. To request a pre-lodgement meeting, the applicant must complete a Pre-Lodgement Meeting Request Form (refer to Clause SC6.4.2.12 Online Form A - Pre-lodgement Meeting Request), which can be submitted either by mail, email (developmentassessment@townsville.qld.gov.au) or to the Council Administration Building – Walker Street. For further information please visit Council's website for more information on pre-lodgement meetings.

SC6.4.2.5 Design requisites and quality assurance guidelines

(1) Engagement of appropriately qualified persons

The developer/applicant is encouraged to engage and nominate appropriately qualified consultants/individuals with the required expertise to undertake design work on their behalf. The consultants are expected to have systems in place to assure the quality of the designs and the reports that they produce. It is the consultant's responsibility to ensure that the design complies with and has satisfied all relevant Council requirements and conditions of the associated development approval.

Concept and detailed designs must comply with the relevant conditions of the development approval, Council's policies, Townsville City Plan, and relevant provisions of this Development manual planning scheme policy. All designs must be prepared and certified by an appropriately qualified professional with relevant experience.

Quality assured personnel must be:

(a) engineering works (including but not limited to geotechnical, access consultant, hydraulic, stormwater infrastructure, civil, structural, or electrical engineering) - Registered Professional Engineer of Queensland (RPEQ) as defined under the *Professional Engineers Act2002*;

(b) for urban stormwater quality and flow management

a person with relevant tertiary qualifications or equivalent, including a registered professional engineer of Queensland (RPEQ) (civil engineering, environmental engineering). Such persons may be responsible for a site stormwater quality management plan (site SQMP);

(c) for erosion and sediment control

a person who is a certified practising soil scientist (CPSS) or certified professional in erosion and sediment control (CPESC), or an RPEQ (or equivalent) with experience and training in soil science and erosion and sediment control. Such persons may be responsible for erosion and sediment control plans (ESCP). The necessary requirements (CPESC and/or RPEQ) are determined commensurate with the Erosion Hazard Assessment;

(d) for wastewater management

a person with appropriate tertiary qualifications or equivalent such as an RPEQ with experience in environmental engineering or environmental scientist (or similar) incorporating wastewater management. Such persons may be responsible for a site wastewater management plan for the design, operation, or construction of a development;

(e) for management of non-tidal artificial waterways

a person with tertiary qualifications or equivalent such as an RPEQ (environmental engineering) or environmental scientist (or similar) and experience in incorporating waterway management. Such persons may be responsible for a waterway management plan for the design, operation, or construction of a development with artificial waterways;

(f) for coastal algal blooms

a person with tertiary qualifications (that is, science) or equivalent and experience in planning and managing for soil nutrients, water quality, hydrology, and acid sulphate soils (for example, certified practising soil scientist or certified environmental practitioner);

(g) for acid sulphate soils

a person with tertiary qualifications (that is, science) or equivalent and experience in planning and managing for soils and acid sulphate soils (for example, certified practising soil scientist);

(h) landscape works

Registered Landscape Architect with the Australian Institute of Landscape Architects (AILA) or a Landscape Designer with the Landscape Design Institute (LDI);

(i) irrigation works

Certified Irrigation Designer where irrigation works are within the public realm;

(j) traffic management assessment personnel shall be TMR qualified; and

(k) audit of access plans and drawings and sign off

a qualified Access Consultant (Transport) certified with the Association of Consultants in Access Australia (ACAA).

(2) Design records and calculations

The Consultant must retain appropriate design records including calculations in a format such that they can be understood readily by design staff with no prior knowledge of the design. The design file must be maintained by the developer/applicants or the developer/applicant's consultant containing records of calculations, approvals and decisions, geotechnical data and other design data which could be relevant in reviewing aspects of the design or planning future maintenance responsibilities. Copies of records are to be made available to Council on request and without charge. Records shall reflect safety in design and future maintenance cost considerations.

(3) Council audit

Council retains the right to audit all processes and documents related to the development design. The developer/applicants and the developer/applicant's consultant must provide Council officers all reasonable assistance in inspecting records of designs submitted to Council.

SC6.4.2.6 Documentation guidelines

To further assist developers in the process of lodging development applications, well-made application checklists have been prepared by Council and the completion of a particular checklist, and submission of all relevant accompanying information, will expedite the assessment process well-made application checklists in SC6.4.2.12 below).

(1) Portable Long Service Leave (PLSL)

Development approvals for operational works cannot be issued by Council until appropriate evidence of payment of the Portable Long Service Leave fees are provided as prescribed by the *Building and Construction Industry Portable Long Service Leave Act 1991*.

(2) Certification and design reports

All designs to be accompanied with certification and design reports which must be signed by a qualified professional with relevant experience (Refer to Clause SC6.4.2.4). The certification report will comprise the certificate (SC6.4.2.12 Form A – Engineering Certification) and design report. The design report must contain documentation as required by Clause SC6.4.2.8 below.

The certification and design reports will be required with preliminary designs and will require resubmission with updates when final drawings are submitted. Certification is not required with sketch plans or concept plans.

The consultant must provide a detailed justification for each variation to or non-compliance with Council's design and construction requirements, local laws, Townsville City Plan planning scheme policies and Townsville City Plan and relevant development approval conditions, as part of the Certification Report.

(3) Design drawings and work requirements

The consultant on behalf of the Developer must present all design drawings and specifications for the development works to Council for audit purposes.

The design drawings must be complete and clearly set out to present the design concepts in such a way that the project can be understood, specified for construction and satisfactorily built. Unless noted otherwise, the submission should comprise a full set of plans for proposed in digital format correctly scaled as per Council-preferred sheet size A3).

All construction work specifications must be prepared by the consultant and submitted to Council for review, specifying workmanship standards not covered by Council's standard work requirements.

Full design drawings and work specifications covering all aspects of the proposed works must be submitted to Council for acceptance. Standard drawings and works specifications (if available) from the following sources are to be included in order of preference:

(a) Section SC6.4.3 Standard drawings;

(b) Council design and construction standards and

(c) Department of Transport and Main Roads.

All design drawings and work specifications must be certified by an appropriately qualified professional with relevant experience. Refer to Clause SC6.4.2.5.

(4) Minimum documentation required with application

The following table SC6.4.2.1 sets out the minimum documentation required to be submitted with an application.

Table SC6.4.2.1 - Minimum Documentation to be Submitted with Application

Documentation	Material Change of Use	Reconfiguring a Lot	Operational Work
Safety in design report including future maintenance considerations	NA	NA	Required
Traffic impact assessment	Required (determined by the type and scale of development)	Required (determined by the type and scale of development)	Required
Traffic management plan	NA	NA	Required, where necessary.
Public transport network including consideration for school bus network	Concept plan required	Required for staged developments.	Required
Road networks	NA	Road network (includes hierarchy, road and carriageway widths, noise impact and traffic studies).	
Pedestrian and cycle network (trunk and neighbourhood) including bicycle lanes.	Concept plan required	Required for staged developments	Required
Flood study report	Required (determined by the type and scale of development).	Required (determined by the scale of development).	Required if not presented in earlier application.
Site based stormwater management plan	Concept plan required - when stormwater quantity, quality, frequency and flood flow management or waterway stability	Concept plan required - when stormwater quantity, quality, frequency and flood flow management or	Detail plan required - when stormwater quantity, quality, frequency and flood flow

	infrastructure is provided. Detailed information on stormwater system (i.e. dimensions, levels and outlet details of detention basin) to be provided if no operational work application is required.	waterway stability infrastructure is provided.	management or waterway stability infrastructure is provided.
Erosion and sediment control plan	NA	Conceptual erosion and soil control plan needed for staged developments.	Required
Geotechnical reports	Required	Required	Required
Subgrade test results and pavement designs	NA	NA	Required
Filling and excavation plan	Concept plan required.	Concept plan required.	Detail plan required.
Inter-allotment drainage plans	Required where downstream discharge involves other private properties.	Required where downstream discharge involves other private properties.	Required where downstream discharge involves other private properties.
Roadworks and stormwater drainage designs	Concept plans required		Detail plans required
Water and Sewer modelling	May be required		Required
Water reticulation plan	Concept plan required	Concept plan required	Detailed design required
Sewerage reticulation plan	Concept plan required	Concept plan required	Detailed design required
Odour assessment report	Required		Required
Servicing details (utilities)		Required for staged developments.	Required
Conduit assessment	Required where impacting on existing conduit services and if no operational work application is required.	NA	Required, where impacting on existing conduit services
Noise and vibration reports	Required	Required	NA

Dust assessment	Required	Required	Required
Electricity reticulation plan	NA	NA	Required
Waste management plan	Concept plan required	NA	Detailed design required
Landscape site analysis	Required (if assessable development).	Required (if assessable development).	NA
Landscape concept plan	Required (if assessable development).	Required (if assessable development).	NA
Landscape detailed working drawings	NA	NA	Required where landscaping is proposed.
Landscape detailed maintenance program for on maintenance	NA	NA	Required where land or infrastructure will be managed by the local government.
Irrigation	Concept plan required		Detailed design required
Work specifications	NA	NA	Required
Certified detailed Schedule/Bill of Quantities by a suitably qualified and experienced professional	NA	NA	Required
Certification of designs	NA	NA	Required

SC6.4.2.7 Council's acceptance of design – advice

Council does not guarantee that the submitted designs for the proposed development have been checked in detail. Upon Council's acceptance of designs for the proposed development, it is assumed that the certifying professional has performed sound judgement in preparing the designs taking into consideration existing site conditions and Council requirements.

Council does not accept any responsibility for the accuracy of the submitted design and that any deficiencies and non-complying works identified by Council must be rectified at the cost of the developer, notwithstanding Council's prior acceptance of the submitted design.

If Council's audit of the design reveals the design certificate report to be inaccurate or incomplete, the submission may be returned to the consultant for resubmission. A resubmission review fee may be charged.

SC6.4.2.8 Preparation of design drawings - guidelines

The information set out in Clause SC6.4.2.11 and Clause SC6.4.2.12 should be used in the preparation of plans for each group of drawings to assist Council in the assessment process.

SC6.4.2.9 Conduit assessment

Conduit assessment of sewer and stormwater lines is required before the acceptance of these assets “on maintenance” (the defects liability period) or prior to the assessment of any development application (including a Building over Services application) which may impact upon a sewer or stormwater asset. Assessments may be required by Council prior to assessment or be conditioned by a development approval as part of construction. Inspections must be undertaken by means of closed-circuit television (CCTV) inspection and submission of the resultant video and assessment report.

Any development which proposes to construct a structure, building or undertake earthworks in the vicinity of or within the “zone of influence” of an existing conduit may be required to identify the condition of the conduit for assessment of serviceability and structural compatibility with the proposed development work. Any upgrading or replacement determined by Council will be carried out at the developer's expense prior to the commencement of any development works.

(1) CCTV inspection

General criteria for closed circuit television (CCTV) sewer and stormwater assessments for operational works/compliance permits are as follows:

(a) Sewer:

(i) Major developments

1. immediately prior to commencement of the defects liability period and following the total completion, cleaning, and testing of the asset; and

2. if defects are identified they must be rectified, and the sewer, for the entire length between the upstream and downstream maintenance holes (MH’s), must be assessed again prior to completion of the defects liability period.

(ii) Minor developments

1. systems containing two or more sewer lengths, or systems containing sewer lengths that exceed a combined service length of 60 m measured centre to centre between manholes require assessment immediately prior to commencement of the defects liability period and following the total completion and cleaning of the asset;

2. if defects are identified they must be rectified, and the sewer, for the entire length between the upstream and downstream maintenance holes (MHs), must be assessed again prior to completion of the defects liability period; and

3. where a defects liability period does not apply, CCTV assessment is mandatory prior to acceptance.

(b) Stormwater:

(i) inter-allotment systems located on private property are exempt;

(ii) rubber ringed jointed pipe systems with flexible joints immediately outside chambers (includes PVC and Polythene pipe systems) will be visually assessed and are exempt subject to the system presenting defect free;

(iii) CCTV assessment of flush end RCP pipe systems is mandatory;

(iv) major developments;

(v) Immediately prior to commencement of the defects liability period and following the total completion and cleaning of the asset; and

(vi) prior to completion of the defects liability period;

(vii) minor developments

1. systems exceeding a service length of 60 m require assessment immediately prior to commencement of the defects liability period and following the total completion and cleaning of the asset; and
2. where a defects liability period does not apply, CCTV assessment of the system is mandatory prior to acceptance.

(2) Qualification of CCTV operators and supervisors

The assessment must be undertaken by a suitably trained and qualified Contractor, in accordance with the relevant sections of the current version of Water Services Association of *Australia's Conduit Inspection Reporting code of Australia* (WSA05) and the results are to be submitted to Council in CD, DVD or any digital storage device acceptable to Council accompanied by a written condition assessment report to be approved in writing by Council prior to the issuance of any development approvals.

In the event of non-compliance in preparation and submission of the conduit assessment, council may require the developer to re-perform the inspections and re-submit. All costs incurred conducting these additional conduit assessments will be the responsibility of the Contractor.

(3) Site establishment

The Contractor is responsible for the following requirements:

(a) any necessary approvals from statutory authorities in order to complete the required work;

(b) any temporary electric light, power installations and water supply including all charges incurred;

(c) public notification if necessary
contractor must notify affected residents/adjacent property owners/commercial business owners and Council (including if the area to be closed is public open space). Additional requirements may be necessary if closures are to be over an extended period. Notification is required prior to commencement of work;

(d) plans of existing services are to be verified by the Contractor. Council does not guarantee the accuracy of the information on these plans;

(e) environmental management plan
if necessary, the Contractor must prepare and implement a site-specific environmental management plan, for inspections which would involve interference to live services e.g., sewer line which poses an environmental risk. The Plan must detail activities and measures to ensure that the inspection is performed in a manner which minimises risk of causing environmental nuisance or harm;

(f) reinstatement
clean-up, repair and reinstate any areas affected or impacted by the works, at their own cost;

(g) maintaining the service in all conduits being inspected;

(h) pipe cleaning
conduits being inspected must be sufficiently clean to allow proper visual identification of existing defects. The proper disposal of debris from the cleaning shall be the responsibility of the Contractor;

(i) traffic management
where the diversion of vehicular and pedestrian traffic is required, the Contractor is responsible for implementing an appropriate traffic management plan; and

(j) occupational health and safety
the Contractor is required to comply with all statutory and other current regulations relating to occupational health and safety.

(4) Inspection report

The production of reports (including mandatory information), detailing the condition of surveyed conduits, all coded and scored to standards that satisfy the requirements of current WSA 05 Code.

(5) Inspection software

The preferred software for use in reporting on conduit inspections is the current version of WinCam, set up to report as per the current WSA 05 code. If a Contractor proposes to use alternative software, a full detail of the software must be provided to Council for approval which includes the capabilities must be provided and must be fully compatible with the WinCam software.

(6) Data ownership

Full ownership of the survey and report data including intellectual property rights to the digital visual records and its contents must be with Council.

SC6.4.2.10 Conceptual and preliminary erosion and sediment control plans

Soil disturbance is inevitable in any development; it is fundamental to develop measures to reduce the impact of soil erosion in every stage of construction to an acceptable level of sediments leaving the development site.

For reconfiguring a lot, material change of use, operational works applications, depending on the scope of development, associated environmental impacts, site constraints (E.g., land use, lot layout site topography, proximity to bodies of water) and other factors, the developer should identify the erosion risk level of the proposed development, which can be determined by assessing the erosion hazard of the intended development site outlined in Sections SC6.4.8 Stormwater management, and SC6.4.10 Stormwater quality and– *Erosion Hazard Assessment* of the International Erosion Control Association's *Best Practice Erosion and Sediment Control (IECA BPESC).*

Where a development site of a development application was assessed as being a high-risk site, the developer should provide a conceptual erosion and sediment control plan (CESCP). The conceptual document should take into consideration the key principles of erosion and sediment control detailed in this clause, and the site planning aspects and guideline in preparing conceptual plans in Sections SC6.4.8 Stormwater management, and SC4.6.10 Stormwater quality.

Where a development site was assessed as being a low-risk site and where a CESP has been accepted by Council, a preliminary erosion and sediment control plan (PESCP) must be submitted to Council as part of the operational works or compliance applications. The PESCP must be prepared in accordance with the design standards and technique selection outlined particularly in:

(1) Chapter 2 – Principles of erosion and sediment control;

(2) Chapter 4 – Design standards and technique selection;

(3) Chapter 5 – Preparation of plans; and

(4) also including the appropriate Model Code of Practice and Specific Guidelines in:

(a) Appendix G – Model code of practice;

(b) Appendix H – Building sites;

(c) Appendix I – Instream works;

(d) Appendix J – Road and rail construction;

(e) Appendix K – Access tracks and trails; and

(f) Appendix L – Installation of services of *IECA BPESC.*

During the pre-start meeting, the applicability and appropriateness of the PESCP will be reviewed on-site and revisions will be required if necessary.

For general guidance in implementation of erosion and soil control plan refer to Sections SC6.4.8 Stormwater management, and SC6.4.10 Stormwater quality.

SC6.4.2.11 Details on drawings guidelines

(1) General requirements guidelines

(a) The information shown on the drawings must be logically collected on discrete sheets to avoid illogical and onerous effort in cross referencing between sheets in order to find information. This policy section details minimal information requirements for plans and drawings submitted for assessment.

(b) Drawings should not be overcrowded with information and should not rely on colour printing or colour wash to impart information.

(c) The preferred submission method is uploading to the Townsville Online Lodgement System (TOLS). The preferred sheet sizes of drawing sheets are:

(i) A1 size (841 mm x 594 mm); and

(ii) A3 size (420 mm x 297 mm).

(d) The preferred scales for use should generally conform with the recommendations of AS 1100.101 *Technical Drawing – General principles*. Generally, the following scales are to be used 1:10, 1:20, 1:50 and multiples of 10 of these scales.

(e) Electronic and hard copies of drawings should be true to scale A1 size sheets and be suitable for black and white printing, copying and photo reduction to A3 size without loss of clarity.

(f) The drafting should be of a standard generally in accordance with the requirements of AS 1100.

(g) Title block

All drawings must, within the boundaries of the title block, clearly indicate the following:

(i) project title e.g., estate name (if any);

(ii) real property description;

(iii) locality;

(iv) developer's name;

(v) details on contents of drawings e.g., sewer reticulation;

(vi) scales – bar scales;

(vii) plan and sheet number;

(viii) schedule and date of revisions;

(ix) survey datum;

(x) street names;

(xi) date of initial issue;

(xii) legend and north point; and

(xiii) signed design certification.

(h) Typical scales

The following scales are suggested, but these may be varied as appropriate to the works concerned:

(i) plans – 1:1000 (rural) and 1:500 (urban);

(ii) longitudinal section horizontal – 1:1000 (rural) and 1:500 (urban);

(iii) longitudinal section vertical – 1:100 (rural) and 1:50 (urban); and

(iv) intersection details - 1:250 or 1:100; and cross sections – 1:100.

(i) Survey datum

Level information should be referenced to the Australian Height Datum (AHD). Position coordinates should be tied to the GDA94 datum based on the Mapping Grid of Australia (MGA) coordinate system.

(j) Dimensioning units

All units should be expressed in metric units. Linear dimensions on all roadworks plans, with the exemption of some details of small structures and standard details which may be in millimetres.

(i) Chainages

Chainages on plans should be expressed to three decimal places of a metre e.g., 0.123 m.

(ii) Cross section intervals

Road cross sections should be provided at 20 metre intervals, with further subdivision to 10 metre or 5 metre intervals where necessary due to horizontal or vertical curvatures.

(iii) Grades

Road and pipe grades should be shown to three significant figures in percentage e.g., 1.234%.

(2) Layout and stage plan guidelines

(a) for large developments, the layout plan shows the relationship of all new roads to each other, and to existing roads adjoining the development;

(b) where development is planned in stages, the boundaries of proposed stages are shown on the plan, and the stages identified by numbering;

(c) existing and proposed streets which are adjacent to or fronting the proposal are included on the layout plans;

(d) all services, natural features, significant trees and the like are shown on existing road reserves; and

(e) details of the permanent survey mark, including the AHD level from which the levels were transferred, are included.

(3) Roadworks and associated drainage drawings

Plans or drawings should include the following details:

(a) road reserve boundaries;

(b) lot boundaries, both existing and proposed (levels provided at each boundary corner) and easements;

(c) centreline or other construction line;

(d) chainages on centreline or construction line or set out co-ordinates;

(e) bearings of the centreline or construction line;

(f) offsets (in tabular form) if the construction line is not the centreline;

(g) tangent point chainages or co-ordinates of each curve;

(h) radius and tangent length and superelevation of each curve;

(i) road reserve boundaries, centreline, and bearing of each intersecting road;

(j) chainage or co-ordinates of the intersection point of road centrelines;

(k) kerb lip lines, kerb types, kerb face, setout radii and chainage or co-ordinates of all tangent points of kerb face setout lines;

(l) edge of pavement, where no kerb and channel is proposed;

(m) dimensioned road reserve, verge, pathways, and cycleways including bicycle lanes, (trunk, neighbourhood/local), concrete footpath and pavement widths, where these differ from the standard cross section;

(n) location and details of signs and road markings proposed;

(o) drain line locations (including inter-allotment drainage), diameters and class of pipes or size of box culverts, open drains and easements and invert levels;

(p) the defined flood event levels;

(q) manhole locations, chainage and offset or co-ordinates and invert and kerb levels;

(r) stormwater flow arrows;

(s) inlet pit and manhole locations tabulated to include type, type of jointing chainage;

(t) culvert/channel and other structures details;

(u) location of existing utilities or other existing works within the site;

(v) limits and levels of lot filling or grading;

(w) cut or fill depths and earthwork quantities;

(x) co-ordinates of all set out points;

(y) retaining wall (including details);

(z) location and levels of benchmarks and reference pegs;

(aa) service conduit locations;

(bb) details of all existing construction on or adjoining the proposed works; and

(cc) longitudinal and cross sections with invert levels and the required flood levels including existing and proposed surface contours of constructed or natural open channels (E.g., table drains) and waterways (including landscape, construction details and maintenance).

(dd) detail plans of intersections, turnaround areas, property accesses, cul-de-sac, traffic calming (LATM) devices (if required) and the like:

  (i) intersection detail plans include all relevant information required for plans together with additional details such as tangent point chainages, kerb lip levels on all kerb returns, pavement contours and channelisation works; and

  (ii) the plans should also include relevant information as listed for standard cross section.

(ee) longitudinal sections of roads

  the longitudinal section of each road includes:

  (i) chainages;

(ii) datum RL, existing surface, and peg levels;

(iii) design road centreline and lip of kerb levels and grades;

(iv) cut or fill depths and earthwork quantities;

(v) design grades, length, and radii of vertical curves;

(vi) chainage and level of grade intersection points and tangent points of vertical curves;

(vii) sight distance diagram for each direction of travel for collector or higher order roads only;

(viii) line marking (where applicable);

(ix) details of superelevation (where possible);

(x) drainage lines and manholes intersecting centre line;

(xi) table drain grading and levels where no kerb and channel;

(xii) sight distance diagram for each direction of travel;

(xiii) horizontal curve details;

(xiv) existing and proposed services; and

(xv) pavement design and design speed.

(ff) type cross sections of road

A standard cross section is shown for each road, including:

(i) road reserve width;

(ii) pavement widths (lip to lip dimension);

(iii) road verge widths;

(iv) concrete pathways and cycleways including bicycle lanes (trunk, neighbourhood/local);

(v) crossfalls of pavement and road verges;

(vi) pavement depth (including subsoil drainage);

(vii) type of kerb and channel;

(viii) type of pavement surfacing;

(ix) batter slopes; and

(x) pegged or shift centre line.

(gg) cross sections of roads

a cross section is shown for each chainage on each road.

(i) a cross section should be shown at a minimum spacing of 20 m. Where roads are in steep terrain, cross sections may be required at closer intervals. Cross sections are to be extended into the allotments for the limit of batters. The cross-section plans are to include:

1. road reserve boundaries;

2. pavement centreline, and shift centre line or other construction lines;

3. natural surface;

4. design cross section;

5. crossfall of pavement and road verge, pavement and road verge widths, and pavement depths, wherever these differ from the standard cross section, E.g., superelevation and curve widening;

6. pavement and subsoil drainage;

7. chainages, and

8. the cross-section plans are to include pathways and/or cycleways on the nature strip, including bicycle lanes on-road.

(ii) when existing bitumen sealed roads are widened, cross sections include the full existing sealed pavement cross section at not more than 10 m intervals:

1. each cross section shows the percentage crossfall on the existing bitumen surface and the design crossfall to the lip of the proposed kerb and channel; and

2. notations on drawings also require the Supervising Engineer to check for any errors between the design and the set out of the kerb and channel before the kerb and channel is constructed.

(hh) traffic signs and pavement markings plan

all required signage and pavement markings (including temporary works) are to be provided in accordance with the current version of the MUTCD, Queensland;

(ii) longitudinal sections of drain lines

a longitudinal section of each drain line should be drawn along the centre line of the drain line and should show:

(i) chainages;

(ii) existing and proposed surface levels;

(iii) design invert levels, hydraulic grade lines, velocity, discharge;

(iv) manhole chainages, inlet and outlet invert levels, and finished surface levels of structures;

(v) distances between manholes;

(vi) grade in percent, diameter, type and class of each pipe or size of each box;

(vii) references to the Council's current standard drawings;

(viii) class of each pipe, length, and type of pipe;

(ix) existing and proposed service locations and levels;

(x) all piped drain lines and constructed or natural channels used to convey run-off as part of the development are shown on drawings;

(xi) longitudinal sections and cross sections of all channels show the calculated hydraulic grade line for the design frequency; and

(xii) piped drain lines are included either on the road longitudinal sections where applicable or detailed separately.

(jj) stormwater drainage catchment plan

the catchment plans should indicate all catchments including external catchments contributing to the stormwater drainage design and the following:

(i) full external catchment;

(ii) development layout plan showing the roads and allotment boundaries;

(iii) existing and finished surface contours (in different line types). Contour intervals are to be sufficient to enable sub-catchments to be defined;

(iv) contours must be extended external to the site to enable the limits of all external catchments to be fully defined;

(v) sub-catchment boundaries, labels and areas;

(vi) location of drain lines, manholes, inlet/gully pits, outlets, open drains etc; and

(vii) labelling of stormwater structures.

(4) Pathways and cycleways drawings guidelines

(a) All plans for pathways and/or cycleways on the nature strip, including bicycle lanes on-road (trunk and neighbourhood/local) networks are to be presented at the reduction ratio 1:500 minimum or 1:200 preferable. The plans are to include details of the signs and pavement markings to be used and any barriers, fences, holding rails, ramps, etc. The landscaping treatment should also be included in the plans.

(b) The cycleways on the nature strip, including bicycle lanes on-road plan sheet to be provided, can be incorporated into the road plan where clarity permits. Specific details are to be provided at reduction ratio 1:200.

(c) Longitudinal sections will be required for all off-road pathways where grades are greater than or equal to 3%.

(d) Longitudinal sections will have reduction ratios of 1:500 horizontal and 1:50 vertical.

(e) Cross sections will be presented at 1:100 reduction ratio (natural) and transition tables will be required where cross falls vary, or superelevation is provided.

(f) A typical cross section will be detailed to indicate pavement materials and layer depths.

(5) Sewerage drawings guidelines

(a) Sewerage layout plan

The sewerage layout plan includes:

For development consisting of two or more stages, a preliminary master layout plan showing boundaries of all stages. The plan shows proposed locations and sizes of all trunk mains, pumping stations and sewage treatment plants, where relevant.

In addition, the sewerage layout includes:

(i) boundary of the development, lot layout and numbers, easements (if required), finished surface contours;

(ii) non-sewered areas;

(iii) references to the Council's current standard drawings;

(iv) location, grades of all sewer lines, manholes (numbered) and other services where they cross;

(v) indicate trunk mains;

(vi) pumping stations, maintenance structure numbers and sewer diameters;

(vii) site plan for sewerage pump stations; and

(viii) details of water and electricity supply, landscaping, access and control buildings, if applicable.

(b) Sewerage longitudinal sections

The longitudinal section of each sewer line includes:

(i) upstream and downstream invert levels;

(ii) existing and finished surface levels, depth to invert;

(iii) grade expressed as 1 in XX;

(iv) diameter, type and class of pipe;

(v) chainage;

(vi) distance between maintenance structures;

(vii) concrete stops, where required;

(viii) manhole and/or shaft number;

(ix) manhole type and drop type;

(x) location and depth of all underground services; and

(xi) the design invert level of each house connection branch, type, and invert level of the branch.

(6) Water drawings guidelines

(a) Water reticulation layout plan for developments consisting of two or more stages, a master layout plan showing stage boundaries should be provided. Locations of existing or proposed trunk mains, treatment plants or reservoirs are to be shown on plan.

In addition, a water reticulation layout plan showing:

(i) pipe location;

(ii) pipe material, diameter, type, class, and joints, including fittings;

(iii) fire hydrant, valve, bends, junction locations;

(iv) size and location of all concrete anchor blocks, thrust blocks, and diaphragm walls;

(v) cut-in details;

(vi) crossroad conduit locations;

(vii) specific notes and instructions;

(viii) boundary of the development, lot layout and numbers, including easements;

(ix) proposed location for any pump stations, showing access details;

(x) references to Council's current standard drawings (Section SC6.4.3 Standard drawings);

(xi) dimension from road alignment boundary/property boundary;

(xii) minimum clearances to other services;

(xiii) pipe and fitting, internal and external protection details including at road pavement crossings;

(xiv) trench cross section detail showing the pipes as well as bedding and filling materials for each size and type of pipe;

(xv) pump curves if appropriate;

(xvi) complete pipe work and structural details of any pump stations, including complete details of valves and other fittings and electrical details; and

(xvii) technical specifications for pumps and pump stations.

(7) Landscape drawings guidelines

(a) Applications including landscape works, detailed plans and documentation containing the following minimum amount of information to be provided, as applicable and in support of the proposal:

(i) Demonstration of design preparation and certification by qualified personnel (refer to Clause SC6.4.2.4).

(ii) Landscape plans, providing the following minimum amount of information, as applicable:

1. specification notes for plant establishment period and maintenance;
2. existing site information, boundaries, contours, underground/overhead services, easements, drainage lines, or the like;
3. adjoining structures that overshadow the site;
4. details of protected vegetation, significant trees that are proposed for retention and trees proposed for removal due to the development;
5. the canopy height and spread of any major tree or building footprint on adjoining property which the proposed development may affect in any way. The incorporation of a qualified arborist's findings may be relevant where adjoining tree root zones or canopy extends into the development site;
6. specification notes either on the drawings or in an associated report that adequately outlines the quality of construction materials, and all other relevant information;
7. proposed location of buildings/structures including finished floor levels;
8. roadways, car parks, footpaths, driveways with description of materials and finishes;
9. all areas and their proposed treatment such as surface treatments, planting layout, planting schedule, including botanical names, stock sizes, quantities, staking and planting details;
10. fences and screens indicating materials, heights, and construction details;
11. location and details of street or park furniture, fixtures, and lighting;
12. indicative cross-sections of important features or areas of the site such as entrances, waterways and retaining walls;
13. details of irrigation system;
14. proposed design levels and original ground levels/contours;
15. design details and materials of all surfaces, retaining walls, edging, embankments, furniture, planting, lighting, and other structures including entry statements;
16. typical cross sections through the site;
17. construction details for planting, paving, edging and retaining structures, and
18. design details of vehicle/pedestrian/cyclist line of sight, CPTED, and correct placement of vegetation at intersections, including consideration of clear zones, shared areas, and *Dividing Fences Act*.

(iii) Landscape statement of intent, describing:

1. how the proposed landscaping meets the intent of the (Section SC6.4.12 Landscaping and open space policy);
2. how the proposed landscaping addresses the sites opportunities and constraints; and
3. the underpinning concepts incorporated into the landscape design and how these relate to and deliver cost-effective sustainable outcomes.

(iv) Locality map illustrating surrounding reserves/natural areas, roads and local features.

(v) Existing site conditions and base information including:

1. site boundaries, levels, and contours;
2. description and location of built elements, including “off street carparking”;
3. site analysis identifying opportunities and constraints;
4. description of all remnant vegetation present and any landforms (for example dunes, gullies, wetlands, waterways, rock formations);
5. location of existing trees and identified vegetation to be retained including Vegetation Protection Zone/s and protection and management provisions as per Clause SC6.4.23.1 (4)(s) Work adjacent to trees and protection of environmentally significant vegetation;
6. canopy height and spread of any major tree or building footprint on adjoining property which the proposed development may affect in any way. The incorporation of a qualified arborist’s findings and implementation Vegetation Protection Zone of may be relevant where adjoining tree root zones or canopy extends into the development site;
7. location of existing trees and identified vegetation for removal;
8. existing driveways, footpaths, adjoining driveways etc. including finished surface/s;
9. adjoining structures that overshadow the site;
10. significant features pertaining to the application E.g., the location of waste collection areas;
11. existing grading and drainage in relation to the landscaping (overland flows to be identified) with inlet and discharge points clearly shown; and
12. underground and overhead services (water, power, telecom and gas) easements and drainage lines.

(vi) Landscape details and schedules including:

1. proposed design levels and original ground levels/contours;
2. typical cross sections through the site including surface grades;
3. method of erosion control for slopes steeper than 1:4;
4. grading and drainage in relation to the landscaping (overland flows to be identified) including surface and subsurface drainage, collection points, and discharge points clearly shown;
5. surface treatment for hardscape areas including accurate location, dimensions, construction notes, details and finishes of concrete footpaths, paving, roadways, car parks, driveways, boardwalks and the like;
6. existing and proposed levels of building slab, hard surfaces, drainage grates and landscaped areas, especially adjacent to trees to be retained;
7. indicative cross-sections of important features or areas of the site such as entrances, waterways and retaining walls;
8. location and details of furniture, fixtures, and lighting, where applicable;
9. fencing and screening locations including height, material, and finish, to boundaries and pool area (if applicable);
10. details and soil depth of planter boxes and podiums including inlet and discharge points for drainage;
11. location, dimensions and construction details for any other proposed works or structures or external elements;

12. calculation of the square metre area of landscape and recreation area;
13. surface treatment for all softscape areas including accurate location, dimensions, planting notes, details and methods of establishment or transplanting for garden beds, lawn areas, and other softscape elements;
14. planting bed preparation details/notes including excavation, cultivation, imported topsoil depths, mulch type and depth, fertiliser or soil additive type and application rate where the Council specification is not being applied;
15. planting plan including planting layout, plant code, stock sizes, quantities, staking and planting details;
16. plant schedule containing plant code, plant species, location, quantity and spacing and size of container (and approximate size of the plant if requested as part of a condition) as per Table SC6.4.2.2 below;

Table SC6.4.2.2 - Example of Plant Schedule

Plant code	Plant name	Location	Qty	Spacing	Container size
1	Rhoeo spathacea	Garden 1	30	500mm centres	140mm
2	Carpentaria acuminata	Garden 2	3	As per plan	25 Litre
3	Callistemon Capt Cook	Garden 1 & 2	10	1 metre centres	150mm

17. specification notes (either on the drawings or in an associated report) that adequately outline the quality of construction materials, and all other relevant information; and
18. specification notes for the plant establishment period and maintenance including responsibility for plant replacement and maintenance.

(b) For public open space, streetscaping or works that will become Council assets, Council may request more detailed information including:

(i) general details such as:

1. demonstration of design preparation and certification by qualified personnel (see Clause SC6.4.2.5);
2. designer’s name and/or company;
3. drafter’s name and/or company; and
4. surveyor’s name and/or company.

(ii) additional details pertaining to open space or streetscaping (existing and proposed) including but not limited to:

1. geotechnical and soil test results;
2. site plan, including relationship to existing infrastructure and details and responsibilities relating to removal or modification of Council assets;
3. details of type, manufacturer, materiality, and warranty of furniture, equipment, and structures (such as play equipment, park furniture, shade shelters) including compliance with relevant standards where applicable;
4. the location and details of any stormwater quality management infrastructure to be constructed including maintenance access to the infrastructure;
5. calculation of the square metre area of landscaping to be planted, broken down into turfed and mulched and planted areas;

6. other works proposed in the location/public open space, which do not form part of the detailed landscape plan, but may impact the landscape works or Council assets (such as vegetation management, rehabilitation, and environmental management plans);

7. the location and details of any stormwater discharge through or into a public open space or waterway; and

8. where plantings are proposed in the road reserve, the provision of a plan showing an accurate footprint, including trunk diameter (at 1.2 m from ground level) and canopy spread of all existing trees and expected diameter at maturity for proposed street trees adjacent to the property and roads concerned, including any trees that are proposed to be removed.

(iii) maintenance plan pertaining to ongoing maintenance of public open space infrastructure or streetscaping, including but not limited to:

1. schedule that lists the assets and associated maintenance activities, including locations, season of visit, schedule frequency and number of visits per year;

2. statement demonstrating alignment with Council public open space management specifications;

3. Bill of Quantities (BOQ) that identifies the relevant types and quantities of each asset;

4. detailed specifications for specialist activities and/or infrastructure including, but not limited to, playground and fitness equipment, public art, ablution facilities, water features, stormwater quality infrastructure, bridges, and revegetation areas;

5. that the landscape maintenance plan has been prepared by a suitably qualified horticulturist or landscape designer (or irrigation designer for any irrigation system component of the landscape management plan); and

6. an approved traffic management plan relating to all ongoing maintenance activities that will be required within the road reserve or require ongoing traffic management.

(iv) other applicable (written) approvals, including but not limited to:

1. asset owner approval of works, including buildings and structure, where the works are within a designated parkland or affecting other Council assets; and

2. all other approvals or certifications necessary for the completion of works in accordance with the Laws of Australia, Laws of the State of Queensland, Townsville City Council Local Laws and Ordinances.

(8) Irrigation drawings guidelines

(a) For all irrigation works, detailed plans and documentation containing the following minimum amount of information are to be provided, as applicable:

(i) standard plan legend as shown in Section SC6.4.3 Standard drawings (Irrigation drawings);

Editor's Note - The symbols and line types shown in the legend are the acceptable convention for design plans to be used to represent the components of the design. Additional symbols and line types may be introduced provided they are shown in the legend on the drawing.

(ii) valve key displaying the relevant information as shown in Section SC6.4.3 Standard drawings (Irrigation drawings);

(iii) sprinkler key displaying the relevant information as shown in Section SC6.4.3 Standard drawings (Irrigation drawings);

(iv) locality plan outlining the location of the site appropriately labelled with the suburb and street names;

(v) name of all adjacent roadways;

(vi) location of water meter, backflow device, automatic controller, valve boxes;

(vii) details of irrigation system and connection (town supply or bore water);

(viii) irrigation design data displaying the relevant information as shown in Section SC6.4.3 Standard drawings (Irrigation drawings);

(ix) irrigation cabling/wiring schedule displaying the relevant information as shown in Section SC6.4.3 Standard drawings (Irrigation drawings); and

(x) design notes detailing relevant design criteria e.g., Sprinkler Type A is to be Hunter PGP; all Solenoid valves are to be Hunter ICV; descriptions of the symbols and line types used from the plan legend.

(b) For all irrigation in public open space works, streetscapes or works that will become Council assets, Council may request more detailed information in addition to the general irrigation works requirements previously outlined, including:

(i) general details such as:

1. demonstration of irrigation design preparation and certification by qualified personnel being a Certified Irrigation Designer or Certified Irrigation Agronomist including certification number;
2. designers name and/or company;
3. drafters name and/or company; and
4. surveyors name and/or company;

(ii) additional details pertaining to irrigation within public open space or streetscapes (existing and proposed) including but not limited to:

1. details and responsibilities relating to removal or modification of Council's irrigation assets;
2. details of type, manufacturer, materiality, and warranty of irrigation system component including compliance with relevant standards where applicable;
3. the location and details of any irrigation associated with stormwater quality management infrastructure to be constructed including maintenance activities and access to the irrigation infrastructure;
4. calculation of the square metre areas of irrigation against the irrigation system type and profile levels;
5. other works proposed in the location/public open space, which do not form part of the detailed irrigation plan, but may impact the irrigation works or council's assets; and
6. where irrigation is proposed in the road reserve, the inclusion of offset details from lanes of traffic to irrigation infrastructure;

(iii) maintenance plan pertaining to ongoing maintenance of irrigation infrastructure or streetscaping, including but not limited to:

1. leak and blockage checks in irrigation lines and emitters;
2. reprogramming the irrigation controller and restationing of emitters as plants grow, die out and are replaced;
3. inspection of moisture sensors;
4. maintenance of tanks and cisterns;

5. checking of water pumps; and
6. an approved traffic management plan relating to all ongoing maintenance activities that will be required within the road reserve or require ongoing traffic management; and

(iv) other applicable (written) approvals, including but not limited to:

1. asset owner approval of works, where the works are will affect Council's irrigation systems or other Council assets; and
2. all other approvals or certifications necessary for the completion of works in accordance with the Laws of Australia, Laws of the State of Queensland, Council Local Laws.

SC6.4.2.12 Attachments, forms and checklists

Online Form A - Pre-Lodgement Meeting Request Form

Click here to view Pre-Lodgement Meeting Request Form.

Form A – Engineering Certification

Click here to view Certification Report

Properly made / well-made application checklists

List of Checklists	To obtain a copy of the form.
Checklist A - Material Change of use	Click here
Checklist B – Reconfiguring a lot	Click here
Checklist C - Operational Works	Click here
Checklist D – Compliance Assessment	Click here

Design Checklists

List of Checklists	To obtain a copy of the form.
Checklist E- Base Plot of Existing Features	Click here
Checklist F - Horizontal Road Alignment	Click here
Checklist G - Vertical Road Alignment	Click here
Checklist H - Road Cross Sections	Click here
Checklist I - Road and Inter-Allotment Drainage	Click here
Checklist J - Signs and Markings	Click here
Checklist K - Pavement Design	Click here
Checklist L - Bridge and Major Culvert Design	Click here
Checklist M - Landscape and Irrigation Plans	Click here
Checklist N - Erosion and Sedimentation Control Plans	Click here
Checklist O - QAF0476 Sewage Pump Station and Pressure Main	Click here
Checklist P - QAF0477 Sewer Reticulation	Click here
Checklist Q - QAF0478 Water Reticulation	Click here
Checklist R - QAF0479 Water and Sewer Model	Click here

Checklist S – QAF0480 Public Transport	Click here

Development manual planning scheme policy (PSP)
SC6.4.3 Standard Drawings

Index

SC6.4.3.1 List of Standard Drawings

(1) Introduction

(2) Standard drawings for roadworks

(3) Standard drawings for stormwater drainage

(4) Standard drawings for water

(5) Standard drawings for sewerage

(6) Standard drawings for transport

(7) Standard drawings for landscaping and open space

(8) Standard drawings for irrigation

SC6.4.3.1 List of standard drawings

(1) Introduction

This section contains the current set of Townsville City Council standard drawings. Council's standard drawings show the minimum standard that Council has adopted for certain types of work. Standards have been developed for works on roads, stormwater drainage, water, sewerage, transport, landscaping and open space, irrigation, and other miscellaneous works.

List of Standard Drawings:

Table SC6.4.3.1 - Townsville City Council Standard Drawings for Roadworks

Table SC6.4.3.2 - Townsville City Council Standard Drawing for Stormwater Drainage

Table SC6.4.3.3 - Townsville City Council Standard Drawings for Water

Table SC6.4.3.4 - Townsville City Council Standard Drawings for Sewerage

Table SC6.4.3.5 - Townsville City Council Standard Drawings for Transport

Table SC6.4.3.6 - Townsville City Council Standard Drawings for Landscaping and Open Space

Table SC6.4.3.7 - Townsville City Council Standard Drawings for Irrigation

(2) Standard drawings for roadworks

Table SC6.4.3.1 - Townsville City Council Standard Drawings for Roadworks

Click here to obtain a copy of the drawings.

Drawing No.	Title
SD-001	Typical Road Cross Sections – Local Streets
SD-002	Typical Road Cross Sections – Major Collector Roads
SD-003	Typical Road Cross Sections – Sub Arterial Roads
SD-004	Typical Road Cross Sections – Arterial Roads
SD-005	Typical Road Cross Sections – Industrial Roads
SD-006	Typical Road Cross Sections – B-Double Turning Path and Access Plan Example Drawing
SD-010	Typical Road Cross Sections – Rural Roads
SD-015	Verge Zones and Trees – General Type Sections
SD-020	Concrete Kerbing
SD-025	Kerb Ramp
SD-030	Driveway Access Urban Residential Properties
SD-031	Driveway Access Industrial Properties
SD-032	Driveway Crossovers Urban Residential Properties
SD-055	Road Crossing and Footpath Reinstatement for Trench Laid Services
SD-060	Traffic Sign Installation
SD-065	Street Name Sign and Installation Details
SD-066	Miscellaneous Traffic Details – Shared Path Terminal Treatments Deflection Rail and Intersection at Side Road
SD-067	Miscellaneous Traffic Details – Pedestrian Refuge and Holding Rail
SD-070	Concrete Pathway Reinforced Concrete (Mesh) Alternative
SD-075	Concrete Pathway Reinforced Concrete (Fibre) Alternative
SD-080	Subsoil Drain

SD-085	Kerb and Channel Drainage Connections
SD-090	Driveway Access Rural Properties Type 1 - Access With Invert Slab H<300mm
SD-091	Driveway Access Rural Properties - Type 2 - Concrete Access With Culvert Cast in-situ with Grate H≥300mm
SD-092	Driveway Access Rural Properties - Type 3 - Gravel Access With Culvert Cast in-situ with Grate H≥300mm
SD-093	Driveway Access Rural Properties - Type 4 - Concrete Access With Culvert Inverted Pre-cast Box Culvert H≥325mm
SD-094	Driveway Access Rural Properties - Type 5 - Gravel Access With Culvert Inverted Pre-cast Box Culvert H≥325mm
SD-095	Driveway Access Rural Properties - Type 6 – Access With Culvert Cast in-situ H≥450mm
SD-096	Driveway Access Rural Properties - Type 7 - Conc. Access With Culvert 535mm<H<685mm
SD-097	Driveway Access Rural Properties - Type 8 - Gravel Access With Culvert 535mm<H<685mm

(3) Standard drawings for stormwater drainage

Table SC6.4.3.2 - Townsville City Council Standard Drawings for Stormwater Drainage

Click here to obtain a copy of the drawings.

Drawing No.	Title	
SD-200	Precast Grated Kerb Inlet System and Cast in-situ Stormwater Manhole	
SD-205	Stormwater Manhole Details	
SD-210	Precast Stormwater Manhole – Slab Top Details	
SD-215	Raised Grate Field Inlet Manhole	

(4) Standard drawings for water

Table SC6.4.3.3 - Townsville City Council Standard Drawings for Water

Refer to the Cairns, Townsville & Mackay (CTM) Water Alliance Design and Construction Code standard drawings for water.

Click here to obtain a copy of the drawings.

(5) Standard drawings for sewerage

Table SC6.4.3.4 - Townsville City Council Standard Drawings for Sewerage

Drawing No.	Title	
SD-435	Sewerage Pump Stations Washdown Service Installation	
SD-440	Pressure Main Discharge to Maintenance Hole	
SD-450	Vents at Sewerage Rising Main Receiving Inspection Chambers and Pump Stations	

Refer to the Cairns, Townsville & Mackay (CTM) Water Alliance Design and Construction Code for other standard drawings for sewerage.

Click here to obtain a copy of the drawings.

(6) Standard drawings for transport

Table SC6.4.3.5 - Townsville City Council Standard Drawings for Transport

Click here to obtain a copy of the drawings.

Drawing No.	Title	
SD-500	Standard Bus Shelter Framing Details Sheet 1 of 2	
SD-502	Standard Bus Shelter Slab and Footing Details Sheet 2 of 2	
SD-505	Regional Bus Shelter Framing Details Sheet 1 of 2	
SD-510	Regional Bus Shelter Construction Details Sheet 2 of 2	
SD-515	Standard Bus Stop Urban Location Layout Details Type 1 and 2	
SD-520	Regional Bus Stop Urban Location Layout Details Type 3 and 4	
SD-525	Basic Bus Stop Layout Details Urban Location	
SD-530	Standard Bus Stop Urban and Rural Locations Layout Details Type 7 and 8	
SD-535	J Pole, Timetable Display Case, Rubbish Bin and Sleeve Installation Details	
SD-540	School Bus Bus Stop Sign Details	
SD-545	Bus Setdown – Urban Locations Layout Details	
SD-550	Bus Setdown – Parking and Indented Details Urban Locations	
SD-555	Bus Setdown Rural Location Layout Details	
SD-560	Bus Setdown Rural Location Table Drain Precast Culvert Crossing	
SD-565	Bus Setdown Rural Location Table Drain Cast-Insitu Culvert Crossing	
SD-570	Standard-Country Bus Shelter – Framing, Slab and Footings Details	
SD-575	Standard-City Bus Shelter Framing Details	
SD-580	Standard-City Bus Shelter Slab and Footing	
SD-585	Standard-City Bus Stop Urban Location Layout Details - Type 9 and 10	
SD-590	Parking for People with Disabilities	
SD-595	Taxi Rank	
SD-596	Taxi sign details	

(7) Standard drawings for landscaping and open space

Table SC6.4.3.6 - Townsville City Council Standard Drawings for Landscaping and Open Space

Click here to obtain a copy of the drawings.

Drawing No.	Title	
SD-600	Open Space Standard Drawing Index	
SD-641	Surface Treatment Edging	
SD-642	Surface Treatment Rubber Softfall	
SD-643	Surface Treatment Sand Softfall	
SD-644	Surface Treatment Decomposed Granite Path	
SD-652	Fencing Playground	

SD-653	Fencing Dog Off-Leash Area	
SD-654	Fencing Open Space Bollard	
SD-657	Fencing Maintenance Access Gate	
SD-664	Furniture - Drinking Fountain	

(8) Standard drawings for irrigation

Table SC6.4.3.7 - Townsville City Council Standard Drawings for Irrigation

Please contact Townsville City Council to obtain a copy of drawings

Drawing No.	Title	
SD-4.1	XR 1 - 4 Panel and Screw Hole Layout	
SD-4.2	XR 1 - 4 Terminal Layout and Power Diagram	
SD-4.3	XR 1 - 4 Control Enclosure	
SD-4.4	XR 1 - 4 Base and Antenna	
SD-4.5	XR 1 - 4 Preferred Equipment List – Controller and Telemetry	
SD-5.1	AC Irrinet ACE DR 24 – 48 Panel Layout	
SD-5.2	AC Irrinet ACE DR 24 – 48 Terminal Layout	
SD-5.3	AC Irrinet ACE DR 24 – 48 Control Enclosure	
SD-5.4	AC Irrinet ACE DR 24 – 48 Base and Pole	
SD-5.5	AC Irrinet ACE DR 24 – 48 Electrical Diagram	
SD-5.6	AC Irrinet ACE DR 24 – 48 Screw Holes	
SD-5.7	AC Irrinet ACE DR 24 – 48 Preferred Equipment List – Controller and Telemetry	
SD-5.8	AC Irrinet ACE DR 24 – 48 Panel Layout Photo	
SD-5.9	AC Irrinet ACE DR 24 – 48 Chassis Mounting Photo	
SD-5.10	AC Irrinet ACE DR 24 – 48 Door Layout Photo	
SD-7.1	Irrigation Design Data Example	
SD-7.2	Irrigation Cabling Wiring Schedule Example	
SD-8.1	Plan Conventions	
SD-9.1	Survey Dimensions	
SD-10.1	Water meter assembly 50MM and Above Type A	
SD-10.2	Water meter assembly 50MM and Above Type B	
SD-10.3	Water meter assembly 25M-32MM Type A	
SD-10.4	Water meter assembly 25M-32MM Type B	
SD-10.5	Water Meter Stands	
SD-10.6	Valve Assembly Side View	
SD-12.1	Sprinkler Installation	
SD-12.2	Sprinkler Riser Large and Small	
SD-13.1	Subdivision Services Allocation (figure 1, 2, 3, 4, 5, 6)	
SD-14.1	Drip Irrigation Overview	
SD-14.2	Drip Valve Assemblies	
SD-14.3	Drip Valve Assembly 25MM and 40MM Internal Reg	
SD-14.4	Drip Valve Assembly 25MM External Reg	
SD-15.1	Drip Tube Holding Pin	
SD-16.1	Curved Road Sprinkler Layout	
SD-17.1	Conduit Placement in Valves	
SD-17.2	Valve Assembly - Plan View and Electrical Pit	
SD-18.1	Typical Pipe Trench Details	

SD-19.1	Scheduling Co-efficient	
SD-20.1	AC Irrinet M Slave 12 – 24 Panel Layout	
SD-20.2	AC Irrinet M Slave 12 – 24 Terminal Layout	
SD-20.3	AC Irrinet M Slave 12 – 24 Control Enclosure	
SD-20.4	AC Irrinet M Slave 12 – 24 Base and Pole	
SD-20.5	AC Irrinet M Slave 12 – 24 Electrical Diagram	
SD-20.6	AC Irrinet M Slave 12 – 24 Screw Holes	
SD-20.7	AC Irrinet M Slave 12 – 24 Preferred Equipment List – Controller and Telemetry	
SD-21.1	AC Irrinet M Slave 36 – 48 Panel Layout	
SD-21.2	AC Irrinet M Slave 36 – 48 Terminal Layout	
SD-21.3	AC Irrinet M Slave 36 – 48 Control Enclosure	
SD-21.4	AC Irrinet M Slave 36 – 48 Base and Pole	
SD-21.5	AC Irrinet M Slave 36 – 48 Electrical Diagram	
SD-21.6	AC Irrinet M Slave 36 – 48 Screw Holes	
SD-21.7	AC Irrinet M Slave 36 – 48 Preferred Equipment List – Controller and Telemetry	
SD-22.1	AC Irrinet M 12 – 24 Panel Layout	
SD-22.2	AC Irrinet M 12 – 24 Terminal Layout	
SD-22.3	AC Irrinet M 12 – 24 Control Enclosure	
SD-22.4	AC Irrinet M 12 – 24 Base and Pole	
SD-22.5	AC Irrinet M 12 – 24 Electrical Diagram	
SD-22.6	AC Irrinet M 12 – 24 Screw Holes	
SD-22.7	AC Irrinet M 12 – 24 Preferred Equipment List – Controller and Telemetry	
SD-23.1	AC Irrinet M 36 – 48 Panel Layout	
SD-23.2	AC Irrinet M 36 – 48 Terminal Layout	
SD-23.3	AC Irrinet M 36 – 48 Control Enclosure	
SD-23.4	AC Irrinet M 36 – 48 Base and Pole	
SD-23.5	AC Irrinet M 36 – 48 Electrical Diagram	
SD-23.6	AC Irrinet M 36 – 48 Screw Holes	
SD-23.7	AC Irrinet M 36 – 48 Preferred Equipment List – Controller and Telemetry	
SD-26.1	Door Bracket	
SD-26.2	Door Bracket Position	
SD-26.3	Door Bracket – Irrinet M	
SD-26.4	Door Bracket Position – Irrinet M	
SD-27.1	Enclosure Earth Wiring	
SD-28.1	Transceiver Interface Cable Type 1	
SD-28.3	Aux Data Cable – RJ45 Modified Crossover Cable	
SD-29.1	Rain Switch Installation	

Drawing No.	**Title**	
SD-31.1	Hydrometer Covers 50mm – 100mm	
SD-31.2	Multijet Covers 25mm - 32mm	
SD-32.1	Drinking Fountain Assembly	
SD-32.2	Drinking Fountains Base	
SD-33.1	Valve Nest Cover (sheet 1)	

SD-33.2	Valve Nest Cover (sheet 2)	
SD-33.3	Valve Nest Cover (sheet 3)	
SD-33.4	Valve Nest Cover (sheet 4)	

Development manual planning scheme policy (PSP)

SC6.4.4 Active transport infrastructure

INDEX

SC6.4.4.1 Introduction

SC6.4.4.2 Terminology

SC6.4.4.3 Planning methodology

SC6.4.4.4 Model code requirements

SC6.4.4.5 Walkable neighbourhoods assessment benchmarks

SC6.4.4.6 Pathway and cycleway design characteristics

SC6.4.4.7 Pathway width requirements based on function and demand

SC6.4.4.8 Pathway demand volumes

SC6.4.4.1 Introduction

Active transport infrastructure comprises inter-connected walking paths, shared use pathways, and cycleways, linked with a network of streets with bike lanes, pedestrian links at intersections, and from ends of streets, including park reserves, laneways, and cul-de-sacs.

Active transport is described as a transport mode that is efficient, cost effective, healthy, and active, sustainable, and accessible, which has many benefits for both the individual and the community. It refers to trips which rely primarily on human power to get from place to place. The most common forms of active transport are walking and cycling, it can also include such modes as wheelchairs, skateboards, roller blades, mobility devices, and scooters.

Active transport infrastructure is typically defined as pathway and may generally include but not limited to:

(1) Transport infrastructure provided for active transport including walking and cycling and other human powered modes of transport. Infrastructure includes:

  (a) pathway facilities;

  (b) cycleway facilities, and

  (c) on-road bicycle facilities.

(2) Pathways which are defined as Principal Routes because they form a connected route servicing the following destinations:

  (a) Within 800m of a school, TAFE or tertiary education facility.

  (b) Within 400m of a district or regional scale park or sporting facility (includes pathways located within the park).

  (c) Within 400m of libraries, theatres, entertainment, and conference centres.

(3) Pathways which are defined as Principal Routes because they are located within the following major centre areas:

  (a) Townsville CBD – Defined development area

  (b) Aitkenvale / Stockland – Defined development intensification area

  (c) Hyde Park / Castletown – Defined development intensification area

  (d) Thuringowa Central / Willows – Defined development intensification area

(4) Pathways which are located on an existing or future Principal Cycle Network Plan alignment.

(5) Pathways which are located on a defined recreational route, e.g., Ross River, Castle Hill, Riverway etc

(6) Minor pathways being footpaths, bicycle paths, and shared paths providing a local area access function. Such pathways are typically on local streets and provide links within a local neighbourhood.

SC6.4.4.2 Terminology

Active Transport Infrastructure is defined as transport infrastructure provided for active transport including walking and cycling and other human powered modes of transport. Infrastructure includes pathway facilities, cycleway facilities including on-road bicycle facilities. Relevant terminology relating to active transport is detailed below.

Pathway Facilities	are defined as active transport infrastructure that is primarily for use by pedestrians, however, can be shared facilities also used by cyclists and other permitted users providing the pathway is of sufficient width to cater for demand.
Principal Routes	are strategically important and high demand routes and connections on the active transport network.
Shared Use Pathways	are pathways that have a minimum width of 2.5m that are designed for shared use by pedestrians, cyclists, and other permitted users.
Footpaths	are pathways that are typically located on the roadside nature strip and are described in legislation as footpaths within a road-related area.
Pedestrian	is a person walking, and including people in wheelchairs, on roller skates or riding vehicles such as skateboards or other vehicles, other than a bicycle, powered by effort or a motor and with a maximum speed of 10 km/h.
Pathway Design Features	typically include kerb ramps for use by cyclists, prams, and wheelchairs. Other features may include safety rails, signage and speed reducing measures at road crossings.
Cycleway Facilities	are defined as active transport Infrastructure that is intended for use by cyclists, this includes both on-road bicycle facilities (e.g., Bicycle Lanes) and off-road facilities designed for exclusive use by cyclists.
On-road Bicycle Facilities	are marked bicycle lanes on the road surfacing located adjacent to marked traffic lanes.
Principal Cycle Network	the Principal Cycle Network (PCN) is cycleway infrastructure that is designed and funded by the State through the Department of Transport and Main Roads. In Townsville, the PCN is defined in the North Queensland Principal Cycle Network Plan (NQPCNP).

SC6.4.4.3 Planning methodology

The active transport network is planned to help service the active travel needs of the Townsville community in line with the vision for transportation set out in the Townsville Integrated Transport Plan – Strategic Directions document. Unlike the road network, strategic transport models are not currently available to forecast the extent and location of future active transport links required to cater for growth. The active transport network has therefore been developed using an iterative planning approach by examining:

(1) connections to and within future growth areas and existing areas;

(2) growth trends in walking and cycling;

(3) the growth for other modes of transport;

(4) changing standards in the type of facilities required; and

(5) State government planning.

The resulting network is consistent with the aspects of the Liveable communities state interest of *State Planning Policy 2017* (SPP) and the requirements set out in the Model Code for Neighbourhood Design – August 2020 (Model Code).

SC6.4.4.4 Model Code requirements

The purpose of the Model Code for neighbourhood design is to:

(1) Facilitate the creation of walkable neighbourhoods that support healthy and active communities.

(2) Facilitate a neighbourhood design and layout that creates well-integrated, well-serviced, compact, and connected neighbourhoods.

SC6.4.4.5 Walkable neighbourhoods assessment benchmarks

In accordance with the *Planning Regulation 2017* (Planning Regulation) and the Model Code, Council will assess new residential "reconfiguration of a lot" development against specific assessment benchmarks that support the development of walkable neighbourhoods. The purpose of the assessment benchmarks is to ensure the reconfiguration supports convenient and comfortable walking for transport, recreation, leisure and exercise in the local area and they include:

(1) Connectivity for pedestrians is provided through a grid-like street layout responding to the local landscape.

(2) Block lengths are a maximum of 250 metres.

(3) Pathways are provided on at least one side of local access streets and on both sides of minor collector streets.

SC6.4.4.6 Pathway and cycleway design characteristics

The specific design criteria for active transport facilities may vary depending on whether the facility is located within or outside of the road reserve. There are also a number of design characteristics and requirements available for the different type of active transport facilities that can be provided E.g., pathways, cycleways – separated, exclusive or shared use. Some cycleways can also be on-road, and the alignment may be part of a cyclists' travel route providing connectivity and directness.

(1) Pathways on major roads
On all new Major Collector, Sub-Arterial or Arterial roads provide pathways located on the road nature strip on both sides of the road with one side of the road being a shared use pathway (minimum 2.5 m wide) and the other pathway being also a shared use path or a pathway suitable for pedestrians only (minimum 1.5 m wide).

(2) Pathways on minor collector streets
Provide pathways (minimum 1.5 m wide) located on the road nature strip on both sides of the road.

(3) Pathways on access streets and places
Provide pathways (minimum 1.5 m wide) located on the road nature strip on one side of the road.

(4) Pathways not aligned along roads
On all pathways that are not aligned along the road network and are defined as Principal Routes provide a shared use pathway (minimum 2.5 m wide).

(5) Cycleways on-road
All cycleways that are provided on-road as bicycle lanes to be a minimum 1.5 m wide and preferably 1.8 m wide located adjacent to the marked traffic lanes with a 0.6 m separation strip (painted chevron) also provided between the bicycle lane and the traffic lane.

(6) Principal Cycleway Network
All cycleways that are on the Principal Cycleway Network that are also located on-road as bicycle lanes to be a minimum 2.0m wide separated from the marked traffic lane by a 0.6 m wide painted chevron.

SC6.4.4.7 Pathway width requirements based on function and demand

Pathways have minimum width criteria based on function as follows:

(1) Pedestrian only paths have an absolute minimum width of 1.5 m to allow for a wheelchair and pram to pass.
(2) Shared paths have an absolute minimum width of 2.5 m to allow for a pedestrian and cyclist to pass with 0.5 m clearance.

The following Table SC6.4.2.1 details the preferred width of pathways based on daily pathway demand volumes assuming a 50/50 split of directional flows.

Table SC6.4.2.1 – Daily Pathway Demand Values

Daily Pathway Volume	Recommended Path Width (m)	Comments
0 - 50	1.5m pedestrian pathway	Not suitable for shared use with bicycles or eScooters
50 - 250	2.5m shared path	Assume up to 25% cyclist component
250 - 500	3.0m shared path	Assume up to 50% cyclist component
500 - 1000	4.0m shared path	Optional 1.5m ped. path & separate 2.5 cycle path
1000 - 1750	1.5m ped. path + 3.0m cycleway	Ped. Only Path & Cyclist Path must be separated
> 1750	1.5m ped. path + 4.0m cycleway	Ped. Only Path & Cyclist Path must be separated

SC6.4.4.8 Pathway demand volumes

The volume of users of the active transport network is difficult to predict, however it is reasonable to assume that the network will provide an attractive travel option for many people as follows:

(1) Exercise i.e., walking to the park or riding a bicycle for personal fitness.
(2) Short walking trips to nearby destinations / shops close to home or place of work.
(3) Commuter cycling for people that ride on the road or cycleways to travel to work.
(4) Recreation short walking trips or safe cycling on shared pathways.
(5) Education trips both walking and cycling to and from schools, TAFE, and university.

In the absence of reliable survey data pathway volumes can be estimated based on 4% of directional AADT data.

E.g., If the road has 2000 AADT on the northern side of the road and 2250 AADT on the southern side of the road the pathway volumes are estimated as follows:

- Northern side of road footpath = 2000 x 4% = 80 people per day
- Southern side of road footpath = 2250 x 4% = 90 people per day

Development manual planning scheme policy (PSP)
SC6.4.5 Road network infrastructure

Index

SC6.4.5.1 Townsville road hierarchy

(1) Introduction
(2) General principles
(3) Four level road hierarchy
(4) Linear Integrated Transport Plans (LITP)

SC6.4.5.2 Traffic impact assessments (TIA)

(1) Introduction
(2) Determining the level of the TIA
(3) TIA report requirements
(4) Essential technical guidance

SC6.4.5.3 Public transport facilities

(1) Introduction
(2) Public transport
(3) Public transport information and guidelines (planning and design)
(4) Consultation guidelines

SC6.4.5.4 Car parking

(1) Introduction
(2) Parking
(3) Servicing

SC6.4.5.5 Driveways

(1) Introduction
(2) Responsibility
(3) Location
(4) Amenity
(5) Materials
(6) Clearances
(7) Gradient
(8) Number of driveways
(9) Stormwater

SC6.4.5.6 Road and street names

(1) Introduction
(2) Information requirements
(3) Criteria for naming of roads and streets
(4) Street name signs

SC6.4.5.7 Maps and Attachments

Map A - Urban and Rural Traffic Environments Map
Map B1 - Townsville Road Hierarchy Map (Existing)
Map B2 - Townsville Road Hierarchy Map (Future)
Attachment A - Road Hierarchy Typical Cross Section Characteristics

SC6.4.5.1 Townsville road hierarchy

(1) Introduction

(a) Overview

The Townsville road hierarchy is a planning tool to guide good practice transport planning and management, with the aim of balancing the needs of both the land use and the roadway system. A road hierarchy establishes each roadway function such that appropriate objectives for that roadway and design criteria, can be developed and implemented.

These objectives and design criteria are aimed at achieving an efficient road system whereby conflicts between the roadway and the adjacent land use are minimised, and the appropriate level of interaction between the roadway and land use is permitted. The road hierarchy also forms the basis of ongoing planning and system management aimed at reducing the conflict between existing incompatible functions.

The use of road hierarchy categories as part of the land use and transport network planning process enables optimisation of the relationships and key roles associated with accessibility, connectivity, amenity, and safety for all road/land users, including vehicles, bicycles, pedestrians, and public transport. The road hierarchy categories and sub-categories contained herein are pertinent and appropriate with the current transport environment in the Townsville area. As time passes, and the transport system and its relationship with land uses changes, these road hierarchy principles will require further development and refinement.

(b) Townsville Integrated Transport Plan – Strategic Directions (TITP)

Integrated land use and transport planning must be embedded and applied in a wide range of circumstances – from strategic planning to detailed design for one mode or across all modes. This road hierarchy section contains specific information for managing the interface between land use and roadway systems. This section has regard to the overarching planning framework of the Townsville Integrated Transport Plan – Strategic Directions document (TITP). The TITP was adopted by the Council in 2021, this document provides overarching guidance on transport planning in Townsville and covers matters not addressed by this road hierarchy section.

The TITP is a strategic directions document that forecasts Townsville's future through a vision statement supported by a series of objectives and key initiatives. The vision states "Townsville has a flexible and responsive world class transport system which meets the needs and aspirations of the community and industry and reflects the city's position as the capital of Northern Australia". The vision is supported by 19 objectives and delivered through 25 key initiatives.

(c) Road hierarchy objectives

The road hierarchy aims to meet the following objectives:

(i) to systematically classify roads into a framework around which Council and the state government can plan and implement various land use, infrastructure construction, maintenance, and management schemes and projects such as:

1. identifying the effects of development decisions in and on surrounding areas and roadways within the hierarchy; and

2. developing design that facilitates urban design principles such as accessibility, connectivity, efficiency, amenity, and safety;

(ii) to guide network planning and management for all modes (private, passenger and commercial/industrial transport) and users (motorised and non-motorised); and

(iii) to clarify policies and decisions in designing new networks and in managing existing road systems to provide a rational basis for management of the network under the current or future planning schemes, for example:

1. enabling investment and traffic management efforts to be concentrated on those links able to cope efficiently with transport needs;
2. enabling Council and the state government to adopt appropriate standards of construction on traffic routes; and
3. enabling the network to be optimised to accommodate access and non-transport functions.

(d) Definition of urban and rural

The application of the road hierarchy requires the terms urban and rural to be defined for the purpose of this policy.

Urban	Developed area which may comprise densely developed uses such as residential, commercial, industrial, education, recreation, or a mix of these. In general, this is characterised by evenly spaced street lighting, kerbed streets,frequent closely spaced driveways (preferably none on traffic carrying roads). This will also include land designated for future urban development.
Rural	Sparsely developed area which may comprise rural development, rural residential development, isolated pocket of urban development and environmental area. In general, this is characterised by unkerbed streets, both sealed and unsealed roads, infrequent driveways, and large tracts of undeveloped land. Street lighting may only be at intersections and points of safety concerns.

For the specific purpose of showing urban and rural traffic environments for the Townsville road hierarchy, a map has been provided in Clause SC6.4.5.7 - Map A.

If a rural development is located in the adjacent urban fringe area or adjoined/contained a part of continuous existing network connection, it may be required to be designed similar to the adjacent road network environment, e.g., urban road cross section.

(e) Terminology

Category	Those elements of the road hierarchy defined at level 2 of the road hierarchy.
DTMR	Department of Transport and Main Roads
Environmental Cell	Contains local streets with a slow speed and pedestrian priority environment, and generally bounded by major collector roads.
LITP	A Linear Integrated Transport Plan is a method of planning between the roadway and the surrounding environment in an integrated manner.
MUTCD	*Manual of Uniform Traffic Control Devices*
RPT	Regular public transport.
Specific Cell	A part of the urban fabric that is contained within a block bordered by trafficcarrying roads or other physical boundaries.
Specific Area	A part of the urban fabric that is generally bounded by arterial or sub

	arterial roads, or other physical boundaries. A specific area will contain one or more cells.
Sub - category	Those elements of the road hierarchy defined at level 3 of the road hierarchy.
VPD	Vehicles per day.

(f) Structure of the road hierarchy

Based on the desired outcomes, directions and principles contained in the TITP Strategic Directions, this section establishes a four-level road hierarchy that manages the interface between land use and roadway system and guides system planning and management in urban and rural areas. Figure SC6.4.5.1 shows the basic structure of the four-level road hierarchy, and the four levels are explored in more detail in Section SC6.4.5.1(3).

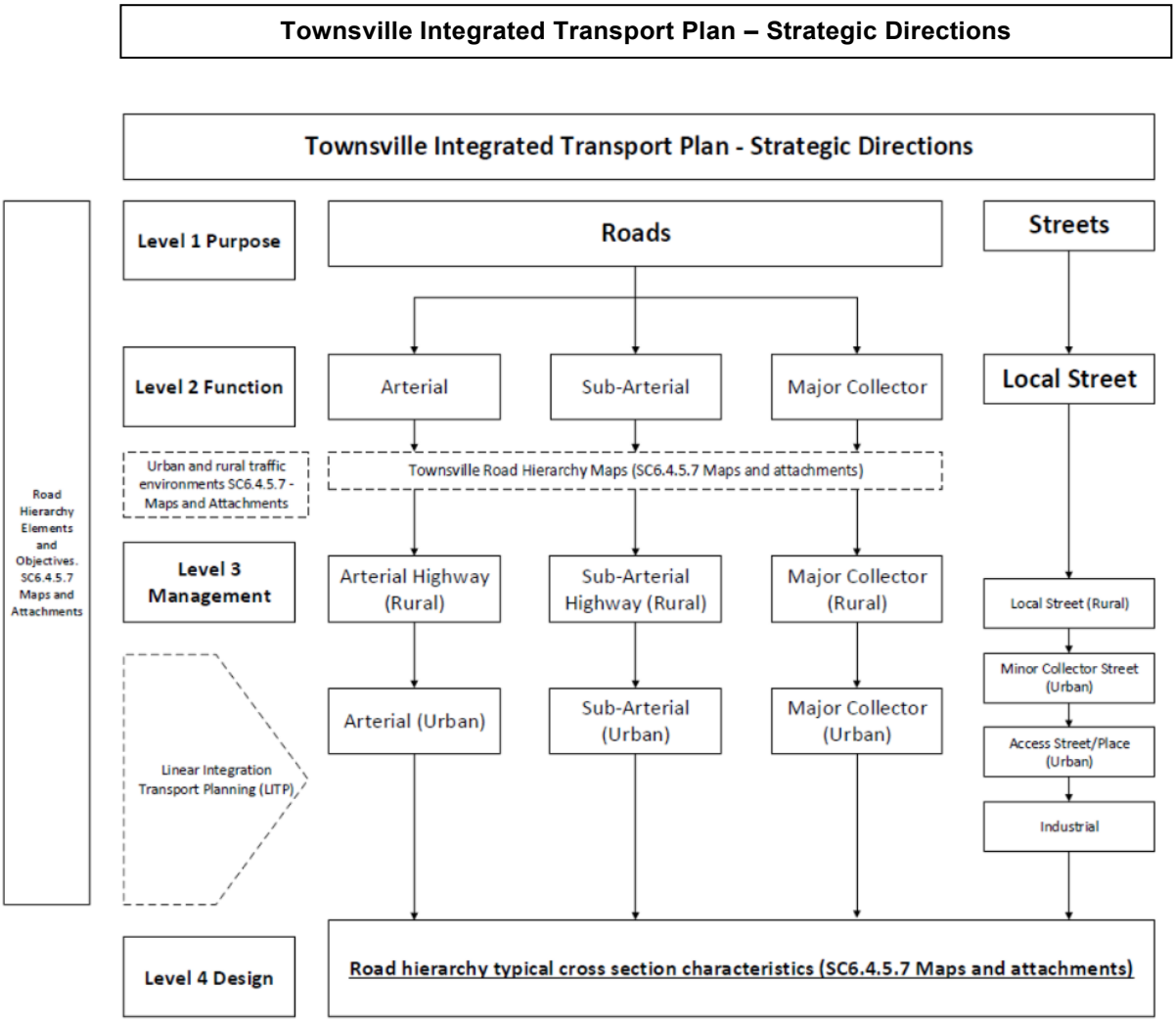


Figure SC6.4.5.1 - Structure of the Four-Level Road Hierarchy

(2) General principles

(a) Network linkage

Ideally, only roadway elements with the same place in the hierarchy, or one position higher or lower in level 2 of the hierarchy, should intersect.

For example:

(i) arterial roads should only intersect with sub arterial roads and other arterials;

(ii) sub arterial roads should only intersect with arterials, other sub arterials, or major collectors;

(iii) major collectors should only intersect with sub arterials, other major collectors, or local streets; and

(iv) local streets should only intersect with collectors or other local streets.

In certain situations, it may be acceptable for roadway categories separated by two positions within level 2 of the hierarchy to intersect. For instance, a local street may intersect with a sub arterial road, or a collector with an arterial, without significant adverse ramifications. In other cases, a permeable grid local network creates too many street/road intersections, and some of these have to be blocked off to limit points of access for vehicles by creating cul-de-sacs. Active transport pathway linkages into the local area for pedestrians and cyclists could be maintained, providing the desired pedestrian and cyclist access onto the arterial roads, without adverse impact on traffic flow, safety, and local amenity.

It may even be acceptable for roadway categories separated by three positions in level 2 of the hierarchy to intersect in certain cases. That is, a local street may intersect with an arterial road, provided it is not an uninterrupted flow facility, without significant adverse effects. This may be the case, for example, where a service road provides access directly to a two or four lane arterial road in an urban area, or two-lane highway in a rural area.

(b) Size of precincts free from unwanted traffic

The spacing of arterials or traffic routes has the effect of defining the size of development areas that are penetrated only by streets. The size of these "areas" has a direct influence on issues such as the local traffic environment, whether or not "difficult traffic routes" can be avoided, the feasibility of sustaining low vehicle speeds in the local area, the number and frequency of connections to surrounding arterials, and access to bus routes around and through the area. Traffic should be distributed appropriately amongst the local streets to ensure that amenity levels are not exceeded, and adequate connectivity is maintained.

(i) Urban areas

While the size and shape of a specific area is commonly constrained by fixed elements such as existing infrastructure, topography and property boundaries, the idealised form is of the order of 1 km × 1 km for an urban specific area. This size would typically encompass four environmental cells, each 0.5 km × 0.5 km. The boundaries of the specific areas will be partially defined by the existing major road system, which in turn has generally been developed to a large extent as a result of historical events rather than recent planning initiatives. Other features may also be used as boundaries.

The aim is to define specific areas which:

1. are relatively homogeneous in land use;

2. have only that traffic necessary for the functioning of the area, I.e., they are free of non-essential or through traffic; and

3. have a balance between the volume of essential traffic and the nature of the area. e.g., higher volumes may be more acceptable in industrial areas than in residential areas.

(ii) Rural areas

While the specific area concept is most relevant to an urban area, it also applies to rural areas, although in a slightly different context. Specific areas in rural areas should be linked by a system of through traffic carrying roads. The dimensions and form of a specific area will vary in rural areas due to the reduced development densities. As a result, specific area sizes in rural areas will be significantly larger than in urban areas.

(c) Abutting development and access

Restriction of access points to abutting land uses is one of the key parameters in the road hierarchy. Decisions on access points to new developments are linked to the strategic function of the road and the types of traffic and trips that it serves, as well as the type of environment intended to result.

Decisions on network types, especially at the local level, will have long term effects on the traffic character of an area, and inevitably the quality of service on the surrounding traffic routes. The road hierarchy provides a means of classifying and designing a roadway according to its purpose, function, and management. It is intended that this process be carried out within the constraints of the network, as it is imperative that corridor continuity be considered. Notwithstanding past decisions that have resulted in existing constraints, this may mean that corridor continuity may need to be targeted as a long-term goal.

In addition to corridor continuity, future development potential should also be addressed in the road hierarchy. The planning scheme earmarks a considerable quantity of land for future urban development, industrial, commercial, or residential. Classification of existing roadways in these areas should support future amendments to the hierarchy and the associated changes in performance criteria. For example, an existing road may currently serve a collector function, but as the area is subdivided into urban development in the future, the potential future function of the road may require allowances to be conformed at an earlier time so that the performance criteria of its future function can be met.

It is important to note that some non-residential land uses such as schools, parks and local shops have to be located within or near the specific areas they serve. These may be accessed by a sub arterial road, or, if this is not possible, it is desirable that they are accessed via a major collector road rather than the local street environment. The conflicting land use requirements in these circumstances mean that network considerations must be carefully examined in terms of connectivity, network efficiency and compatibility between private vehicle, public transport, nonmotorized, and freight networks. Integrated land use and hierarchical transport planning can overcome this shortcoming to a large extent.

(d) Relationships between networks

"Cells" may be sized and have access limited to manage entry of unwanted traffic. However, different networks will have different entry criteria. As mentioned in Clause SC6.4.5.1 (2) above, network linkage principles may vary between motorised vehicles modes such as public transport and active transport (pedestrian and bicycle). For example, passenger transport networks are often focused on middle order roads to balance point to point travel times, network reach, connectivity, and passenger safety. Similarly, freight networks will be based on specific freight criteria and result in different networks for freight. The overlay of modal networks is a key consideration in establishing the functional category for a specific link in the road network.

(3) Four level road hierarchy

A four level road hierarchy has been developed, based on the functional objectives of each category or sub-category within the hierarchy. Level 1 begins with a broad distinction between roads and streets, and the following three levels listed with an increasing degree of detail with respect to functional objectives. The levels are defined as follows:

Level 1 - Purpose relates to the primary objective of the element, whether to carry through traffic or provide direct property access.

Level 2 - Function relates to the relationship between the roadway and land use it serves (I.e., how the roadway serves the land use). This level of the hierarchy is common to traditional road hierarchy concepts.

Level 3 - Management relates to the implementation of policies to achieve the envisaged function based upon the attributes of the element and of the adjacent land uses.

Level 4 - Design relates to specification of the form of the element to achieve its functional objectives.

(a) Hierarchy level 1 – purpose

Level 1 of the hierarchy defines roadways as either:

(i) roads to carry through traffic; or

(ii) streets for access to property and collection of local traffic.

This classification applies to both rural and urban areas.

The definition of a roadway in one particular category serves to indicate a planning intent in relation to the functions that will be permitted on that roadway. Thus, measures are likely to be adopted on streets that relate to amenity and environmental capacity, for example, by removal of through traffic, or direction of local traffic to a particular collector road. At the other end of the scale, treatments on arterial roads will principally be related to increasing traffic carrying capacity. This would tend to be by removal of some incompatible lower order functions, such as limiting access to properties, disallowing any further new accesses, or reducing the number of intersecting roads.

Figure SC6.4.5.2 below illustrates the relationship between traffic mobility and land access in a functionally classified roadway system.

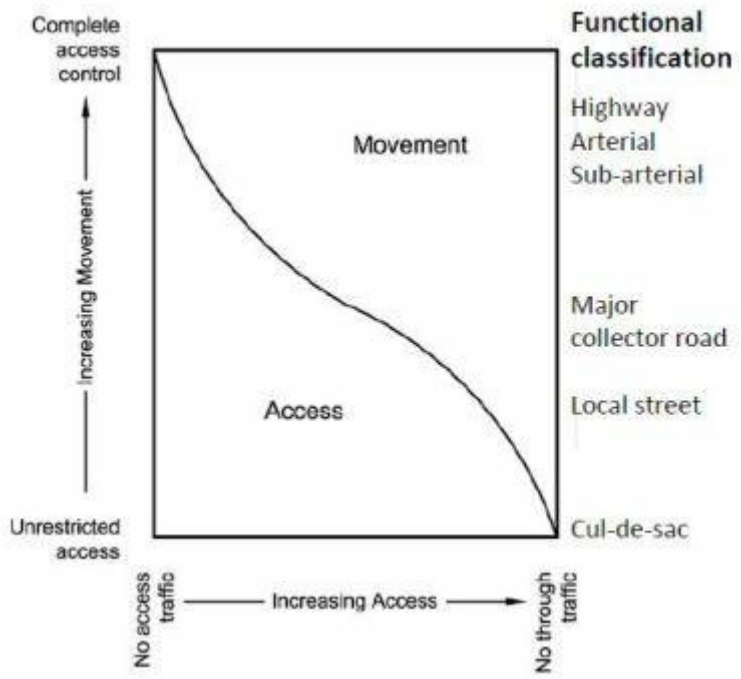


Figure SC6.4.5.2 - Relationship Between Traffic Mobility and Accessibility.

Source - Adapted from a figure in NCHRP Report 348, Access management Policies and Guidelines for Activity Centres, Transportation Research Board, Washington DC, 1993.

(b) Hierarchy level 2 – function

Within the two broad groups of roads and streets in the first level of the hierarchy, four functional roadway categories have been identified, reflecting the different ways in which they serve land use and carry traffic.

The functional classification indicates the relative importance of the traffic mobility function as opposed to the amenity/access functions, and how these conflicting aims are to be prioritised and managed.

Based on the current and future land use zoning in the Townsville City Plan, the Townsville Road Hierarchy map (see Clause SC6.4.5.7 Map B1 Townsville Road Hierarchy Map (Existing) and Clause SC6.4.5.7 Map B2 Townsville Road Hierarchy Map (Future)) has been developed for all level 2 categories. To enable easier application of the road hierarchy, the same overarching objectives and category names have been applied for both urban and rural areas. It should be noted that some links are identified as a conceptual location with respect to spacing, hierarchical connectivity and continuation of links between start and end points. Therefore, if significant development is planned to occur in a large or multiple parcels of undeveloped land in either an urban or rural area, then it may be necessary to reassess that area road hierarchy plan within a whole network.

The four functional categories in level 2 of the hierarchy are:

(i) Arterial roads are to carry long distance through traffic external to specific areas.

The primary objective of arterial roads is to provide major through routes for traffic. All longer distance traffic movements should be directed onto the arterial roads.

Arterial roads should form a principal connection between major regional centres and towns. It can also serve a line haul function for public transport.

Arterial roads may accommodate sections of the active transport network, but travel speed, volume and composition is such that cycle movements should desirably be kept separate from general traffic.

In general, arterial roads have high design standards for efficiency and no direct frontage access.

In rural areas it is recognised that many arterial roads have direct property access. On such roadways the main goal is to provide a highly efficient traffic flow (increased speed and increased capacity), balanced with safe access.

For all arterial roads it is desirable that, over time, no new accesses are permitted and that existing accesses be removed, or at least consolidated, or turns restricted.

(ii) Sub arterial roads are to carry through traffic between specific areas and arterial roads in a supporting role to the latter.

Sub arterial roads carry through traffic and should be more convenient than using the "streets" network; therefore, a high level of efficiency and safety should be provided.

In general, sub arterials serve to provide connections between arterial roads and may be used to provide such additional connections for through movements.

In urban areas, sub arterial roads typically provide connection between residential, commercial, or industrial areas and arterial roads. They will normally be the lowest order of road to be traversed by scheduled public transport in performing a line haul function.

Sub arterial roads may provide for active transport network infrastructure.

These roads can provide consolidated access to commercial and retail developments and as a result can also cater for pedestrian movements, especially in the vicinity of such developments. The provision of consolidated access allows for turning movements to be focussed at specific, controlled locations rather than at high frequency along the roadway, thus minimising interruptions to through traffic.

In rural areas, sub arterial roads provide connections between adjacent suburbs and/or between arterials. Access may also occur, and be necessary, but these will be more widely spaced due to the larger lots.

(iii) Major collector roads are to provide connectivity between the environmental cells and the traffic carrying road and to provide grouped property access.

The objective of major collector roads is to provide for the connection between the local area (local streets) and the traffic carrying roads. The form of linkage provided should predicate against the usage of major collector roads within a particular area by longer distance traffic unless the trip is relevant to the area. In residential areas particularly, amenity and safety should be the most important consideration, as these roads are also intended to provide direct access to grouped properties, commercial premises, schools, or community facilities.

Major collector roads will carry public transport operating in a sweeper role, and these are likely to be school bus routes. It is necessary to ensure that the connectivity to achieve an efficient bus route does not encourage penetration by through traffic. Typically, scheduled bus routes would begin a service on major collector roads, as a sweeper service, and then move to higher order links in the bus network to run as limited stop or express services.

As these roads serve as access to adjacent grouped properties, whether in residential or commercial/industrial areas, pedestrian movements need to be accommodated off the roadway. Traffic volumes should be balanced to accommodate local active transport cycle movements on the road, and road design should create a safe environment for these vulnerable road users.

(iv) Local streets are to provide direct property access and immediate local movements. The objective of local streets is to provide access to properties. In residential areas, these should be in a form to encourage a liveable and safe street environment where the motor vehicle is secondary to the active transport modes such as walking and cycling. Through traffic should be discouraged on these streets and a lower speed environment is desirable for safety. Given the low traffic volume and potentially lower speed environment, it is appropriate for active transport cyclists to share the road space. Similarly, specific facilities for pedestrians (such as pedestrian crossings) may not be required due to low traffic volumes and speeds.

(c) Hierarchy level 3 – management

To achieve the desired traffic levels and conditions, a combination of road use management actions will often be necessary to reduce traffic flows on some elements of the network and to increase traffic flows on other elements of the network. To minimise the use of lower order roads, such as local residential streets, it will be necessary to manage arterial roads in a way that makes their use more attractive than the lower order roads. Lower order roads must then be managed in a way that discourages traffic through environmental street design, such as street closures, street element length and design speed. If reactivity treatments are applied in existing areas, they must be undertaken on an area wide basis to ensure that problems are not simply shifted from one street to another.

In managing road hierarchy distinction needs to be drawn with respect to performance criteria between roadways in an urban or rural environment. Accordingly, the thresholds of the performance criteria differ between the urban and rural areas. The desirable performance criteria are subdivided into four groups and described below.

(i) Urban and rural characteristic (sub-categories)

To achieve effective management of the road system, the road hierarchy has been split into sub-categories of rural and urban. Each sub-category has objectives that are more specific than the category objectives for level 2. The management sub-categories are described broadly as follows (listed under each level 2 category):

1. Arterial road

    a) Arterial highway (rural) serves longer distance movements as well as regionally and nationally significant movements. (A motorway is a highway that provides for a very high standard of travel by restricting non-motorised traffic and using only grade separated intersections.).

    b) Arterial (urban) caters for longer distance movements, for example, connections between major centres, they may also serve adjacent retail/commercial land uses.

2. Sub arterial road

    a) Sub arterial (rural) connects traffic generated in rural areas to the arterial roads.

b) Sub arterial (urban) connects traffic generated in urban areas to the arterial roads and provides access to major developments and adjacent retail/commercial land uses.

3. Major collector road

a) Major collector (rural) are typically spine roads that connect local streets in a specific rural area to the sub-arterial or arterial rural road network.

b) Major collector (urban) typically carry more than 3,000 vpd in each direction and provide connections between local streets and the sub-arterial or arterial urban road network. These roads also provide direct access to large sites with restricted or controlled access (for example, schools, shops, and multi-unit residential developments).

4. Local street

a) Local street (rural) typically provide direct access to individual rural properties that do not have frontage to higher order rural roads.

b) Minor collector (urban) carry less than 3,000 vpd and provide connections between local access streets and the major collector or sub arterial or urban road network. These streets are often the entry street or main street in a residential subdivision / precinct. They provide direct access to individual properties and smaller local community sites with restricted or controlled access (for example, childcare facilities & local shops). Minor collector streets may also provide a route for public transport and school bus service and typically have pedestrian pathways on both sides of the street.

c) Access street / place (urban) are low traffic carrying streets typically providing access to individual properties. These streets provide for high permeability and connectivity of pedestrian and recreation use pathways that service the local area; as such the streets are generally short in length, i.e., less than 250 m and have a lower speed limit, i.e.,50 km/h or less.

d) Industrial streets are local streets or roads that provide access to properties within an industrial area. Industrial streets are generally designed for trucks, with wide traffic lanes and wide property accesses that can accommodate the turning radius of large vehicles (for example, semi-trailers, B-doubles and road trains). The pavements and surfacing treatments on these streets are also designed for heavy loads.

(ii) Functional characteristics

Functional characteristics have been set to ensure the network operates effectively, efficiently, and safely for its users. The functional aspects of a roadway element include:

1. dominant linkage

what type of areas should the roadway provide service to/from;

2. traffic carrying function

whilst volumes are not intended to define the category into which the roadway falls, this criterion provides some guidance as to the maximum volumes anticipated. These maximum volumes may not be met in non-urban areas due to the low density of development, residential, commercial, industrial access – what degree of access to each of the land use types is appropriate;

3. desirable traffic speed environment

   the desirable speed anticipated. This is not intended to define the maximum speed limit, which should be done in accordance with the MUTCD;

4. heavy vehicle movement

   whether the roadway is appropriate for heavy vehicles, other than for local access. Note that heavy vehicle volume will be important in defining road pavement and design form;

5. dangerous goods movement

   whether the roadway is appropriate for the passage of dangerous goods vehicles, other than for local access;

6. public transport facilities

   what role should the roadway serve for public transport (consistent with any public transport network planning);

7. active transport cycleway facilities

   what type of cycleway facilities should be provided in the roadway corridor (consistent with any cycleway network planning). Cycleway facilities would only be provided where sufficient demand is proven; and

8. active transport pathway facilities

   what type of pathways (not for crossing the roadway) should be provided along the roadway. These should only be provided to satisfy a proven demand.

   Editor's Note - The term pathway refers to footpaths that are typically located on the roadside nature strip and are described in legislation as footpaths within a road-related area.

(iii) Frictional characteristics

Frictional characteristics are set with the intent of improving the efficiency of traffic flow and thus reducing its environmental consequences in balance with access needs. Frictional characteristics relate to the way roadside activity affects traffic use and include:

1. access control

   constraints imposed on direct access to adjacent development sites;

2. parking provision

   what provision for parking within the road reserve is appropriate;

3. bus stopping provision

   what provision for bus stops within the road reserve should be made;

   Editor's Note - Indented bays also refer to bays which are clear of the through lanes as per Council standard.

4. pedestrian crossings

   what type of facilities should be provided to allow pedestrians and cyclists to cross the roadway, for example, signalised crossings, zebra crossings or pedestrian refuge islands;

   Editor's Note - Crossings must meet Council standards and MUTCD guidelines.

5. typical intersection spacing

   the typical distance between successive intersections along that roadway;

   Editor's Note - Generally, 300 m intersection spacing is not favourable for a corridor signal coordination plan.

6. preferred intersection treatments

   what form of intersection control is appropriate where the roadway intersects another of equal or higher classification; and

   Editor's Note – Clause SC6.4.5.7 Attachment A provides some guidance on the preferred intersection treatments.

7. number of traffic lanes

   what function of road hierarchy and ultimate traffic demand should be considered.

(iv) Impact characteristics

The impact characteristics of a road element is important in making the adjacent land use areas more liveable and to address issues associated with the social interaction between transport and land use.

Impact characteristics relate to the relationship between a roadway element and amenity for adjacent land use and include:

1. abutting land use types

   what type of land use would be appropriate or compatible with the roadway function; and

2. land use impact amelioration

   what type of measures are appropriate on this roadway to reduce the immediate social and environmental impacts of traffic. Such treatments include barriers (fences, walls), buffers (vegetation), setbacks (distance to property lines and/or building facades), streetscaping and environmental street design.

(d) Hierarchy level 4 – design

The fourth level of the road hierarchy framework relates to specific design criteria that are applicable to each sub-category in level 3. Level 4 aims to provide the tools with which to specify the form required of individual road hierarchy elements in order that they achieve their functional objectives. The roadway design should meet safety objectives as well as capacity and amenity objectives, where relevant. In conjunction with level 3 objectives, it should also dictate the type of facility and design form for active transport infrastructure (pedestrians & cyclists) and public transport.

For each roadway, there are design elements that combine to produce a cross section or form for the roadway. Clause SC6.4.5.7 Attachment A provides a set of desirable performance criteria for urban and rural areas, and Section SC6.4.3 Standard drawings also includes a set of road cross sections. The design elements identified are those applicable to the road cross section away from intersections (i.e., mid-block cross section). Intersection requirements will dictate other specifications. For example, widening at intersections and future planning are an important part of defining these overall requirements. These design element details and the cross sections have been prepared for new roadways. Council recognises that there will need to be variations to this to suit existing roadways (i.e., existing road forms and existing road reserve widths) in the process of network design.

It is important to note that the level 4 requirements represent preferable performance criteria. There will be other constraints (for example, topography role in the range of networks, existing land uses, road reserve, and physical elements), which mean that the requirements may be varied from time to time. Whilst this flexibility needs to exist, it is important to keep an appropriate balance between mandatory standards, desirable objectives, and constraints, to develop an appropriate road form for each individual situation whilst still maintaining some consistency in the overall road network. The objectives and performance criteria should be maintained wherever possible.

In any case, all design criteria should be considered in line with relevant documents and proper guidelines, for example, other parts of the SC6.4 Development manual planning scheme policy, DTMR Guidelines, Austroads, MUTCD, Australian Standards, the *Model Code for Neighbourhood Design* for the local street level.

Editor's Note - Posted speed limits are to be designated in accordance with the MUTCD Part 4 and are required to be approved by Council.

(i) Arterial road design standards

Administrative responsibility for roads is based on historical and political decisions as well as function within the hierarchy. Arterial roads comprise highways, typically administered by DTMR and urban arterials that may be the responsibility of either the state or local government.

1. Arterial roads (general criteria)

Arterials cater for external or intra-regional traffic and traffic between suburbs or major centres. These facilities should preferably have no direct access for all land uses. However, they often do have direct accesses due to past land use decisions, so longer-term access limitations and land use amalgamation should be pursued so that the traffic carrying role can be progressively enhanced.

The design standards are set to achieve a balance between safety and efficiency. In this case, spacing of intersections will often control the design speed and hence other design elements. There will be many existing situations where the road design is constrained by elements such as the road reserve, property access and road width. In such situations, an individual design form will need to be developed to suit the constraints, whilst still achieving the arterial road objectives.

The policy is to pursue no direct access from individual properties to arterial roads. Examples of alternative treatments include:

a) side street entry to corner blocks; and/or

b) combining driveways; and/or

c) creating rear lane access; and/or

d) creating easements to service multiple properties.

To facilitate efficient traffic movement, a higher speed environment is desirable. Limits of 80 km/h for new arterial roads and 60 or 70 km/h for existing arterial roads and where physical constraints exist in urban areas, and up to 100 km/h in rural areas are recommended. Speeds more than the above stated speeds are generally not appropriate with intersections at grade and high traffic volumes.

These roads may provide the primary freight routes and often provide secondary freight routes. Selected routes may be appropriate for dangerous goods movement. They accommodate inter urban and inter centre coach traffic and regular public transport bus traffic under a line haul mode with priority treatment. Any bus stops should be separate from the through traffic lanes.

Pedestrians should be located separately from the carriageways, and pedestrian crossings provided at signalised points. Cycleway facilities can be provided in exclusive bike lanes or on the road shoulder on roads with a speed limit less than 80 km/h, provided Austroads guidelines are met. In locations where the speed limit is higher than 80 km/h, or where there is a cycle accident history or identified potential, consideration should be given to locating these facilities separate from the carriageway.

A number of traffic lanes have to be acquired, with a minimum of a four to six lane carriageway for ultimate traffic growth, and provision made for a proper width to cater for kerb and channel, medians, bus stops and bike lanes. For the interim, a two-lane undivided cross section may be appropriate for a low traffic volume environment whilst achieving affordability, sufficient overtaking opportunities, vehicle breakdown, stopping or turning vehicles and bicycles. However, divided carriageways are desirable to optimise safety and driver comfort.

The abutting land use should preferably be less noise sensitive, or alternatively should include building and site designs that minimise impacts from adjacent traffic flows.

In urban areas, intersections are generally configured at grade for this sub-category. Signalised or roundabout control is generally appropriate although high volumes may necessitate grade separation. Intersections should desirably be spaced a minimum of 500 m apart.

In rural areas, direct access can be tolerated due to low volumes and limited frequency. However, appropriate safety levels must be achieved, and the aim should be to remove such accesses over time. Intersections are generally configured at grade for this sub-category. Priority control is generally appropriate, and intersections should desirably be spaced a minimum of 1km apart due to the higher speed environments. However, a proper intersection type must be assessed and determined using traffic analysis.

2. Highways and motorways (specific criteria)

These roads serve regionally significant travel and longer distance travel. To provide for a high standard of travel, speed environments of 100 km/h or more are desirable, together with no frontage access. If frontage access does occur, then elimination of direct access from the abutting land use should be pursued.

These roads should also provide the primary freight routes, and dangerous goods routes, and carry coach traffic between centres and regular public transport bus traffic under a line haul mode. Any pathway and cycleway facilities in urban areas should be located separately from the carriageways and protected accordingly. Crossing provisions should be grade separated. Grade separated intersections are desirable for all facilities in this category, although this will essentially be driven by volume demand or safety issues rather than hierarchy.

The road reserve width will often be dictated by the need for adjacent service roads, buffer zones and ancillary uses in the road corridor (for example, cycleway facilities, bus lanes). Divided carriageways are desirable to optimise safety and driver comfort. However, a two-lane undivided cross section may be appropriate for low traffic volumes on a rural highway, provided there are sufficient overtaking opportunities. Whilst cycleway facilities, pathways and bus lanes may be provided in the overall corridor, these facilities should desirably be separated from the through roadway and therefore represent an additional carriageway within the overall corridor. In rural areas, it is recognised that the demand for these adjacent facilities will generally be low.

Abutting land use types should be non-sensitive to vehicular traffic and generally not have frontage or direct access to the roadway. Uses such as highway service centres with amenities may be deemed appropriate in some locations based upon a needs assessment. In such cases, these would be provided with high quality direct access. Design standards for highways will primarily be set according to a high design speed and to maximise road user safety. In particular, the provision of wider shoulders is important in high-speed locations.

In urban areas, grade separated intersections on urban roadways should desirably be spaced at least 2 km apart. Intersections at grade on existing highways should be desirably spaced no less than 1 km apart and are generally found to be between 1 km and 2 km apart.

In rural areas, if some land use provides for frontage access due to historic events, then any works undertaken to reduce this frontage access will enhance the traffic carrying capability of the highway in terms of both volume and speed. Whilst volumes may be low, the high traffic speeds mean that safety issues are important at access locations and reductions in the frequency of accesses will reduce the crash rate. Provision of pathway and cycleway facilities will generally be related to demand and the need for a link associated with network planning. Grade separated intersections should be spaced between 4 km and 8 km, with a maximum spacing of 12 km.

3. Arterial roads in urban areas (specific criteria)

This category is directed at existing situations in urban areas, including urban precincts where a group of commercial land uses exists, generally on both sides of an arterial road. In these situations, a decision needs to be made, dependent on the value of these uses, whether the traffic carrying, and access functions should coexist, or whether a bypass or parallel route upgrade is warranted. If it is decided that these functions should coexist, whether in the short or long term, measures will need to be developed as part of a Linear Integrated Transport Plan (LITP) to address this mix.

These design standards are primarily aimed at safety and ensuring pedestrian mobility in conjunction with parking and vehicle access. Traffic volumes may be so high that amenity to roadside activities is limited. However, as these are arterial roads, traffic volumes should not be moderated except by bypassing where feasible.

Speeds on these facilities should be kept sufficiently low (60km/h to 70 km/h) to provide for safe pedestrian crossing at controlled points and to maintain environmental amenity for adjacent land uses while still allowing for efficient traffic movement. These roads should provide for pedestrian movement on both sides

with crossing at controlled points and with bicycle lanes on the road to avoid mixing with denser pedestrian traffic.

Limiting the frequency of property access is important for the traffic carrying capacity and for the amenity levels associated with significant pedestrian traffic in the 'main street precinct'. Streetscaping would assist in ameliorating visual and audible land use impacts.

A number of traffic lanes will have to be acquired to enable four lane or six lane carriageways (if a corridor is likely to take a key public transport route associated with the adjacent land use, e.g., potential exclusive PT lane) for ultimate traffic growth and provision made for proper width to cater for kerb and channel, medians, indented bus bays to reduce delay to through traffic and bike lanes. Opportunities should be sought to bypass freight movements. This category is generally inappropriate as a dangerous goods route.

Intersections are typically spaced 250 - 400 m apart, however due to past planning and land use decisions intersections and median breaks should be spaced a minimum of 150 m apart to avoid queue interaction.

(ii) Sub arterial road design standards

1. Sub arterial roads (general criteria)

These traffic carrying roads are the key supplement to the arterial road network. They should connect between arterials and specific areas and should be more convenient than using the local streets. Consequently, a higher level of efficiency and safety should be provided. Due to the traffic volumes, the abutting land uses should be non-sensitive.

To make these roads more desirable to drivers than local streets, a higher speed environment is desirable. Speed environments of between 60 km/h to 80 km/h in urban areas and up to 100 km/h in rural areas are recommended. The policy is to pursue no direct access to individual properties.

Examples of treatments include:

a) side street entry to corner blocks;

b) combining driveways;

c) creating rear lane access; and

d) creating easements to service multiple properties.

In the preferred design form, access should be restricted and should be managed through treatments such as amalgamated entry points or side streets as discussed above. This would be the treatment pursued as part of any new development. Access for major developments, multi-unit dwellings, schools, childcare centres, and/or commercial uses may be provided along these routes, provided it is controlled through channelisation or signals.

These roads may serve as secondary freight routes. Nominated routes may be appropriate for dangerous goods movement. They could accommodate public transport (bus) traffic under a sweeper mode. Any bus stops should be located separately from the through traffic lanes.

In most circumstances, specific provision for control of pedestrian movements should be provided and roadside parking will be discouraged. Usually, the prime concern will be the movement of traffic, so traffic management techniques could be

applied (such as access minimised by consolidation of development accesses or side road access to sites). Noise and visual amenity impacts on surrounding uses should be managed through site considerations and/or road treatments.

Cycleway facilities can be provided in exclusive bike lanes or on the road shoulder on roads with a speed limit less than 80 km/h, provided Austroads guidelines are met. In locations where the speed limit is higher than 80 km/h, where a high percentage of school cyclists are likely or where there is a cycle accident history or identified potential, consideration should be given to locating these facilities separate from the carriageway.

A number of traffic lanes have to be acquired, with a four-lane carriageway for ultimate traffic growth, and provision made for a proper width to cater for kerb and channel, medians, bus stops and bike lanes. For the interim, a two-lane undivided cross section may be appropriate for a low traffic volume environment whilst achieving affordability, sufficient overtaking opportunities, vehicle breakdown, stopping or turning vehicles and bicycles. However, divided carriageways are desirable to optimise safety and driver comfort.

To satisfy the competing demands of traffic carrying efficiency and property access/on street parking, it is important to separate parked cars and turning vehicles from the through traffic lanes. The verge widths need to include landscaping, pathways, and separation. This will be an important factor in subdivision planning when determining the lot layout and road reserve needs.

In urban areas, paved pathways are generally required on both sides depending on the demand of pathway usage to abutting land use and traffic facilities (e.g., bus stops) with pedestrian crossings at controlled points. Intersections at grade are appropriate for this management type. Signalised or roundabout control is generally appropriate although priority-controlled intersections may be acceptable; this will be determined by a traffic analysis study.

Intersections are typically spaced 250 - 400 m apart, however due to past planning and land use decisions, intersections and median breaks should be spaced a minimum of 150 m apart to avoid queue interaction.

In rural areas, although access is restricted in the preferred design form, individual lot accesses are acceptable, particularly if the access points are widely spaced and properties are well set back. Pathways are only required where the road serves an identified pedestrian linkage, with pedestrian crossings at controlled points. Roundabouts or priority control are generally appropriate, although this will be determined by a traffic analysis study.

2. Sub arterial in urban areas (specific criteria)

   This category is directed at situations where a group of commercial land uses exists, generally on both sides of a sub arterial road. On these stretches of road, a decision needs to be made, dependent on the value of these uses, whether the traffic carrying, and access functions should coexist, or whether a bypass or parallel route upgrade is warranted.

   If the traffic carrying and access functions need to, or should coexist, whether in the shorter or longer term, management measures will need to be developed as part of an LITP to address the coexistence of these two functions.

   In contrast to the arterial sub-category, the traffic environment on sub arterial roads may be restricted to improve the amenity for pedestrians and users of the adjacent

developments. Measures may be taken to reduce some traffic use of the road, for example, during peak periods, and opportunities should be sought to bypass freight movements.

On roads where frequent access to adjacent land uses exists, and cannot be removed or consolidated, measures should seek to achieve safe access while retaining the convenience and efficiency of the route for through traffic.

Access for individual lots should be controlled using one or more of the following measures:

a) central median (no right turns);

b) turning lane separate from through traffic lane;

c) large lot frontage;

d) lot layout to avoid on street visitor parking (large lots); and

e) adjacent properties having adjacent driveways.

This category is generally appropriate as a bus route, and indented bays should be provided to reduce delay to through traffic. This category is generally inappropriate as a dangerous goods route.

Speeds should be kept low to improve amenity to pedestrians and abutting land uses and should typically be 60 km/h. Volumes in major shopping / commercial areas that have high pedestrian movement activity should be no greater than 15,000 vpd to maintain amenity to abutting land uses. These roads require a balance between accessibility and mobility, using environmental street design or streetscaping.

In special cases, a number of traffic lanes will have to be acquired to enable four lane carriageways for ultimate traffic growth (if a corridor is likely to take a key public transport route associated with the adjacent land use, e.g., potential exclusive Public Transport Lane), and provision made for a proper width to cater for kerb and channel, medians, bus stops and bicycle lanes. For the interim, a two-lane undivided cross section may be appropriate for a low traffic volume environment, whilst achieving affordability, sufficient overtaking opportunities, vehicle breakdown, stopping and turning vehicles and bicycles. However, divided carriageways are desirable to optimise safety and driver comfort.

This category should provide for pedestrian movement on both sides with crossings at controlled points, and with bicycle lanes on the road to avoid mixing with denser pedestrian traffic.

Intersections should be controlled by way of signalisation or roundabouts, although priority intersections may be appropriate. Spacing of intersections and median breaks is site specific based on past planning and land use decisions, although a minimum spacing of 150 m should be provided to avoid queue interaction.

(iii) Major collector road design standards

1. Major collector roads (general criteria)

Major collector roads provide a connection between the local streets and the traffic carrying roads and mark a shift in the environment between roads and streets. The design standards place a greater emphasis on travel time efficiency and strict guidelines for safety and environmental amenity apply to these roads.

Traffic flow levels commonly accepted range from 3,000 vpd up to 12,000 vpd. Access to multi-unit residential developments, schools or shopping centres may well be via major collectors. Individual residential lot access to these roads should be restricted, and generally a speed environment of 60 km/h to provide for safety and amenity while ensuring travel times are reasonable. Where there are long sections of on-street parking that generate frequent disruption to traffic flow, a 50 km/h speed limit may also be appropriate. Heavy vehicle and dangerous goods movement should be restricted in residential areas, except for service vehicle movement. Buses will generally operate in a sweeper role and indented bays may be required to maintain safety at some locations.

Pathways and bicycle lanes should be provided on both sides of the road. However, in rural areas, pathways are generally not required unless network planning deems it appropriate. Some controlled pedestrian crossing points may be required in urban areas, particularly where traffic volumes are higher. Kerbside parking could be provided for in urban areas.

Intersections and median breaks are typically spaced 150 m – 200 m apart, however due to past planning decisions a minimum 100 m spacing can be applied to major collector roads.

Intersection control would generally be either by roundabout or priority control. These roads should have two or four lane carriageways, depending on the degree of frictional and impact characteristics criteria that apply.

Environmental street design may be required in urban areas to moderate speeds and minimise through traffic penetration. Streetscaping would also assist in ameliorating visual and noise impacts to abutting land uses.

(iv) Local streets design standards

1. Local streets (general criteria)

Streets have as their function to facilitate public interaction and movement through a place or neighbourhood. Local Streets must allow for the safe and efficient movement of all users, provision for parked vehicles, the provision of public utilities, access to allotments and streetscaping.

The management of these streets is less restrictive due to low traffic volumes, property access and parking. Volumes should be limited to below 3,000 vpd in any one direction and the speed environment of 40 - 50 km/h in urban areas to ensure amenity for abutting land uses, it is noted that the default posted speeds will be at 50 km/hr as per the road rules, and to a maximum 60 km/h in rural areas to ensure reasonable travel times.

Heavy vehicles and dangerous goods movement should be restricted in residential areas, except for service vehicles and public transport. Kerbside bus stops are generally appropriate, although indented bays may be required to maintain safety at some locations.

No specific pedestrian crossing provision is required. No special cycleway facilities are needed unless specifically required as part of an active transport network route, cyclists should be able to share the road space due to the low traffic volumes and speeds.

No specific parking provision is required on these streets.

Intersection spacing is a minimum of 50 m in urban areas and 100 m in rural areas. Some intersections may be controlled by roundabouts; otherwise, priority control should be sufficient. These streets should have a two-lane cross section, or one lane where necessary, with reasonable travel efficiency.

Environmental street design may be required in urban areas to moderate speeds and minimise through traffic penetration. Streetscaping would also assist in ameliorating visual impacts on abutting land uses.

If significant development occurs in the future in rural areas, then it may be appropriate to reclassify these streets as 'major collector' if the catchment size or density increases significantly. Accordingly, allocations should be made in the network planning.

In urban areas, the primary design objective is to maximise safety and amenity for adjacent properties and adjacent activities/users (I.e., pedestrians, cyclists, car parking, children playing). The most important design standard in this regard is the maximum design speed. Travel time efficiency will be compromised over safety and amenity aspects by appropriate subdivision design. Such design includes consideration of the maximum volume (by catchment size), the design speed (by street length) and the travel time efficiency (by connectivity of streets). It is this category of roadway whereby design standards are well defined because of the clear principles set out in such documents as The Model Code for Neighbourhood Design.

In rural areas, the primary design objective is to minimise the cost of roadway provision whilst still maintaining acceptable performance levels (because of the very low volume use). Travel time efficiency will be compromised over safety and amenity aspects. There may be an issue with dust nuisance, which may be one of the factors considered when determining whether the road should be sealed or not. The low traffic volumes anticipated on some rural streets require the need for a single lane cross section alternative, as well as the two-lane form. There may also be a demand for the provision of horse trails within the road verge, and in this case a widened verge may be required to cater for these.

Generally, the maximum traffic volume on unsealed rural roads is 100 vpd.

2. Local streets in commercial and industrial areas (specific criteria)

   Generally, higher traffic volumes can be tolerated in local streets in commercial (including CBD) and industrial areas than can be accepted in residential areas. Fewer lots would be served in commercial and industrial areas by these streets than low density residential areas, due to the high trip generation of the land uses. Significantly higher heavy vehicle proportions and tolerances for environmental factors such as noise would be acceptable on such streets in industrial areas.

(4) Linear Integrated Transport Plans (LITP)

There may be cases where a roadway does not readily fit into any category within the road hierarchy due to incompatibility with the performance criteria. Under these cases, it is recommended that an LITP be developed specifically for the roadway under consideration. For example, with a key public transport corridor such as Ross River Road and Charters Towers Road there is a need to satisfy both the traffic carrying roadway objectives, as well as the access and amenity to adjacent properties objectives. Each LITP will need to assess the roadway under consideration on an individual basis and will therefore have to satisfy individually tailored criteria. Figure SC6.4.5.3 below describes a general methodology for developing an LITP.

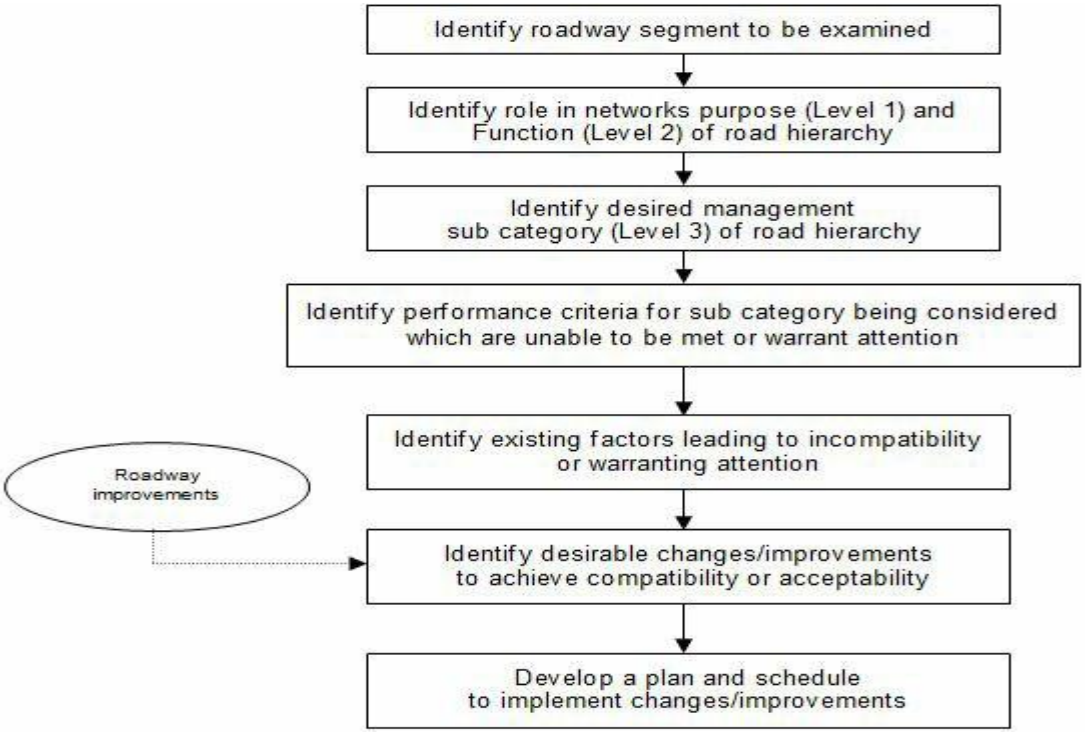


Figure SC6.4.5.3 - Linear Integrated Transport Planning (LITP) Process.

SC6.4.5.2 Traffic impact assessments

(1) Introduction

(a) Overview

A traffic impact assessment (TIA) is a process of compiling and analysing information on the impacts that a specific development proposal is likely to have on the operation of roads and transport networks. The assessment will not only consider general impacts relating to traffic management (road efficiency and safety) but will also consider specific impacts on land use, environment, and all road users, including on road public transport, pedestrians, cyclists, and heavy vehicles.

Developers should refer to the *Guide to Traffic Management* produced by Austroads as a primary reference, and in particular, *Part 12: Integrated Transport Assessments for Developments*. The TIA section has been produced to supplement Part 12 by establishing criteria for low, moderate, and high traffic impact developments, and to supply additional information pertinent to particular land uses, climate, and traffic characteristics in Townsville. If a discrepancy exists between this document and the *Guide to Traffic Management*, this section will prevail.

To add clarity and further guidance developers should also refer to the Townsville City Council TIA Guidelines this document provides in-depth guidance on the requirements of Traffic Impact Assessments and has been prepared to assist Council staff and development applicants to identify the traffic information which is typically needed to support a development application.

Editor's Note - DTMR have published a TIA guideline which applies to State Controlled Roads only, and it does not align with the TCC City Plan and Council's Desired Standards of Service (DSS) and Measures of Effectiveness (MoE) for transport infrastructure. The DTMR TIA guideline is not applicable to Local Government roads.

(b) TIA scope and purpose

(i) TIA purpose

Council requires a TIA in order to:

1. assess the adequacy of the existing or future transportation system to accommodate additional traffic generated by a proposed development, redevelopment, or land use change; and

2. to assist in determining what improvements may be required to transport infrastructure (e.g., roadways, pathways, public transport, and traffic facilities, parking, etc.) to maintain a satisfactory level of service for the Townsville community.

3. within the context of the matters outlined above, the aim of this section is to ensure that:

a) traffic impact assessment of developments is undertaken in a uniform manner leading to consistent treatment of similar developments;

b) the level of impact assessment is appropriate for the level of potential impacts;

c) a road or a road network continues to operate at an agreed level of service following the opening of a development;

d) both "soft" solutions (e.g., road use management such as alternative routes) and "hard" solutions (e.g., changes to infrastructure) are considered when mitigating impacts;

e) the needs of all road users are considered and appropriate facilities (e.g., bicycle lanes, footpaths, bus lanes, intersection widening or upgraded intersection controls) are provided in a timely manner;

f) a development is considered within its proposed environment and not in isolation from nearby features such as intersections, footpaths and other driveways;

g) cumulative impacts on transport networks of other developments in an area or region are considered; and

h) road safety and environmental impacts (both natural and built) are considered.

(ii) TIA scope

A TIA may be required where a development affects the function, safety, and efficiency of the transport network. The requirements for a TIA are outlined in this policy section.

The scope of a TIA will depend on the location, type and size of the development and the ability of the road network to handle traffic generated by the development. Therefore, some developments will require an extensive and detailed TIA, while others will require only a brief TIA.

(c) How to use the TIA Guidelines document

The following steps will guide the applicant in determining the level of TIA required with regard to land use and traffic environment perspectives.

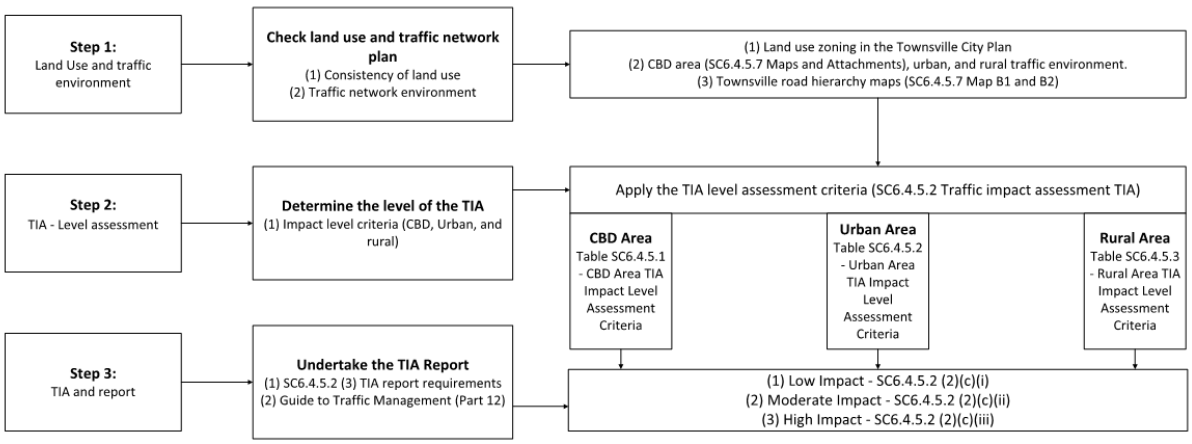


Figure SC6.4.5.4 How to use clause SC6.4.5.2 Traffic Impact Assessment Guidelines

(d) Terminology

AADT	Annual Average Daily Traffic
CBD	Central Business District, click here to see Townsville's CBD Information Sheet
DTMR	Queensland Department of Transport and Main Roads
DoS	Degree of saturation
Inconsistent Development	Development that is not consistent with the planning scheme, or development that is inconsistent as described in Section 650 in the *Planning Act 2016*.
Level of Service (LOS)	A qualitative measure using a sequence of letters from A through F to describe the quality of operational conditions within an intersection, transit, or a roadway link. Refer to the Highway Capacity Manual for details.
LGIP	Local Government Infrastructure Plan
PCE	Passenger Car Equivalent
PCU	Passenger car unit
PT	Public transport
TAIM	Townsville Aimsun Integrated Model
TIA	Traffic impact assessment
Traffic Facility	Roads, streets, bikeways, highways, their networks, terminals, traffic signs, public transport/car park and abutting lands related to all modes of transportation, I.e., people, vehicles, goods.
TDM	Travel Demand Management - the application of strategies and policies to reduce travel demand (specifically that of single occupancy private vehicle), or to redistribute this demand in space or time.
Trip	A single or one direction person or vehicle movement

Trip Generation	The total number of trips measured in trip ends (i.e., trip production or trip attraction) entering and exiting the site for the defined period, e.g., day or hour
VPD	Vehicles per day

(e) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(i) Queensland Government Legislation:

Planning Act 2016

(ii) *Transport Infrastructure Act 1994*Townsville City Council:

TIA Guidelines (refer current version)

Transport and Pathway Demand Rates (refer current version)

(iii) Australian Standards:

AS2890.1 *Parking facilities - Part 1: Off street carparking,*
AS2890.2 *Parking facilities - Part 2: Off street commercial vehicle facilities,*
AS2890.*3* *Parking facilities - Part 3: Bicycle parking facilities,*
AS2890.*5* *Parking facilities - Part 5: On street parking, and;*
AS2890.*6* *Parking facilities - Part 6: Off street parking for people with disabilities).*

(iv) Austroads:

Cycling Aspects of Austroads Guides (refer current version)
Guide to Road Safety (in particular, Part 6) (refer current version)
Guide to Traffic Management (in particular, Part 12) (refer current version)

(v) Department of Transport and Main Roads Queensland:

Manual of Uniform Traffic Control Devices (MUTCD)Road Planning and Design Manual (RPDM)

(vi) Other:

Transportation Research Board, *Highway Capacity Manual (HCM*), (refer current version)

Roads and Maritime Services NSW (RMS), Guide to Traffic Generating Developments (refer current version)

(2) Determining the level of the TIA

(a) Traffic impacts

The scope, intent and degree of traffic impact will vary. This will depend on the land use of the proposed development, direct access locations and current land use zoning.
For example:

(i) development based on the current land use zoning and character of the locality;

(ii) location of the development: CBD, urban, rural area;

(iii) the existing and future planned transport network;

(iv) direct access to the external road hierarchy system;

(v) staging, size and type of the development;

(vi) the traffic environment at the time of the proposal;

(vii) existing approved (but not delivered) development within the area;

(viii) Council's current LGIP for roads and pathways;

(ix) current development applications within the area; and

(x) any strategic planning determining future land uses such as the Townsville State Development Area.

(b) Land use environment

Due to the different desirable service standards in the CBD/Urban and Non-urban areas, Council has different impact assessment thresholds depending on whether the development is in the CBD, urban or rural traffic environments. These areas are defined as follows:

(i) The CBD - (refer to Clause SC6.4.5.7 - Map A); or

(ii) Urban area – with the exception of the CBD, refer to the map in Clause SC6.4.5.7 - Map A; or

(iii) Rural area – areas not in the urban area, or CBD, refer to the map in Clause SC6.4.5.7 - Map A.

These TIA land use traffic environment definitions relate to the character of the land for the purpose of assessing the traffic impacts on the site and the adjacent network.

(c) Three levels of TIA

For each of the development locations identified above, and in conjunction with the defined Townsville road hierarchy system, Clause SC6.4.5.1 Townsville road hierarchy, there are three different levels of traffic impact assessment. The anticipated level of impact will require different methodologies of traffic forecasting and analysis, as described below.

(i) Low impact – low TIA report

The development is likely to have a very minor impact as the land use is consistent with the Townsville City Plan, but a review is still required to ensure potential traffic issues are assessed in terms of traffic safety and amenity issues. A low-level TIA report will generally involve assessment of the proposed property access of the development and comprise of a statement of impact, and a corresponding statement of proposed mitigation measures to ensure the access is safe.

(ii) Moderate impact – moderate TIA report

The development is likely to have a moderate traffic impact on the surrounding existing and future land uses, traffic network and operations. A moderate level TIA Report will be performed using traffic forecasting processes or computerised methods (e.g., Sidra) to estimate and analyse traffic flows on the surrounding road network at predefined time horizons.

(iii) High impact – high TIA report

The development is likely to have a high impact on the surrounding existing and future land uses, traffic network and operations. A high level TIA report will require a comprehensive assessment approach using appropriate traffic modelling software (e.g., Sidra, Aimsun or Emme), which allows the model outputs to be directly comparable against Council's traffic model outputs at predefined time horizons, e.g., 2021, 2026, 2031, 2036 & 2041.

(d) Applying the TIA impact level assessment criteria

Use Tables SC6.4.5.1, SC6.4.5.2 and SC6.4.5.3 whichever is relevant to the location of the development, I.e., CBD, Urban, or Non-urban area, and assess the development against the TIA impact level assessment criteria whilst also considering the following:

(i) the applicant must consider the actual or potential traffic impacts of all land/development under their common ownership or control (for example, by a joint venture agreement), at one location.

Editor's Note - The phrase "at one location" means all adjacent land of the applicant, the property lines of which are contiguous or nearly contiguous at any point, or separated by other land of the applicant, or a public or private street, road, highway, or utility right-of-way or other public or private right-of-way.

Editor's Note - "All land/development" includes existing development and planned/potential development.

(ii) an applicant must not avoid the intent of this policy section, and that of Townsville City Plan, by submitting partial or segmented applications or approval requests for development plans, subdivisions, etc. If the properties will form an integrated or complementary development, Council expects the applicant to submit one consolidated TIA report based on the integrated level of impact;

(iii) if the criteria that apply are spread across two or more impact columns, the highest level of impact will apply. For example, if the development is low for all criteria, except for one criterion that is in the high column, a high level TIA will be required;

(iv) Council may require additional information as part of the traffic impact assessment at the Information and Referral stage of an application for a Development Permit, which will be decided on a case-by-case basis;

(v) if the proposed development land is zoned for rural purposes but the development proposed is an urban land use that will either be surrounded by a rural traffic environment or adjoin an urban area, Table SC6.4.5.2 Urban TIA impact level assessment criteria must be used, rather than Table SC6.4.5.3 Rural area TIA impact level assessment criteria;

(vi) Council may request a more thorough analysis if negative impacts on traffic facilities have been identified, or if particular factors of the development cause concern to the safety, efficiency and operation of the transport network; and

(vii) if the proposed development has roads that are not identified in the Road Hierarchy Map (e.g., in the development of new subdivision plans), a new link(s) road hierarchy in the subjected development area may be proposed by the developer, with Council's agreement.

Editor's Note - If any of the above conditions apply, or more details are required, Council encourages a pre lodgement meeting to be arranged prior to commencing the TIA.

Table SC6.4.5.1 - CBD Area TIA Impact Level Assessment Criteria

Criteria	Impact		
	Low	**Moderate**	**High**
Trip generation	New or additional trip generation in a peak hour of <10 trips directly accessinga street[1].	New or additional trip generation in a peak hour of 10 to 100 trips directly accessing a street. New or additional trip generation in a peak hour <100 trips directly accessing a major collector, sub arterial, arterial, or highway[1].	New or additional trip generation in a peak hour of more than 100 trips.
Commercial vehicles	3 or less new or additional commercial vehicles per day.	More than 3 and up to 100 new or additional commercial vehicles per day.	More than 100 new or additional commercial vehicles per day.
Car parking	An increase or decrease of9 or less on-site car park spaces. Loss of 2 or less line marked on-street carparks and no loss of loading zones.	An increase or decrease of 10 or more on-site car park spaces. Loss of 3 or more line marked on-street carparks, or any loading zones.	
Public transport	No impact on any bus zone or taxi operations.	Relocation of any bus zone or taxi rank. Impacts on the bus interchange or bus routes.	
Transport system	No change to existing transport network operation.	Change to permitted vehicle movements at a T-intersection.	Change of permitted vehicle movements at a crossroads or multiple intersections.

Editor's Note - 1. Refer to Map B1 Townsville Road Hierarchy Map (existing) and Map B2 Townsville Road Hierarchy Map (future).

Table SC6.4.5.2 - Urban Area TIA Impact Level Assessment Criteria

Criteria	Impact		
	Low	**Moderate**	**High**
Trip generation	New or additional trip generation in a peak hour of less than 20 trips directly accessing a street[1].	New or additional trip generation in a peak hour of 20 to 300 trips directly accessing a street. New or additional trip generation to a major collector, sub arterial, arterial, or highway[1].	New or additional trip generation in a peak hour of more than 300 trips directly accessing a road system.
Commercial vehicles	5 or less new or additional commercial vehicles per day in a residential area. Less than 10 new or additional commercial vehicles per day in a non-residential area.	More than 5 and up to 300 new or additional commercial vehicles per day in a residential area. More than 10 and up to 300 new or additional commercial vehicles per day in a non-residential area.	More than 300 new or additional commercial vehicles per day.
Car parking	Increase or decrease of 9 or less on-site car park spaces. Loss of 2 or less line marked on- street carparks or loading zones.	Increase or decrease of 10 or more on-site car park spaces. Loss of between 3 or more line-marked on street carparks or loading zones.	
Public transport	Relocation of any bus zone or taxi rank.	Impacts on the bus interchange or bus routes.	
Transport system	No change to existing transport network operation.	Changes to the connectivity between local streets and collector roads.	Changes to the connectivity between arterial and sub arterial roads.

Editor's Note - 1. Refer to Map B1 Townsville Road Hierarchy Map (existing) and Map B2 Townsville Road Hierarchy Map (future).

Table SC6.4.5.3 - Rural Area TIA Impact Level Assessment Criteria

Criteria	Impact		
	Low	**Moderate**	**High**
Trip generation	New or additional trip generation in a peak hour of less than 30 trips directly accessing a street[1].	New or additional trip generation in a peak hour of 30 to 300 trips directly accessing a street. New or additional trip generation of less than 300 trips directly accessing a sub arterial, arterial, or highway1.	New or additional trip generation in a peak hour of more than 300 trips.
Commercial vehicles	Less than 30 new or additional commercial vehicles per day.	More than 30 and up to 300 new or additional commercial vehicles per day.	More than 300 new or additional commercial vehicles per day.
Public transport	Relocation of any bus zoneor taxi rank.	Impacts on the bus interchange or bus routes.	
Transport system	No change to existing transport network operation.	Changes to the connectivity between local streets and collector roads.	Changes to the connectivity between arterial and sub-arterial roads.

Editor's Note - 1. Refer to Map B1 Townsville Road Hierarchy Map (existing) and Map B2 Townsville Road Hierarchy Map (future).

(e) Collaborative traffic impact assessments

If the anticipated traffic impact is determined to be of moderate or high impact on the existing or future transportation system due to its location, development type, or land use characteristics, the traffic impact assessment may require a more strategic and holistic assessment to be prepared collaboratively with Council and any other relevant stakeholders.

(f) Associated reports

(i) Road safety audit

If the TIA report indicates that significant safety issues may occur, the developer must engage an accredited road safety auditor to undertake an independent Road Safety Audit, in line with the *Guide to Road Safety* Part 6, Austroads. It is not acceptable for the consultant who prepared the TIA report or who undertook any design to mitigate the effects of the development to also undertake the road safety audit.

(ii) Noise

A road noise assessment may be required if there is a forecasted volume that will increase traffic over 3,000 vpd (link traffic) in the subjected TIA study scope, or if noise sensitive receptors are identified. Refer to Section SC6.4.19 Noise and vibration assessment guidelines for more information.

(3) TIA report requirements

The TIA will be used to help evaluate whether the development is appropriate for the site and what type of transportation improvements may be required. The TIA Report should address any traffic issues outlined in this document and the *Guide to Traffic Management Part 12: Integrated Transport Assessments for Developments.*

Additional guidance on TIA Report requirements is provided in the TIA Guideline which provides information about the steps involved in preparing a TIA report to support a development application. The guideline may also be used to help identify measures to mitigate any impacts the development proposal may have on the operation of the road.

The TIA report must identify the type and amount of additional traffic expected to be generated by the proposed development on the adjacent transport network and include recommendations on any site specific and external upgrading or network management works required to cater for short term and long-term traffic and transportation planning.

It is important that early contact be made with the Planning and Development Division of Council during the TIA process. This should commence at the outset and continue as required during the preparation of the TIA. For example, if Council's concerns about access to the Council's Road network are identified early, this may be able to be addressed through minor amendments to the on-site layout of the development. For larger developments, it may be appropriate to consult with Council regarding consideration of the project's scope, methodology and other possible planning consideration during the development of the initial project concept.

(a) General requirements

The TIA Report must demonstrate that the proposed development is consistent with the traffic and transportation aims of the planning scheme for that area. The intent of the TIA is to evaluate worst case traffic scenarios. For example, if several different uses are proposed, the land use with the greatest overall traffic impact must be assumed in the study, unless the applicant specifies the uses for the site.

(i) TIA consultant qualification

A low impact TIA report may generally be prepared by the developer. However, if existing traffic facilities need to be changed, then recommendations for mitigation must be made by a Registered Professional Engineer of Queensland (RPEQ) qualified person at a minimum. The moderate or high impact TIA is to be prepared by an impartial professional traffic/transportation consultant who is appropriately experienced and holds current RPEQ qualification. The document must be certified by the appropriately qualified and experienced RPEQ.

(ii) Report documentation

The TIA Report must fully document the approach, methodology, and assumptions of the analysis. It must clearly explain the reasons for any adjustments to the trip generation rates and assumptions used for trip distribution and assignment. Figures (drawings and maps) are to be used to help illustrate these assumptions. The report must summarise the results of the Level of Service (LOS) calculations in tabular or map form and include figures showing the traffic volumes for the project alone and for each scenario. The report must also include any mitigation measures, appropriately tested by the model. All worksheet and analysis input and output data must be included as appendices to the report, if applicable.

(iii) Impact on other stakeholders

If there are other jurisdictions or stakeholders impacted within the area of influence, for example, DTMR, Queensland Rail (QR), or Bus/taxi companies, the consultant should arrange a scoping meeting with all relevant agencies to discuss the issues. This will provide improved coordination and reduce the potential for later revisions to the TIA.

(iv) Updating an existing TIA

An existing TIA requires updating when the amount or character of traffic is significantly different from an earlier study; for example, changes to the land use, road hierarchy or road networks. Any traffic study may also need to be revised if the study is older than 2 years and Council determines that the existing conditions have changed enough to invalidate the study results or if the initial study assumes an incorrect build out period. A TIA may require updating sooner in rapidly developing areas and not as often in slower developing areas. In these cases, consultation with Council is recommended.

(v) Possible additional requirements
At times, Council may extend the study to additional street segments and/or intersections on the public street system. Council will make this determination based on the scale, location, and/or nature of the proposed development and the condition or state of development of the street network in the vicinity of the site.

(b) Low TIA report

1. Justification for low impact assessment;
2. A brief description of the development in terms of site location, direct site access(es), land use, size and expected year of completion;
3. Analysis/Findings, e.g., impact on existing traffic facilities, heavy vehicles turning path and other safety issues;
4. Recommendation and mitigation; and
5. Appendices if applicable.

(c) Moderate and high TIA reports

Executive Summary

- a brief description of the development (site location, internal layout, all site access(es), land use/size andyear of completion) ;
- a brief overview of trip generation and analysis result (LOS), Degree of Saturation (DoS) and Average Delay;
- parking demand; and
- mitigation plan and conclusion/recommendation.

Editor's Note - Desirably, the executive summary should be no longer than five pages, complete in itself, and not dependent on supplementary data included by reference.

1. Introduction and Summary

1.1 Justification for moderate or high impact assessment

1.2 Study objectives and scope

- Time horizon - the analysis shall consider the following time periods:
  - (a) Year of commencement of the development. (Commencement Year)
  - (b) Year of completion of ultimate buildout of the development. (Completion Year)
  - (c) All TAIM future traffic projection periods between the Commencement Year and the Completion Year. The TAIM future projection periods are 2026, 2031, 2036 and 2041.
  - (d) Period 10 years after the Completion Year
- TIA Area – where:
  - (a) the amount of additional traffic likely to be generated is more than 5% of existing volumes on links and at intersections during a peak hour; or
  - (b) the likely increase in the proportion of heavy vehicle traffic is more than 5% during a peak hour associated with the development.

2. Proposed Development

2.1 Land use and intensity;

2.2 Site plan/layout;

2.3 Phasing and timing; and

2.4 Specific information of the proposed development (operation hours, number of employees, type ofservice vehicles, etc.).

3. Existing Conditions

3.1 Study area land use:

- existing land use/zoning; and
- anticipated future development (background); land use/traffic network.

3.2 Existing traffic analysis:

- roadway system;
- traffic volumes and analysis;
- active mode facilities (public transport stops/route, pathway, bicycle lane, trip end facilities);
- parking (car park type, operation, existing/potential car park demand);
- traffic accident data (traffic safety); and
- other.

4. Traffic Forecasting and Analysis

4.1 Method of projection.

4.2 Background traffic (each horizon year):

- traffic model calibration or validation if applicable; and
- forecasting and analysis.

4.3 Site traffic (each horizon year):

- trip generation;
- trip distribution;
- modal split;
- trip assignment; and
- analysis.

4.4 Summary of analysis (with/without development scenario).

5. Improvement Analysis

5.1 Improvements to accommodate background traffic.

5.2 Additional improvements to accommodate all site traffic.

5.3 Alternative improvement.

5.4 Need for any improvements (e.g., TDM).

5.5 Status of improvements already funded, programmed, or planned.

5.6 Independent road safety audit, if required.

5.7 Summary.

6. Parking

6.1 Method of projections.

6.2 Parking demand forecasting and analysis (including all service vehicles and bikes).

6.3 Site circulation and parking layout (including all service vehicles).

7. Public Transport and Pathway

7.1 Possible/desirable PT system.

7.2 Internal/external pathway network system (type, location).

8. Recommendation

8.1 Site access/circulation plan.

8.2 Roadway improvement:

- On-site;
- Off-site; and
- phasing, if appropriate.

8.3 PT, bicycle, and pathway system.

8.4 Other.
9. Conclusion
10. Special Analysis/Issues (if applicable, refer to Clause SC6.4.5(4) below.
11. RPEQ Certification
Appendices

(4) Essential technical guidance

(a) Existing condition

(i) Traffic count data

Traffic trends and counts data may be available from DTMR and Council. Traffic data must reflectexisting normal conditions and should not be used if more than two years old at the time of the TIA submission or if significant changes have occurred at or near the count location or as otherwise requested by Council. The traffic consultant or the applicant is responsible for providing traffic counts that are not available through DTMR or Council. If requested Council will provide TAIM future year traffic flow projections for year 2026, 2031, 2036 and 2041. These projections are updated annually and take account of the most recent approved LGIP.

Editor's Note - TAIM data is available in TownsvilleMAPS

(ii) Traffic accident and safety

Accident data is available from the State traffic accident reporting system and can be obtained through data analysis at the Queensland Department of Transport and Main Roads. Accident data requests should be made as early as possible to enable the information to be provided in a timely manner.

(b) Traffic forecasting and analysis

(i) Townsville Aimsun Integrated Model (TAIM)

The TAIM is a city-wide mesoscopic model and is Council's primary planning tool for the analysis of proposed improvement options, upgrades, and interventions on the road network to support growth identified in the Local Government Infrastructure Plan (LGIP).

The TAIM is calibrated annually against traffic signal information provided by DTMR and provides detailed traffic flow information across the entire city for the calibration year and future year projections in 2026, 2031, 2036 and 2041.

Upon request, or following a pre lodgement meeting agreement, TAIM and future demographic data are available to use under license among Council/DTMR and the applicant. Also, depending on the process of Council/DTMR traffic model development, meso/micro simulation models for other areas will be available, including various Aimsum subnetwork microsimulation models which have been integrated within the TAIM. Council encourages the use of the output of these models, as they have been developed for the LGIP and reflect the planned future network structure.

All traffic modelling input and output data produced by the applicant should be calibrated and validated at the time of the assessment prior to using the data and details of this process are required to be included in the report. It should be acknowledged that TAIM, especially, is intended for use with high level or complex traffic network modelling and is

not designed for small size or individual lots of development and other traffic modelling software such as Sidra may be more appropriate considering the scale of the proposed development. It is important to apply the correct level of traffic modelling work/methodology to forecast the traffic demand associated with the development.

Council retains intellectual proper

ty ownership rights to the latest data for Council purposes. Applicant must ensure that any consultants engaged to undertake this work are aware of this stipulation.

Any updated or developed input/output traffic modelling data as part of the TIA study, must be submitted. If the applicant intends to develop new traffic modelling as part of the TIA report, Council encourages the use of the same platform of traffic modelling, I.e., Sidra Intersection and Aimsun. If the applicant uses an alternative equivalent traffic model, this must be agreed to by Council prior to the TIA commencing. The agreement will cover issues such as network structure, demographic data, and methodology.

(ii) Trip generation rates

The trip generation rates for the residential component of dwellings are 8 VPD per dwelling in nonurban areas and 10 VPD per dwelling in CBD/Urban areas unless actual survey data is available. In the same manner, all considered trip generation rate data must be provided in the TIA Report as source or reference data. Consideration must also be given for other ancillary uses proposed on the land.

In the absence of specified trip generation rates within Council documentation including the Transport and Pathway Demand Rates (refer current version), the DTMR's *Guide to Traffic Impact Assessment*, December 2018 and *Road Planning and Design Manual* must be used.

(c) Traffic analysis performance criteria

The results of the traffic analysis must be compared using the Measure of Effectiveness (MOE), as set out inTable SC6.4.5.4 below.

Table SC6.4.5.4 - MOE Based on the Traffic Characteristics and Type

Facility	Type	Measure of effectiveness (MOE)
Intersections	Un-signalized or prioritised control	Average delay (seconds per vehicle) Delay to critical movements (seconds) Degree of Saturation (DOS) Queue length for critical movements (metres or vehicles)
	Traffic signals	Average delay (seconds per vehicle) Delay to critical movements (seconds) Degree of Saturation (DOS) Queue length for critical movements (metres or vehicles)
	Roundabouts	Average delay (seconds per vehicle) Delay to critical movements (seconds) Degree of Saturation (DOS) Queue length for critical movements (metres or vehicles)
Interrupted flow, e.g., Urban/CBD network		Average travel speed (km/h) Volume/Capacity ratio
Uninterrupted flow, e.g., Non-urban/highway network		Density (PCU/km/lane) Volume/Capacity ratio

Two lane uninterrupted flow, e.g., Non-urban/highway network	Average travel speed (km/h) Volume/Capacity ratio
Pedestrian	Space (m^2/person) in queuing area Speed (person/min/m) in walkway
Transit	Headway (minutes or veh/hr) Passenger loading (m^2/person) Reliability (%)

Source: *Transportation Research Board, Highway Capacity Manual,* 2010.

The type and level of analysis and evaluation will include documentation of LOS for intersections. A saturation flow rate and all parameters for analysis should be considered in accordance with the SIDRA Intersection user guide and default parameters unless field measurements at the study area would indicate a more appropriate value. In this case, all source or reference data must be provided in the TIA Report.

(d) Conversion of vehicle numbers to passenger car equivalents (PCE)

Table SC6.4.5.5 shows the conversion of vehicles (as classified by Austroads) to comparative number of passenger car equivalent (PCE) for the determination of trip generation, intersection capacity and LOS analysis.

Table SC6.4.5.5 - Calculating Passenger Car Equivalent (PCE)

Austroads (*Guide to Traffic Management Part 12)* Vehicles Classifications	**Passenger Car Equivalent (PCE)**
Classes 1 to 2 i.e., short vehicles	1 PCU
Classes 3 to 5 i.e., light to medium trucks	2 PCU
Classes 6 to 9 i.e., heavy trucks	3 PCU
Classes 10 to 12 i.e., B-doubles, Triple Road Train	5 PCU

(e) Desirable service standards for links

According to the given MOE in Table SC6.4.5.4, the threshold for acceptable operation is the upper limit of LOS D' for CBD/urban roads and upper limit of LOS 'C' for rural roads. Refer to the table SC6.4.5.6 below:

Table SC6.4.5.6 - Maximum Volume to Capacity Ratios for the Road Network

Infrastructure item	**Maximum volume to capacity ratio by land use**	
	Residential (Urban)	**Non-residential (Rural)**
Arterial	0.9 (Upper limit LoS D)	0.7 (Upper Limit LoS C)
Sub arterial	0.9 (Upper limit LoS D)	0.7 (Upper Limit LoS C)
Major collector	0.9 (Upper limit LoS D)	0.7 (Upper Limit LoS C)
Arterial (state-controlled)	0.95 (Mid LoS E)	0.95 (Mid LoS E)

(f) Desirable service standards for intersection/access operationi

Any intersection analysis should demonstrate that the delays would be less than that shown in Table SC6.4.5.7 up to the ten-year horizon after completion of the development. If they are not, improvements to the intersection layout and/or changes to the proper method of control must be assessed.

Table SC6.4.5.7 - Desirable Service Standard for Intersection/Access Operation

Road network item	Maximum degree of saturation	
Traffic signals	0.9 (55 second average delay)	
Roundabout	0.85 (35 seconds average delay)	
Priority controlled	0.8 (35 seconds average delay)	
Traffic signals (state-controlled)	0.9 (55 seconds average delay)	

(g) Parking

Adequate parking must be provided to meet site generated demands and be consistent with the most current version of the references. If the consultant conducts a survey, or uses other source data, the car parking demand must be compared against Clauses SC6.4.5.4 Car parking and SC6.4.5.3 Public transport facilities guidelines, with the greater car parking demand being applied. In considering car parking for a specific type of development, the consultant must use data from at least two different sources, or use the data compiled from both a survey and one source data, with the greater level of car parking demand being applied. All surveys or source data must be from a similar land use to the proposed development.

Specific dimensions, parking angles, and parking ratio requirements are addressed in the planning scheme and planning scheme policies (Clauses SC6.4.5.4 Car parking and SC6.4.5.3 Public transport facilities guidelines), and Austroads *Cycling Aspects of Austroads Guides.*

Editor's Note - From time to time, Council may introduce incentive programmes that impact on parking requirements. Information on any incentive programmes is available from Council.

(h) Special analysis/issues

Council may request specific traffic analyses relevant to the proposed development. These include details about access management, a TDM plan, cut through traffic and residential quality of life analysis, truck estimates, Intelligent Transport System (ITS) strategies, pedestrian/bicycle safety, signage and access, safe routes to school, emergency routes, etc.

(i) Mitigation plans and conclusions

All mitigation plans identified as necessary to serve the proposed development should be listed in the TIA report, along with the timing of implementation.

During construction, private approaches should be located, and configured in such a manner as to avoid disruption to the public street system. If changes to traffic controls are proposed, warrants should be reviewed and documented in the report. Reference should also be made to Section SC6.4.6 Road works and traffic control, relating to the control of traffic.

The TIA report must provide a preliminary overall master plan map, and recommendations, and include the status (funded, programmed, or unfunded) of any existing traffic upgrading plans.

(j) TIA report appendices

The following appendices should be included in the TIA Report submitted to Council:

(i) raw traffic count data-average daily and peak hour turning movement traffic count data collected and/or obtained from other sources;

(ii) printouts of analysis results input/output; e.g., SIDRA;

(iii) all traffic network modelling work as an electronic copy - e.g., network attribute data, demographic data, and other relevant files (macro, excel etc);

(iv) photographs of the site;

(v) additional tables or figures not included in the TIA report;

(vi) description of methodologies and assumptions used in analysis;

(vii) worksheets used in analysis - I.e., signal warrant, LOS, queuing, capacity etc;

(viii) notes on the outcomes of any meetings in regard to the development; and

(ix) variations to the standard report (template) – RPEQ certification of any non-conformances with requirements.

SC6.4.5.3 Public transport facilities

(1) Introduction

(a) Purpose

This section provides advice, guidance, and standards with respect to public transport facilities to support an integrated safe, efficient, and sustainable transport network.

(b) Scope

This section includes the consideration ofpublic transport infrastructure integration with the road network and for the provision of facilities both on-road and off-road;

(c) Relationship of codes

(i) Where a development application is assessable against Part 9.3.5 Transport impact access and parking code, the application of this section will assist the applicant to address the performance outcomes and acceptable solutions of that code as it contains advice, guidelines, and standards.

(ii) This section can also be used as guidance and advice for other assessment criteria and codes including Part 9.3.4 Reconfiguring a lot code, Part 9.3.6 Works code and Part 9.3.3 Landscape code.

(d) Reference and source documents:

The reference and source documents that must be read in conjunction with this section are as follow:

(i) Townsville City Plan planning scheme policy sections:

Section SC6.4.3 Standard drawings

Section SC6.4.4 Active transport infrastructure

Section SC6.4.6 Road works and traffic control

Section SC6.4.12 Landscaping and open space

Section SC6.4.14 Public utilities and building over/near services

Section SC6.4.17 Structures

Section SC6.4.20 Footpath treatment and outdoor dining design,

Section SC6.10 Parking rates

(ii) Australian Standards:

AS 2890 *Parking Facilities Set*

AS1428 *Design for Access and Mobility Set*

(iii) Austroads Guides:

Austroads Design Vehicles & Turning Path Templates

Guideto Road Design – set

Guide to Traffic Management – set

(iv) Department of Transport and Main Roads Queensland:

Manual of Uniform Traffic Control Devices (MUTCD)

Road Planning and Design Manual (RPDM)

Transport Planning and Coordination Regulation 2005

Planning for Safe Transport Infrastructure at Schools, (refer current version)

Public Transport Infrastructure Manual (PTIM) *TransLink Division*

(v) Other:

Australian Government	*Disability Standards for Accessible Public Transport (Refer current version)*(DSAPT)
Australian Government	*Disability (Access to Premises - Buildings) Standards 2010 Premises Standards*

Disability Discrimination Act 1992 (DDA)

Australian Building Codes Board	*National Construction Code (NCC)*
Queensland Government	*Crime Prevention through Environmental Design: Guidelines for Queensland* (CPTED)

(2) Public transport

(a) Public transport provision

(i) The need for public transport provision should be assessed for any new residential reconfiguration of a lot development or major development. As part of this needs assessment consideration must be given to upgrading the existing road network, PT service, and facilities in accordance with the current and future demands.

(ii) The developer is required to consult with Translink on existing PT services and any proposals to change the locations of existing or proposed bus stops.

(iii) The developer is to provide Council with a comprehensive assessment of the current and projected public transport demands and to advise of any new facility or change to existing PT facility required by the proposed development. This assessment is to be in the form of a detailed transport infrastructure assessment (TIA) and will include the particulars of any proposed upgrade to the existing transport services, routes and systems that adjoin the proposed project development. Taxi services are also considered a form of public transport and are to be considered in the model assessment

of the site (if applicable). Taxi services should be integrated with other transport node facilities wherever it is possible to do so.

(b) Major development

(i) Major developments include schools, hospitals, event venues, shopping or employment centres, and high-density residential developments, aged care facilities, medical centres, and retirement villages.

(ii) These developments typically have high levels of public transport demand. Design of major developments should include consideration to the provision and integration of public transport services on or near the development site. Facilities should be designed to be convenient and encourage public transport, walking or cycling.

(iii) Major developments which will generate high demands for public transport services may require a modal interchange which includes provision for taxis. A setback from the main road/route should be provided to ensure the site is serviced safely and directly for these facilities. Developments should present an active frontage to the transport interchange facility with wide footpaths and no conflicting vehicular accesses to ensure pedestrian and user safety is a priority.

(3) Public transport information and guidelines (planning and design)

(a) For new residential reconfiguration of a lot development or major development the developer is to prepare a draft public transport master plan for the proposed development. The public transport master plan will identify (as a minimum):

(i) proposed residential development lot sizes and densities;

(ii) any proposed commercial development, including approx. GFA;

(iii) any proposed education facility or other significant bus passenger service attractor (e.g., retirement village, hospital etc.);

(iv) location, type, and hierarchy of open spaces areas;

(v) the proposed road hierarchy for the development, and how it connects to the existing road network;

(vi) the location of the proposed active transport network facilities (pathways and cycleways) throughout the development, and how they connect to the existing, and future, road network;

(vii) the route of all existing passenger bus routes within 1 km of the proposed development and through the development; and

(viii) the public transport master plan must be submitted for the approval of Council.

(b) As part of the information required in obtaining a development approval, the developer must provide evidence of feedback from consultation with all the following stakeholders on the feasibility of potential passenger bus service route/major bus corridor through the new development:

(i) Department of Transport and Main Roads (TransLink Division);

(ii) Department of Transport and Main Roads (Northern Region);

(iii) local contract bus operator (Sunbus Townsville) and if necessary, school bus operator/s;

(iv) local taxi operators (13 cabs Australia, Checker Cabs); and

(v) Council's Infrastructure Services Division.

(c) The outcome from the engagement with the stakeholders will be:

(i) advice if the development is ever likely to be serviced by a passenger bus service or school bus service;

(ii) agreement of the most likely route(s) through, or servicing, the proposed development;

(iii) the need and likely location of bus stops necessary to service the development;

(iv) general agreement on the location and route of pathways servicing any future bus service along the agreed bus routes;

(v) advice on the need for any bus stop to be constructed as part of any proposed commercial centre, and the likely required standard of the facility; and

(vi) the need for the developer to provide any other additional facilities to ensure the operation of an efficient and effective public transport services, including taxis. This may include required intersection treatment, bus stop locations, the possibility of joint use bus stops and the like.

(d) Public transport facility design guidance is discussed in detail in the Public Transport Infrastructure Manual (PTIM), specific Townsville City Council requirements are:

(i) Bus routes are preferred along the shortest route, or up to 120% of the shortest length, between destinations.

(ii) Preferred bus routes are generally located along arterial, sub arterial and major collector roads. Passenger bus services will not service an estate with only one entry/exit; as existing passengers are taken on a tourist trip through the estate without getting closer to their destination.

(iii) The main criteria in determining the location of a bus route is that no more than 10% of residents should have to walk more than 400m to catch a bus within the urban area. Council may request a public transport route plan as part of the development to demonstrate this requirement. Bus services operate to a published timetable, so routes with minimal delays at intersections are preferred; routes with multiple traffic signals can cause delays to timetable service.

(iv) To minimise resident objection to the placement of bus stops in front of houses, any public open space (e.g., drainage or recreational reserve) should be considered to accommodate a bus stop. This is particularly pertinent if the public open space contains a pathway. Other options include high density residential or commercial developments where off-street / on-site parking is a component of the development. It is most desirable to establish the location of future bus stops during the design process to ensure that future development proposals recognise the implications of this infrastructure and its location. A layout plan showing the proposed locations must be submitted for the approval of Council.

(v) New bus stops will be one of four standards:

1. minimum boarding point bus stop sign with timetable displays (TDC), platform with tactile ground surface indicators (TGSI); or
2. regular stop bus stop sign, with TDC, platform with (TGSI) and seat (inbound definite, outbound optional); or
3. intermediate stop bus stop sign, with TDC, platform with TGSI and shelter with seat (inbound definite, outbound optional) – site specific; or
4. premium stop generally limited to high route volume locations and stops at

shopping centres. As per intermediate stop, with greater care to the infrastructure finish standards and capacity requirements.

(vi) New regular and intermediate bus stops are to be designed and constructed in accordance with Council's standard drawings (Section SC6.4.3 Standard drawings) and meeting disability compliance standards (DSAPT and Premises Standards) or set out under the *Disability Discrimination Act 1992*.

(vii) Bus stops should be located where there is no conflict with the location of (drainage pits/surrounds, poles, items of street furniture), street trees or driveways to properties. Drainage pits must be located away from the bus platform (concrete slab) to avoid creating a safety hazard. They are generally located in residential areas at side boundaries of adjoining properties to avoid resident concerns about loss of amenity and view, by having a stop directly in front of their property. Bus stops are generally preferred to include a location near an intersection to pick up passenger from the side streets; however, it should not impact on intersection functionality or operation. Bus stops are preferred on the departure side of intersections and major driveways.

(viii) Bus stop facilities within private property must comply with the DSAPT and associated guidelines, the Premises Standards or under the DDA. The developer must provide documentation to demonstrate consultation with the Department of Transport and Main Roads and the impacted bus operators about future passenger bus routes servicing the facility during the design phase. A layout plan showing the proposed location with details must be submitted for the approval of Council.

(ix) Pathways servicing bus stops must form an integral part of an active transport pathway network servicing the entire estate, and not just be a short connection to the corner of the nearest street.

(x) The in-bound and out-bound bus stops along the same route should be in proximity to each other on opposite sides of the street, although the bus stops do not have to be directly opposite each other (especially at intersections).

(xi) All new bus stops being constructed must comply with the requirements of the DSAPT and associated guidelines (including any bus stop relocations), the Premises Standards or under the DDA. It must also have a clear continuous accessible path of travel; that is be serviced by a smooth, level, and impervious surface with a 1.5 m minimum width. One aspect of compliance is that the preferred crossfall on the bus stop platform slab is 2%, and absolute maximum of 2.5%. School bus stops (mostly in a rural environment) do not need to comply with this requirement at this time.

(xii) A standard bus stop is 3 m wide by 12 m long, (see minimum width. One aspect of compliance is that the preferred crossfall on the bus stop platform slab is 2%, and absolute maximum of 2.5%. School bus stops (mostly in a rural environment) do not need to comply with this requirement at this time.) plus entry/exit tapers on roads with a posted speed limit of 60 km/h or less. A bus bay (with associated parking restrictions) is approximately 42 m long (allowing for a 15 m in taper and 15 m egress taper). These dimensions can vary and may severely impact on the required street width (especially where no indents are to be provided), driveway access to properties and the availability of visitor/customer parking.

(xiii) Consideration must be also given as to how elderly and young passengers (especially school children) will safely cross the street to access the bus service. This may require the installation of a nearby refuge crossing or traffic signals, or similar measures.

(xiv) Bus routes should avoid having vertical or horizontal deflection traffic calming measures along the route. Any vertical deflection devices that are to be used by a bus service intended to operate in high pedestrian environment must be flattop road humps. Council may support a bus route where speed cushions are installed.

(xv) Any roundabout along a bus route must be able to accommodate a turning bus without mounting the kerb and channel or encroaching onto any landscaping on the centre island, including during a right-hand turn. Consideration must be also given as to how elderly and young passengers (especially school children) will safely cross the street to access the bus service. This may require the installation of a nearby refuge crossing or traffic signals.

(4) Consultation guidelines

The following sets out the requirements for authority consultation for public transport, taxis, buses, and school buses.

(a) Taxi service operations

Contact the Department of Transport and Main Roads Northern Region and the local taxi operators about taxi service operations.

(b) Taxi rank infrastructure

(i) Contact Townsville City Council about existing and proposed taxi rank infrastructure in the area.

(ii) Any existing or new infrastructure undergoing substantial refurbishment or alteration must comply with the Disability Standards for *Accessible Public Transport 2002* and associated guidelines, the Premises Standards or under the *Disability Discrimination Act 1992* (DDA), and be in accordance with Section SC6.4.3 Standard drawings at the time of the re furnishment or alteration. It must have clear continuous accessible path of travel; that is, be serviced by a smooth, level, and impervious surface.

(c) Bus routes

(i) Contact the Department of Transport and Main Roads Northern Region and the local bus operator (service contract holder) about current and future passenger bus routes.

(ii) The developer will need to be aware of, and make provision for, future bus routes as determined through the consultation process with DTMR, Council and the local bus operators.

(d) Bus stop infrastructure

(i) Contact Townsville City Council in the first instance about existing and proposed bus stop infrastructure on the road reserve, then contact the Department of Transport and Main Roads about interchange type infrastructure.

(ii) Any existing or new infrastructure undergoing substantial refurbishment or alteration must comply with the DSAPT and guidelines, the Premises Standards or under the DDA, and be in accordance with Section SC6.4.3 Standard drawings at the time of the refurbishment or alteration.

(iii) Townsville City Council has prepared standard drawings for bus stop infrastructure. Also, new or relocated bus stops must have the specified branding (J Pole/ Blade signing), an identifying name approved by Council's Technical Services Unit and be in accordance with Section SC6.4.3 Standard drawings and the bus stop position identified by easting and northing.

(e) School bus services

Contact the Department of Transport and Main Roads Northern Region and the local bus operator about currentand future school bus route operations.

(f) School bus infrastructure

Contact Townsville City Council about existing and proposed school bus stop infrastructure on the roadreserve.

(g) Intercity buses (long distance)

Contact Townsville City Council about existing and proposed intercity bus stop infrastructure on the road reserve, but also contact the Department of Transport and Main Roads TransLink Division about bus stop infrastructure and bus stop operations.

SC6.4.5.4 Car parking

(1) Introduction

(a) Purpose

This section provides advice, guidance, and standards with respect to car parking facilities to support an integrated safe, efficient, and sustainable transport network.

(b) Scope

This section includes the consideration of:

(i) parking facilities integration with the road network including consideration of parking both on-site (outside of the road reserve) and on-road; and

(ii) servicing provision of appropriate loading/unloading facilities and manoeuvring areas both on-road and on-site and provision for emergency and service vehicle access.

(c) Relationship of codes

(i) Where a development application is assessable against Part 9.3.5 Transport impact, access and parking code, the application of this section will assist the applicant to address the performance outcomes and acceptable solutions of that code as it contains advice, guidelines, and standards.

(ii) This section can also be used as guidance and advice for other assessment criteria and codes including Part 9.3.4 Reconfiguring a lot code, Part 9.3.6 Works code and Part 9.3.3 Landscape code.

(d) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(i) Townsville City Plan planning scheme policy sections:

Section SC6.4.3 Standard drawings

Section SC6.4.4 Active transport infrastructure

Section SC6.4.6 Roadworks and traffic control

Section SC6.4.12 Landscaping and open space

Section SC6.4.14 Public utilities and building over/near services

Section SC6.4.17 Structures

Section SC6.4.20 Footpath treatment and outdoor dining design,

Section SC6.10 Parking rates planning scheme policy

(ii) Australian Standards:

AS2890 *Parking Facilities* - Set

AS1428 *Design for Access and Mobility* - Set

(iii) Austroads Guides:

Austroads Design Vehicles and Turning Path Templates

Guide to Road Design – Set

Guide to Traffic Management – Set

(iv) Department of Transport and Main Roads Queensland:

Manual of Uniform Traffic Control Devices (MUTCD)

Road Planning and Design Manual (RPDM)

Transport Planning and Coordination Regulation 2005

Planning for Safe Transport Infrastructure at Schools, (Refer to current version)

Public Transport Infrastructure Manual (PTIM) - TransLink Division

(v) Other:

Australian Government	*Disability Standards for Accessible Public Transport 2002* (DSAPT)
Australian Government	*Disability (Access to Premises - Buildings) Standards Premises Standards (Refer to current version)*

Disability Discrimination Act 1992 (DDA)

Australian Building Codes Board	*National Construction Code (NCC)*
Queensland Government	*Crime Prevention through Environmental Design: Guidelines for Queensland* (CPTED)

(2) Parking

(a) Parking on-site

(i) On-site parking must be provided to meet the demands of the development, including open space areas and meet the minimum rates set out in Section SC6.10 Parking rates planning scheme policy (Table SC6.10.2.1 Parking rates). Section SC6.4.12 Landscaping and open space policy provides further direction on the provision of parking to service open space areas.

(ii) Any associated change to existing on street parking controls or loading bays must also be appropriately addressed by the development. A parking layout plan must be submitted for the approval of Council which accounts for the loss of any existing on street parking bays to accommodate loading zones, bus stops, taxi ranks or driveways required for the orderly operation of the proposed development.

(iii) The design of the car park, its accesses and associated aisles are to be in accordance with AS/NZS 2890.

(iv) Accesses must be designed in accordance with Section SC6.4.5, Clause SC6.4.5.5 Driveways below and Section SC6.4.3 Standard drawings.

(v) Where car parks are accessed through security barriers, doors or lifts, sufficient queuing space must be provided on site to accommodate all expected traffic during peak demand periods.

(vi) Access ways adjacent to car park entries should have sufficient internal queuing space to prevent vehicles queuing into the street whilst waiting for a vehicle to manoeuvre into or out of a parking bay.

(vii) Turning paths for cars and service vehicles must be provided in accordance with the Austroads' Design Vehicles and Turning Path Template Guide. Council may require the preparation of plans that demonstrate adequate turning paths in accordance with Austroads.

(viii) Pavements must be sealed, line marked and constructed to a design appropriate for the anticipated vehicular loading.

(ix) Parking for schools must comply with Planning for Safe Transport Infrastructure at Schools.

(x) Car parks must provide adequate manoeuvring and parking areas for the type of vehicles and functions served. They must be clearly signed and marked, accessible, safe and contribute aesthetically to the internal user and the streetscape character. Landscaping associated with parking facilities must be in accordance with Part 9.3.3 Landscape code and with Section SC6.4.12 Landscaping and open space.

(xi) All car parking spaces for people with a disability must be designed in accordance with AS 2890.6. Car parking spaces for people with a disability are to be largely located as close as possible to the point of entry into the proposed development. Provision for off-site parking may also be required. In this circumstance, the ability to safely provide this within the road reserve must also be demonstrated.

(xii) Pedestrian access and movements within the car park should be separate from vehicular access and should be appropriately marked and signed and accessible by all abilities.

(xiii) Carwash bays must be clearly marked and signed, even though this may also be utilised as a visitor space. Run off from the car washing bay must not discharge into the stormwater drainage system. Stormwater quality treatment for the car park run-off must be considered as part of the treatment for the whole site.

(xiv) Bicycle storage racks must be provided on-site in accordance with AS 2890.3.

(xv) Provision of lighting in off street carparks is to comply with AS1158.

(b) Parking on-street

(i) The design of on-street parking is to be in accordance with AS/NZS2890.5.

(ii) If a new driveway is to be constructed in a street where parallel parking exists and it is necessary to remove parking bays and install a driveway, the remaining parallel parking bays must be remarked such that at least 3 m is left clear from the edge of the driveway on the approach side of the driveway and at least 2 m is left clear on the other side of the driveway. Remarking of the remaining on street bays and any relocation/alteration to parking control signs must be undertaken as part of this works. A parking layout plan must be submitted for the approval of Council.

(iii) Where a loading zone, bus stop or a taxi zone is required as a result of a development, the infrastructure, line marking, and signage must be provided by the developer. The design must be submitted to Council for approval prior to works commencing on site.

Editor's Note - A loss of parking may occur due to access requirements by Queensland Fire and Rescue at hydrant boosters.

(3) Servicing

(a) The development must make adequate onsite provision for the access, loading, unloading, and manoeuvring of service vehicles sufficient to cater for the demand generated by the development and the service vehicles utilised. The design must ensure the safety of other vehicles, pedestrians and cyclists and that other users are not inconvenienced. The design must also consider any adverse effect on the amenity of the development and its surroundings including the effects of visual amenity, operating hours, the generation of noise, odour and dust, and proximity to sensitive uses. The design of this layout must conform to AS 2890.2.

(b) The development must make adequate internal provision within the site to allow all vehicles servicing the development to enter and exit the site in a forward direction only. In demonstration of this requirement, Council may request a turning path plan to show how the intended vehicle types that are expected to use the development can enter and exit the site in a forward gear.

(c) Entry of B-double or other multi-combination vehicles servicing a proposed development will be considered by Council on a case-by-case basis. In making this assessment, Council will:

(i) assess the status of the roadway fronting the development;

(ii) consider the zoning of the adjoining properties;

(iii) design particulars of the vehicle entry and exit layout – with particular attention to the footway/verge crossing details;

(iv) the internal manoeuvring capacity of the development site; and

(v) safety implications to the public and other road users.

Editor's Note - Road manager consent is required for travel on the road network. Applications are coordinated by the National Heavy Vehicle Regulator.

(d) Provision for waste collection must be in accordance with Section SC6.4.22 Waste management.

SC6.4.5.5 Driveways

(1) Introduction

This section details standards and provides advice and guidelines to assist in the design and construction of driveways (domestic, industrial, commercial, and rural property access), location, and other aspects in relation to theirimpact on pedestrians, cyclists, other vehicles, stormwater, and neighbours.

Editor's Note - the technical details depicted and described in Section SC6.4.3 Standard drawings must be adhered to.

(a) Reference and source documents
Reference and source documents that must be read in conjunction with this section are as follow:

(i) SC6.4 Development manual planning scheme policy sections:

SC6.4.3 Standard drawings:

SD-006 *Typical Road Cross Sections – B - Double Turning Path and Access Plan Example Drawing*

SD-020 *Concrete kerbing*

SD-025 *Kerb Ramp*

SD-030 *Driveway access urban residential properties*

SD-031 *Driveway access industrial properties*

SD-032 *Driveway crossovers urban residential properties*

SD-090 *Driveway Access Rural Properties Type 1 - Access With Invert Slab H<300mm*

SD-091 *Driveway Access Rural Properties Type 2 - Conc. Access With Culvert Cast Insitu With GrateH≥300mm*

SD-092 *Driveway Access Rural Properties Type 3 - Gravel Access With Culvert Cast Insitu WithGrate H≥300mm*

SD-093 *Driveway Access Rural Properties Type 4 - Conc. Access With Culvert Inverted Pre-cast BoxCulvert H≥325mm*

SD-094 *Driveway Access Rural Properties Type 5 - Gravel Access With Culvert Inverted Pre-cast Box Culvert H≥325mm*

SD-095 *Driveway Access Rural Properties Type 6 – Access With Culvert Cast Insitu H≥450mm*

SD-096 *Driveway Access Rural Properties Type 7 - Conc. Access With Culvert 535mm<H<685mm*

SD-097 *Driveway Access Rural Properties Type 8 - Gravel Access With Culvert 535mm<H<685mm*

(ii) Townsville City Council:

Local Law No. 1 *(Administration) 2011*

Local Law No. 4 *(Local Government Controlled Areas, Facilities and Roads) 2011*

Subordinate Local Law No. 1.1 *(Alteration or Improvement to Local Government Controlled Areas and Roads) 2011*

Subordinate Local Law No. 1.15 *(Carrying Out Works on a Road or Interfering with a Road or itsOperation) 2011*

(iii) Australian Standards:
AS2890.1 *Parking facilities - Part 1: Off street carparking*
Queensland Development Code:

NMP1.1 Driveways

(iv) Austroads:

Guide to Road Design: Part 3 – Geometric Design
Guide to Road Design: Part 4 - Intersections and Crossing - General

(b) Terminology

Driveway	Unless stated otherwise, the term driveway in this section refers to the access between the road and the property boundary; I.e., on Council-controlled land. This section does not provide advice on the vehicular movement area within the private property.

Editor's Note - Types of driveways include:

New driveways	Must comply with the requirements of Council's standard drawings. Works are at the property owner's cost and to the satisfaction of Council.
Non-conforming driveways	Existing driveways which do not meet Council requirements that must be reassessed in the event of a redevelopment of the site. Works are at the property owner's cost and to the satisfaction of Council.
Redundant driveways	Existing driveways that are no longer in use and must be removed. Works are at the property owner's cost and to the satisfaction of Council.
Unapproved driveways	Driveways that have not been approved by Council. Council may require these driveways to be removed or modified. Such works are at the property owner's cost and to the satisfaction of Council.
Modified driveways	Modifications to existing driveways must comply with the requirements of Council's standard drawings. Works are at the property owner's cost and to the satisfaction of Council.
Temporary driveways	Temporary property access during construction. Works are at the property owner's cost and to the satisfaction of Council.
Crossover	The part of a driveway that is located crossing the kerb and channel.
Local Road	A road under the control of a local government.
Property owner	Entity, applicant, developer, or owner/s who is responsible for the driveway at the time.
Queuing area	The area of a circulation roadway between the property boundary and the vehicle control point, available for the queuing of vehicles.
Regulated parking	Parking controlled by traffic signs and/or line marking.
Rural area	An area where the urban criteria are not met as specified in the Townsville City Plan.
Road corridor permit	A permit issued by the Department of Transport and Main Roads authorising works on a State Controlled Road.
Road works permit	A permit issued by Council authorising works within the road reserve on a Local Road; the area of land under the Council's control, dedicated, notified, or declared to be a road for public use.
Sight stopping distance	Means the distance to enable a normally alert driver, travelling at the design speed on wet pavement, to perceive, react and brake to a stop before reaching a hazard on the road ahead. Refer to the Austroads *Guide to Road Design Part 3 – Geometric Design*.
State controlled road	Means a road under the control of the Department of Transport and Main Roads, including national highways.
Urban area	An area where the urban criteria are met in accordance with Clause SC6.4.5.1.

(2) Responsibility

(a) The driveway is the responsibility of the property owner to construct and maintain. A road works permit isrequired for all works within the road reserve under Council control.

(b) Costs

The property owner is responsible for the cost to:

(i) prepare and obtain the appropriate permit(s);

(ii) design and construct the driveway and associated works; and

(iii) maintain the driveway.

(3) Location

The location and layout of a driveway must consider the type of frontage road, land use of the property, and the type and volume of vehicles likely to use the access. It must be located to avoid being a hazard to any pedestrian and cyclist, through movement of traffic, and to minimise damage to the verge and vegetation/ landscaping. A separate, clearly distinguishable access for pedestrians and cyclists is to be provided.

The property owner must ensure that there are no impacts on stormwater, upstream or downstream, due to the driveway (refer to Section SC6.4.9 Stormwater quantity) being constructed.

Rural driveway location and layout must also consider the through traffic volume, turning volume, vehicle type, speed environment, road layout, land use and general topography. It may be necessary to widen the shoulder or provide a turning lane to enhance safety for turning vehicle and through traffic.

(a) For all driveways, the location of the driveway should be:

(i) as far as practical from intersections to minimise points of conflict and confusion, and to improve safety.Driveways should not be situated within the functional area of at grade intersections;

(ii) to a road of a lower hierarchy where reasonable access can be provided. Notwithstanding this preference, access arrangements for each development must be considered on a case-by-case basis.

(iii) at least 6 m from the tangent point, or where no tangent point exists, at least 12 m from the intersection of two street property boundaries; and

(iv) positioned to achieve adequate sight distance for all traffic movements associated with property accesses. Desirably, a driver has at least stopping-sight distance available to react to a potential conflict and come to a stop.

Editor's Note - Refer to *AS2890.1 Parking facilities - Part 1: Off street carparking,.*

(b) All driveways should avoid being located:

(i) opposite the terminating road of a T junction on non-residential streets;

(ii) within the signalised area (defined by extension of the signal stop lines to the road boundaries), within 25 m of a signalised intersection, and not adjacent to auxiliary lanes, depending on the property frontage width. Access may be permitted if it can be demonstrated to Council that the location of the driveway will be safe;

(iii) within a roundabout area, nor desirably within 25 m of the roundabout entrances or exits. Access may be permitted if it can be demonstrated to Council that the location of the driveway will be safe;

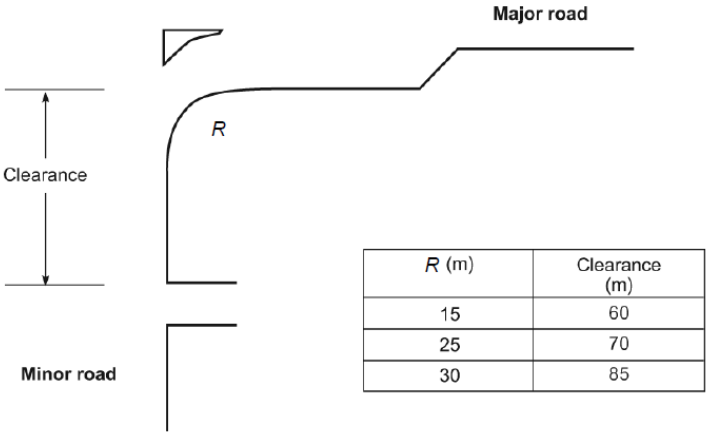
(iv) opposite or within 6 m of a median opening in a major road; and

(v) within the bus stop boarding area and on the downstream side of the bus stop.

Editor's Note - On-site parking bays must be located clear of queuing areas. This allows vehicles to drive completely onto the property without having to stop for other vehicles to complete on-site parking manoeuvres.

(c) Driveways in the vicinity of intersections on major roads, (Arterial & Sub arterial) should be located in accordance with following Austroads guideline:

(i) *Guide to Road Design Part 4: Intersections and Crossings – General,* Figure E 5: Corner clearance – channelised intersection below.



R (m)	Clearance (m)
15	60
25	70
30	85

Source: Transportation Research Board (2003).

(ii) Alternatively in accordance with Austroads *Guide to Traffic Management Part 12: Traffic Impacts of Development*, 3.3.2 Driveways or Intersections into the Development; right turns after major intersections should only be considered where a separate right-turn lane with adequate deceleration and storage length can be provided, otherwise rear end crashes may become common. On typical undivided urban roads, the safety implications of allowing right turns from a through lane into a development within 100 m of a major intersection should be carefully considered.

(d) Driveways must be constructed at a right angle to the kerb line/road centreline unless demonstrated that it is not safe to have the driveway at a right angle.

(e) Driver visibility at the property line to pedestrians, cyclists and other vehicles must be clear of obstruction (e.g., fencing, and landscaping), and should account for changes in grades or curves in road alignment. The location of the driveway will be assessed against the safety provisions detailed in the Department of Transport and Main Roads Guideline - *Treatment options to improve safety of pedestrians, bicycle riders and other path users at driveways, February 2021.*

Editor's Note - If sight distance is not adequate then a mirror, or other approved device, will be required to be installed at the property owner's cost.

(4) Amenity

(a) The driveway should not adversely affect, impede, or cause a nuisance to neighbouring properties.

(b) The driveway crossover of one property should not encroach onto the frontage of any adjacent property, except where it is required to achieve the desired outcome and has received approval from Council.

(c) The driveway should minimise the vehicle headlight impact on the adjacent neighbourhood.

(5) Materials

The driveway must be constructed in accordance with Section SC6.4.3 Standard drawings.

(6) Clearances

The driveway must be constructed in accordance with Section SC6.4.3 Standard drawings..

(7) Gradient

The driveway must be constructed in accordance with Section SC6.4.3 Standard drawings.

Editor's Note - This may not be practicable in some particularly hilly residential locations. Driveways with higher gradients can be constructed by using the expertise of a professionally qualified engineer and with the approval of Council.

(8) Number of driveways

(a) The number of driveways will be one per lot.

(b) Two may be permitted where:

(i) there will be more than ten metres or less than two metres between the new driveway and any otherdriveways; and/or

(i) the property has two street frontages; and

(ii) an analysis of on street parking demonstrates that on street parking will continue to be adequate even if a second driveway is constructed.

Where parking bays are marked on the street including service bays and bus stops and alteration to these bays is required to accommodate the second driveway, there is to be no loss of use. Displaced bays can be included in the off-street parking component of a commercial development, where considered appropriate. The applicant is responsible for the alterations to the line marking and signage.

(9) Stormwater

(a) The property owner must ensure that there are no impacts upstream or downstream as a result of the driveway works.

(b) In rural areas in particular, the driveway must not block or significantly impede stormwater flow along the road table drain.

(c) Where a box culvert is installed under the access, the minimum clearance below the level at the property boundary or the edge of the bitumen roadway (whichever is the lower) to the top of the access is provided in accordance with Section SC6.4.3.Standard drawings. This clearance must be achieved to allow water flowing in the drain to surcharge over the access before entering onto the roadway or the adjacent property.

SC6.4.5.6 Road and street names

(1) Introduction

(a) Objectives

The objectives of this section are to:

(i) provide a consistent procedure and setting of standards for road and street naming within the Townsville City Council Local Government Area to contribute towards a legible road and street network;

(ii) ensure urban and rural addressing are simple as possible, unique, and clearly identifiable;

(iii) identify the information Council may request for a development application or as a condition of approval; and

(iv) provide guidance or advice about satisfying an assessment criteria.

(b) Terminology

Estate	An estate is a group of homes and other buildings built together as a single development (e.g., housing development).

Roadway	Is considered to be any public or private land- based thoroughfare or course navigable by vehicle or foot that can be used for assigning addresses or allowing access between points or to a feature. Examples of roadways include alleyways, roads, streets, highways, laneways, fire tracks, bicycle paths, and walking tracks.
Roads	Are generally through routes for the movement of vehicular traffic. (Refer Clause SC6.4.5.1 Road hierarchy).
Streets	Are generally for providing property access, pedestrian, and cycle movement with more localised vehicular traffic. (Refer Clause SC6.4.5.1 Road hierarchy).

(c) Reference and source documents:

Reference and source documents that must be read in conjunction with this section are as follow:

(i) SC6.4 Development manual planning scheme policy sections:

Section SC6.4.3 Standard drawings

SD-065 Street Name Sign and Installation Details

Section SC6.4.17 Structures,

Section SC6.4.18 Concrete works

(ii) Australian Standards:

AS/NZS 4819 *Rural and urban addressing*

(2) Information requirements

(a) For Council to consider a name for a new road or street, the following information is required, in support of the request:

Editor's Note - An application for road/street name approval must be submitted to and approved by Council prior to the submission of any operational works application.

Editor's Note - Fees are to be paid in accordance with the Planning and Development Schedule of Fees and Charges for formal applications for road and street naming approval. Planning and Development Schedule of Fees and Charges – Schedule 1 can be found on Council's website.

(i) for new developments not associated with an estate, three proposed names for each proposed road/street;

(ii) for a new estate, a list of proposed names to be used within the estate; and

(iii) the origin of each name should be clearly stated on the submitted proposal for consideration. Requests for roads/streets to be named after significant individuals are to be accompanied by a summarised autobiography of each individual to be recognised. For groups of names with similar origins, a bulk explanation is acceptable if the theme generated is from the same source.

Editor's Note - For roads/streets that are existing gazetted roads, whether constructed or not, names must be submitted to Council for approval.

Editor's Note - The approved road/street names as well as the road/street type must be shown on the engineering drawingssubmitted for subsequent operational works approval.

(3) Criteria for naming of roads and streets

The following criteria will be used in assessing requests for road and street naming:

(a) Australian Standard (AS/NZS 4819 – *Rural and urban addressing*):

This section adopts the parts of AS/NZS 4819 identified below, for use in the naming of roads and streets:

(i) Section 1 – Scope and General;

(ii) Section 4 – Road definition and naming; and

(iii) Appendix A – Road types – Australia

Where this section is silent on a matter, Sections 1, 4 and Appendix A of AS/NZS 4819 shall apply and,further, they will prevail to the extent of any inconsistency with this section.

(b) Name duplication

Name duplication (both existing names and approved names) within the Townsville City Council Local Government Area will not be approved. This requirement is to ensure consistency and to avoid confusion andmisunderstanding in the delivery of goods or services or in the dispatch of emergency vehicles.

(c) Sources

(i) The preferred sources for road and street names include:

1. indigenous names of significance to the area, subject to prior approval of the relevant local Aboriginal or Torres Strait Islander Land Council via Council's Aboriginal and Torres Strait Islander Advisory Committee;

Editor's Note - The relevant local Aboriginal or Torres Strait Islander Land Council should be consulted via Council's Aboriginal and Torres Strait Islander Advisory Committee when choosing Aboriginal or Torres Strait Islander names unless Council already has an agreed list of appropriate names.

2. flora and fauna, generally using the common name and excluding lengthy or complex scientific names;

3. names of founding mothers and fathers, prominent citizens, or identities, excluding living persons;

4. war casualty lists;

5. local heritage values; and

6. existing road/street naming themes in the suburb or area.

(ii) Names should be appropriate to the physical, historical, or cultural character of the area concerned.

(iii) The origin of each name should be clearly stated on the submitted proposal for consideration. Requests for roads/streets to be named after significant individuals are to be accompanied by a summarised autobiography of each individual to be recognised. For groups of names with similar origins, a bulk explanation is acceptable if the theme generated is from the same source.

(iv) A variation to these sources will be considered on the individual merits of the proposal.

Editor's Note - All proposed names will be considered on their individual merit.

(d) Communication

(i) Names should be reasonably short, easy to read, spell and pronounce in order to assist service providers, emergency services and the travelling public. Proposed names should not be similar in spelling or sound to existing names.

(ii) Names must not be offensive or discriminatory.

(iii) Unduly long names and names composed of two or more words should be avoided:

1. a given name should only be included with a family name where it is essential to identify an individual or where it is necessary to avoid ambiguity, e.g., Angus Smith Drive, John Melton Black Drive, Sir Leslie Thiess Drive etc. The use of given names should generally be avoided; and

2. whilst street and cul-de-sac names should have only one word it is recognised that some roads require a two-word name because of their geographic relationship e.g., Old Common Road, Ross River Road etc.

(e) Spelling

(i) Where it is intended that a road/street have the same name as a place or feature with an approved geographical name, then particular care should be taken to ensure that the correct spelling is adopted.

(ii) Where names have been changed or corrupted by long established local usage, it is not usually advisable to attempt to restore the original form; that spelling which is sanctioned by general usage should be adopted.

(iii) Generally, road/street names proposed or approved should not contain abbreviations. For example, the "Creek" in "Wallaby Creek Road" must not be abbreviated. There is, however, one exception: "ST" should always be used in place of Saint.

(f) Form

(i) "The" must not be used in place of a name followed by a road type for example, "The Boulevard".Prepositions in road names should not be used, for example, "Hampton on Boulevard".

(ii) No directional indicators are to be used, for example, "Gold Road West" and "Gold Road East".

(iii) Prefixes such as "Upper", "New", "North" or "South" must not be used unless the name has been specifically derived from a name that includes these.

(iv) The apostrophe mark must be omitted in the possessive case, e.g., ‘Smith’s Road’ should be "Smiths Road".

(v) Hyphens are not to be used. Full stops are not to be used.

(vi) No symbols, diacritical marks or special characters are to be used. The exception is macrons for Maori names.

(vii) Numerals are not to be used. Any numbers in a name must be written in full. Only standard A to Z alphabet characters may be used.

(g) Road types

(i) Particular attention should be paid to the use of street, road, court, crescent, drive etc., to ensure that the road type is representative of the road being described. Road/Street types are to be in accordance with AS 4819 Appendix A and read in conjunction with section 4.3 of AS 4819.

(ii) The road/street type/s is required to be submitted to Council as part of the application for consideration of road/street names. The road/street type/s is to be submitted for checking by Council on plans associated with operational works approval. The road/street type must be appropriate for the road layout.

(h) Holding of approved names

Approved names remain valid for the following periods:

(i) 5 years for developments not associated with estates; and

(ii) for estates, the applicant is to advise Council at the time of the request for approval of names, the proposed, estimated time period for the completion of the estate. Approved names will be held for this time period.

(4) Street name signs

The street name signage must be in accordance with Section SC6.4.3 Standard drawing SD-065 Street Name Sign and Installation Details and installed and constructed in accordance with Section SC6.4.18 Concrete works and Section SC6.4.17 Structures, Clause SC6.4.17 (11) Signs and supporting structures

SC6.4.5.7 Maps and attachments

Map A - Urban and Rural Traffic Environments Map	Click here
Map B1 - Townsville Road Hierarchy Map (Existing)	Click here
Map B2 - Townsville Road Hierarchy Map (Future)	Click here
Attachment A - Road Hierarchy Typical Cross Section Characteristics	Click here

Development manual planning scheme policy (PSP)

SC6.4.6 Road works and traffic control

Editors Note:

Construction specifications and construction processes are project specific and form part of the Project Contract Documentation for construction.

Inclusion of construction specifications and construction methodology statements in the Planning Scheme is not recommended because it locks the construction of works into using a predetermined construction process that may not be appropriate for the specific / unique construction challenges faced by the contractor responsible in performing the works.

Generally, the construction process is dictated by the materials being used and the latent / site specific conditions encountered during the conduct of the works, hence a formal contract document which sets out how to manage site specific challenges and latent conditions is necessary. Often inclusion of construction specifications in a Planning Scheme will lead to issues about which document has precedence (Planning Scheme or Construction Contract).

Legally a Contractor has agreed to perform work in accordance with the terms and specification described within the Construction Contract document, so where there is a dispute about how to conduct construction the Construction Contract document is regarded as the precedent document not the Planning Scheme.

Index

SC6.4.6.1 Geometric road design

(1) Introduction

(2) Consultation and planning

(3) Urban design criteria (road geometry)

(4) Rural design criteria (road geometry)

SC6.4.6.2 Pavement design & seal design

(1) Introduction

(2) References and source documents

(3) Pavement design criteria

(4) Design subgrade CBR

(5) Pavement structure – general

(6) Subgrade treatment – general

(7) Expansive soils

(8) Selection criteria for subgrade treatment type

(9) Rural unsealed gravel pavements

(10) Unbound flexible pavement

(11) Bound flexible pavement

(12) Rigid concrete pavements

(13) Concrete segmented pavements

(14) Clay segmented pavements

(15) Preferred surfacing design configuration

(16) TCC Standard pavement designs

SC6.4.6.3 Subsurface drainage design

(1) Subsoil and sub pavement drains

(2) Foundation drains

(3) Drainage mats (blankets)

(4) Documentation – subsurface drainage drawings and calculations

SC6.4.6.4 Roadworks construction

(1) Introduction

(2) Who attends the inspections

(3) When are inspections required

(4) Notifying inspections

(5) Acceptance of the works “works completion”

(6) As constructed drawings

(7) Workmanship guarantee

(8) “Maintenance period” and “on maintenance”

(9) Close-out workshop inspection

(10) “End of maintenance” inspection

(11) What to expect roadworks inspections

SC6.4.6.1 Geometric road design

(1) Introduction

(a) Purpose

(i) This section sets out requirements developed specifically for the design of roads using principles of street design to ensure safety and improved amenity and to reduce pedestrian/vehicular conflicts.

(ii) A fundamental requirement of the design process is for designers to determine the vehicle speed which is deemed acceptable for a particular subdivision or section of road.

(iii) All relevant design principles must be integrated in the development of the road network, recognising the primary role of roads for transport function.

(iv) The objective of road design is to recognise the carrying of through traffic.

(v) The objectives of street design are to recognise improving safety and security, increase vitality and interaction, reduce private motor vehicle dependence, improve development efficiency, provide valuable community space, and retain economic activity in communities.

(b) Scope

(i) This section must be read in conjunction with the IPWEAQ publication *Street Design Manual: Walkable Neighbourhoods and Practice Notes*, with limited adoption in Townsville as follows:

1. in areas with close nexus to the CBD, and in areas where higher densities are encouraged and it can be demonstrated that there is high access and potential use of public transport, then a full adoption of the *Street Design Manual* while tying into existing road and street networks. For infill development and upgrades in these areas, development is to be in line with the *Street Design Manual* principles of pedestrian and cyclist friendly environments, encouraging developments that engage with active street frontages;

2. new, large, master planned developments are to adopt the *Street Design Manual*, although they will be required to recognise the role of public transport as an alternative to moving people between these sites and other areas of Townsville. Designs should emphasise pedestrian and cyclist movements, and allow for retrofitting of public transport options in the future, if and when they become viable;

3. other developments are to apply priorities in line with the *Street Design Manual*, but layout is to be adapted to tie into existing road and street networks, recognising high car dependence, and lack of containment opportunities, where commercial centres, schools and retail facilities are not proposed within the development; and

4. curvilinear street designs are to be avoided wherever practical, with a focus on the grid structure in accordance with the *Street Design Manual* and requirements of the Townsville City Plan.

(c) Aims

A road system within a subdivision is to be designed to achieve the following aims:

(i) to provide convenient and safe access to all allotments for pedestrians, vehicles, and cyclists;

(ii) to provide safe, logical, and hierarchical transport linkages with existing street system, including consideration of crime prevention in streets, bikeways, and pathways;

(iii) to provide appropriate access for buses, emergency, and service vehicles;

(iv) to provide both a permeable and legible street network;

(v) to provide for a quality product that minimises maintenance costs;

(vi) to allow for public utilities;

(vii) to provide an opportunity for visual amenity, E.g., street landscaping;

(viii) to provide convenient parking for visitors;

(ix) to provide connecting streets and places through permeable networks without any corresponding increase in vehicle speeds or "rat runs";

(x) to have appropriate regard for the climate, geology, and topography of the area; and

(xi) to provide connectivity to the external transport networks.

(d) Terminology

For the purpose of this section the definition of terms used to define the components of the road reserve must be in accordance with these AS 1348 terms.

Carriageway	that portion of the road or bridge devoted particularly to the use of vehicles,inclusive of shoulders and auxiliary lanes.
Footpath	the paved section of a pathway (verge).
Pathway	a public way reserved for the movement of pedestrians and of manually propelled vehicles.
Pavement	that portions of a carriageway placed above the subgrade for the support of, and to form a running surface for, vehicular traffic.
Shoulder	the portion of the carriageway beyond the traffic lanes and contiguous and flush with the surface of the pavement.
Verge	that part of the road reserve between the carriageway and the road reserve boundary. It may accommodate public utilities, footpaths, stormwater flows, street lighting poles and plantings.

(e) References and source documents:

References and source documents that must be read in conjunction with this section are as follow:

(i) SC6.4 Development manual planning scheme policy:

Section SC6.4.5. Road network infrastructure

(ii) Australian Standards:

AS 1348	*Road and traffic engineering – Glossary of terms, Road design and construction*.
AS 1428	*Design for access and mobility.*
AS 1742	*Manual of uniform traffic control devices*.
AS 2890	*Parking facilities.*
AS/NZS 3845	*Road safety barrier systems.*

(iii) Austroads:

Guide to Road Design (Set)
Guide to Road Safety (Set)
Guide to Traffic Management (Set)

Design vehicles and turning path templates

(iv) Department of Transport and Main Roads

Queensland Manual of Uniform Traffic Control Devices

Road Planning and Design Manual

Treatment options to improve safety of pedestrians, bicycle riders and other path users at driveways

(v) Other:

Queensland Government, *Active Healthy Communities*

Queensland Government, *Crime Prevention through Environmental Design*

Queensland Government, *Model Code for Neighbourhood Design*

Institute of Public Works Engineering Australia, Qld Division, *Street Design Manual: Walkable Neighbourhoods and Practice Notes*

(2) Consultation and planning

(a) Consultation

(i) Designers are encouraged to consult with the Council and other relevant authorities prior to and during the preparation of the design. Designers should, in addition to requirements of this section, ascertain the specific requirements of these authorities as they relate to the designs in hand.

(ii) The designer must obtain service plans from all relevant public utility authorities and organizations whose services may exist within the area of the proposed development. These services are to be plotted on the relevant drawings including the plan and cross-sectional views.

(b) Planning concepts

(i) In new areas (as distinct from established areas with a pre-existing road pattern) each class of route should reflect its role in the street and road hierarchy by its visual appearance and related physical design standards. Routes should differ in alignment and design standard according to the volume of traffic they are intended to carry, the required traffic speed, adjoining land uses, and other factors. All higher order road networks under Council jurisdiction must comply with Section SC6.4.5 Road network infrastructure.

(ii) The road network for residential developments should have clear legibility for all road users, particularly pedestrians and cyclists.

(iii) The road network should reinforce legibility by providing sufficient differentiation between the road functions.

(iv) Distinct existing landmark features such as watercourses, mature vegetation or ridge lines should be emphasised within the structural layout to enhance their legibility.

(v) The road networks should by its inherent design and functional distinction provide the necessary legibility and place making.

(vi) The road network should provide for shortest reasonable access from any lot to the major road system for all pedestrian cyclists and vehicles.

(vii) Speed regulation should be built into the street geometry, to create an environment where drivers are actively discouraged from driving above the legislated/design speed. Speed control devices, often known as Local Area Traffic Management (LATM), are considered unnecessary for appropriately designed new streets and should only be used where no other solution is viable, due both to their capital and maintenance costs and possible intrusive nature. Side friction may be considered to assist with speed regulation where appropriate.

(viii) Provide convenient and safe access to all allotments for all road users including pedestrians, cyclists, public transport users, garbage trucks, and motorists. Priority of consideration in streets should be as per *Complete Streets.*

(ix) Include adequate network considerations in the placement and design of safe pedestrian crossing facilities especially across roads and high-volume streets.

(3) Urban design criteria (road geometry)

(a) Road and street hierarchy

(i) A hierarchical road network is essential to maximise road safety, residential amenity, and legibility. Each class of road in the network serves a distinct set of functions and is designed accordingly. The design should convey to motorists the predominant function of the road.

(ii) Transport routes are divided into two distinct levels (refer to Section SC6.4.3 Standard drawings):

1. streets; and

2. roads

(iii) The lowest order of transport route (streets) has as their primary function to facilitate public interaction and movement through a place, village, town, or city.

1. Streets should be designed in accordance with the adjoining land uses

(iv) The highest order of transport route (Roads) should have as its main function the convenient and safe distribution of traffic and should be designed in accordance with the Section SC6.4.5 Road network infrastructure, Austroads, and Department of Transport and Main Roads standards.

(b) Road network

(i) The design features of each type of road or street convey to the driver its primary functions and encourage appropriate driver behaviour.

(ii) Traffic volumes and speeds on any road or street should be compatible with its adjoining land uses and function.

(iii) The maximum length of a residential street should ensure its status as a residential place is retained, where the traffic, in terms of speed and volume will enable the integration of pedestrian, bicycle and vehicular movements. This length will typically be 250m in accordance the *Model Code for Neighbourhood Design* ..

(iv) The distance required for pedestrians, cyclists, and drivers to travel between two points within the development should be minimised.

(v) Where local streets form part of a pedestrian or bicycle network, access links should provide suitable connectivity with adjoining local streets or open space systems to ensure such pedestrian and bicycle network are functionally efficient and safe.

(vi) The road network should ensure that no road intersects with another road which is more than two levels higher or lower in the hierarchy. In exceptional circumstances roads may intersect with others that are more than two levels apart with Council approval, however, no local street should have direct connection to an access controlled arterial road.

(vii) The road and street layout should conform to the requirements of the external road network and satisfy the transport provisions of an outline development plan.

(viii) The external road network should be designed and located to provide routes which are more convenient for potential through traffic within the network. Major roads should be provided at intervals of no more than 1.5 km and should be complete and of adequate capacity to accommodate through network movements.The internal road system should not provide through routes that are more convenient than the external road network.

(ix) The design of major collector roads, sub arterial roads and arterial roads should achieve a context sensitive design by providing an acceptable balance between the level of service, safety, whole of life costs, flexibility for future upgrading or rehabilitation and environmental impact. Consequently, major collector roads, sub arterial roads and arterial roads should provide a higher level of efficiency and safety with space for public transport, bicycle lanes and pedestrian facilities.

(x) Operations on major collector roads, sub arterial roads and arterial roads must be in accordance with Austroads' *Guide to Road Design Part 2:Design Considerations,* taking into account:

1. intersection spacing and control;
2. lane changing;
3. weaving;
4. merging;
5. spacing of median openings;
6. reverse flow/tidal traffic control;
7. pedestrians;
8. cyclists;
9. parking (if permitted);
10. transit lanes for buses and high occupancy vehicles (HOV);
11. provision for B-doubles and multi-combination vehicles;
12. provision for intelligent transport systems (ITS);
13. bus stops;
14. service roads;
15. driveway spacing and their distances from intersections (if permitted); and
16. signage and line marking in accordance with Main Roads' *Manual of Uniform Traffic Control Devices* (MUTCD) and *Traffic and Road Use Management Manual* (TRUM).

(c) Design speed

(i) Design speed is generally used as the basic parameter in the design standards, determining the minimum design value for other elements and is the 85th percentile maximum speed of traffic within the road / street. This is similar to the “Speed Environment” used in Austroads *Guide to Road Design*. Vehicular speeds are also limited by road intersections as well as changes in horizontal and vertical alignment.

(ii) Adoption of a low design speed discourages speeding, however, where vertical or horizontal curves of low design speed are located in otherwise high-speed sections (tangents) the result is a potentially dangerous section of road. Attention should be given to ensuring that potentially hazardous features are visible to the driver and adopting traffic engineering measures which will help a driver avoid errors of judgement.

(iii) Design speed should allow for road characteristics such as:

1. traffic volume;
2. width of carriageway;
3. grades; intersections;
4. the presence and spacing of consolidated property access;
5. traffic characteristics; and
6. traffic composition (pedestrians, cyclists, public transport, passenger vehicles, heavy vehicles).

(iv) The posted speed limit on roads should generally comply with the road hierarchy design criteria detailed in SC6.4.5 – Road network infrastructure, Clause SC6.4.5.7 Attachment A-Road Hierarchy Typical Cross Section Characteristics.

(v) Where there is a proposed change to an existing speed limit or where new roads are proposed with speed limits outside of the range permitted by the road hierarchy, the formal speed limit review process must be followed in accordance with Section 3 of the Queensland Department of Transport and Main Roads, *Queensland Road Safety Technical User Volumes* (QRSTUV): *Guide to Speed Management.*

(d) Sight distance

(i) Stopping sight distance should be provided at all points on the road.

(ii) Stopping sight distance is the sum of the braking distance and the distance the vehicle travels during a reaction time of 2.5 seconds.

(iii) Adequate sight distance should be provided at intersections both horizontally and vertically. Each intersection location must be examined for conformance with the criteria for Approach Sight Distance (ASD), Entering Sight Distance (ESD) and Safe Intersection Sight Distance (SISD).

1. ASD relates to the ability of drivers to observe the roadway layout at an anticipated approach speed.
2. ESD relates to the driver entering the intersection from a minor street and ability to observe the roadway layout and assess traffic gaps.
3. SISD relates to an overall check that vehicles utilising the intersection have sufficient visibility to allow reaction and deceleration to provide adequate stopping distance in potential collision situations.

(e) Longitudinal gradient

(i) A general minimum gradient of 0.5 % should be adopted. In very flat conditions it may be reduced to 0.3% with Council approval. Where underground drainage with gully pits or other special works are used it is preferable to allow near level grades rather than reverting to introduction of artificial undulations. Variable crossfall may be necessary to produce the required grade in the kerb and channel. The maximum longitudinal grade on any street should not exceed 12%, from consideration of pedestrian walking convenience.

(ii) Grades over 8% must provide additional considerations for pedestrians, cyclists, public transport, and heavy vehicles (E.g., garbage trucks, furniture vehicles) where appropriate. Exceptionally steep terrain may be allowed for very short lengths on steep streets of up to 16%. In these exceptional circumstances, the developer must demonstrate that alternate routes for pedestrians, bicycles, and heavy vehicles are available.

(iii) The longitudinal grade of the minor street on the approach to an intersection should not exceed 4% with sufficient length to accommodate a stationary single unit truck. Design of the road alignment and the grades used are interrelated. A steep grade on a minor side street is not acceptable if vehicles have to stand waiting for traffic in the major road.

(iv) Turning circles in cul-de-sacs on steep grades should have grades less than 5%.

(f) Horizontal curves and tangent lengths

(i) The horizontal alignment of a road or street is normally in a series of tangents (straights) and curves which may be connected by transition curves. The choice of the horizontal alignment should be determined from the design speeds for a street, in particular the expected operating speeds and constraints of the developments adjacent to the road in accordance with Austroads' *Guide to Road Design Part 3: Geometric Design*. Designers should ensure that, for a given design speed, the minimum radius of curvature utilised is such that drivers of all vehicles can safely negotiate the curve. Curves which progressively tighten, and sudden reverse curves must be avoided.

(ii) While horizontal alignment is one means of limiting vehicle speed, the greater of the following requirements must be complied with:

1. minimum curve radius for a street - 10 m; or

2. minimum curve radius for a road in accordance with DTMR design standards.

(iii) Carriageway widening applies to all standard carriageway widths. Widening should be applied to the inside kerb line of the carriageway, in accordance with Austroads' *Guide to Road Design.*

(iv) The minimum horizontal sight distance required at any point along the street / road is the general minimum sight distance for the spot speed relevant at that point. The sight distance is measure along the vehicle path, which may be assumed as the carriageway centreline for streets.

(g) Vertical curves

(i) The design of vertical alignment must reflect the expected operating speeds and constraints of the developments adjacent to the road in accordance with Austroads' *Guide to Road Design Part 3:Geometric Design.*

(ii) Vertical curves will be simple parabolas and should be used on all changes of grade exceeding 1%. The length of the crest vertical curve for stopping sight distance is based on speed and should conform with Austroads' *Guide to Road Design Part 3: Geometric Design.*

(iii) In addition to the above general minimum sight distance, which is required to be provided at all points along the street / road, at locations where there may be channelisation or line marking, such as intersections or pedestrian crossings, the driver must be able to see such indications within the stopping distance, I.e., sight distance from 1.15 m eye height to zero is not less than single vehicle stopping distance.

(iv) For adequate riding comfort, lengths of sag vertical curves should conform with Austroads' *Guide to Road Design Part 3: Geometric Design.*

(v) Junctions of streets / roads should be located at a safe distance from a crest, determined by visibility from the side street / road. Location of a side street / road at a crest should only occur if there is no suitable alternative.

(vi) Drainage poses a practical limit to the length of sag curves and a maximum length (in metres) of 15 times the algebraic sum of the intersecting vertical grades (expressed as a percentage) is suggested. To avoid water ponding in excessively flat sections of kerb and gutter, a minimum grade of 0.3% must be maintained in the kerb and channel.

(vii) The three-dimensional coordination of the horizontal and vertical alignment of a street / road should be aimed at improved traffic safety and aesthetics. Economic considerations often require a compromise with aesthetic considerations. The following principles should be applied:

1. the design speed of the street / road in both horizontal and vertical planes should be of the same order;and
2. combined horizontal and vertical stopping sight distance and minimum sight distance should be considered three dimensionally.

(h) Superelevation

(i) The use of superelevation in association with horizontal curves is an essential aspect of geometric design of roads with design speeds more than 60 km/h. Streets which are designed for speeds of 40 km/h or less and with curves of 60 m radius or less generally have the pavement crowned on a curve instead of superelevation.

(ii) The maximum superelevation for urban roads of higher design speeds should be 5%. Any increase in the longitudinal grade leading to excessive crossfall at intersections should be considered with caution. While all curves should be superelevated, negative crossfall should be limited to 3%.

(iii) In general, curve radii larger than the minimum and superelevation rates less than the maximum should be used where possible. The minimum radius of curves is determined by the design speed.

(iv) Superelevation (or maximum adverse crossfall) at any point on the circular portion of the curve, and the maximum coefficient of side friction which allows safe lane changing. Refer to the *Road Planning and Design Manual* Table 11.1.

(v) Recommendations for minimum curve radii (in metres) on major urban roads under varying superelevation/crossfall are as per Austroads' *Guide to Road Design*.

(vi) Plan transitions are required on superelevated curves for appearance and to provide a convenient length in which to apply the superelevation. On urban roads, superelevation may be conveniently applied to the road cross section by shifting the crown to 2m from the outer kerb. The axis of rotation of the cross section for urban roads will normally be the kerb grading on either side which best enables access to adjacent properties and intersections.

(vii) Rate of Rotation for superelevation refer Austroads' *Guide to Road Design Part 3: Geometric Design* (Section 7.7).

(i) Road reserve characteristics

(i) the cross section of the road reserve must provide for all functions that the street / road is expected to fulfil, including the safe and efficient movement of all users, provision for parked vehicles, acting as a buffer from traffic nuisance for residents, the provision of public utilities and street scaping. Road reserve widths will depend on verge widths, service roads and pathway requirements, and major collector roads, sub arterial roads and arterial roads must also allow for future upgrading;

(ii) the carriageway width must allow vehicles to proceed safely at the operating speed intended for that level of road in the network and with only minor delays in the peak period. This must take into consideration the restrictions caused by parked vehicles where it is intended or likely that this will occur on the carriageway. Vehicles include trucks, emergency vehicles and, on some roads, buses. Excessive carriageway widths can be detrimental to safety, amenity, user convenience, capital expenditure and maintenance costs;

For example, for urban residential streets:

1. Access places are narrower urban residential carriageways in accordance with Section SC6.4.3 Standard drawing SD-001. Access places are allowable for shorter street lengths, with low parking demand, and serving standard residential allotments. This carriageway does not allow for any buses or bike lanes. Frequent staggered parking may occur on both sides of the street where there are less than 150 vehicles per day, otherwise on street parking should be infrequent or along one side of the street only. Generally,street lengths should be kept to a maximum length of 250 m. These streets may not function as a through route, and must carry a low traffic volume;

2. Access streets are standard urban residential carriageways in accordance with Section SC6.4.3 Standard drawing SD-001. Access streets are allowable where there is relatively frequent parking on both sides of the street with traffic volumes generally less than 750 vehicles per day;

3. Minor collector streets are wider urban residential carriageways in accordance with Section SC6.4.3 Standard drawing SD- 001. Minor collector streets are required where there is a higher density residential area with higher parking demand or higher volume of traffic (less than 3000 vehicles per day in accordance with Section SC6.4.5 Road network infrastructure, Clause SC6.4.5.1(3)(c) and possible bus routes. Indented bus bays may be required, on advice from Council;

(iii) the safety of pedestrians and cyclists where it is intended that they use the carriageway, must also be assured by providing sufficient width;

(iv) the carriageway width should also provide for unobstructed access to individual allotments. Drivers should be able to comfortably enter or reverse from an allotment in a single movement, taking into consideration the possibility of a vehicle being parked on the carriageway opposite the driveway;

(v) the design of the carriageway should discourage drivers from travelling above the intended speed by reflecting the functions of the road in the network. The width and horizontal and vertical alignment should not be conducive to excessive speeds;

(vi) appropriate verge width should be provided to enable the safe location, construction and maintenance of required footpaths and public utility services (above or below ground), with acceptable clearances and to accommodate the desired level of streetscaping. Wherever possible, services should be in common trenches;

(vii) the verge when considered in conjunction with the horizontal alignment and permitted fence and property frontage treatments should provide appropriate sight distances, considering expected speeds and pedestrian and cyclist movements;

(viii) stopping sight distances and junction or intersection sight distances, provided by the verge, should be based on the intended speeds for each road type;

(ix) safe intersection stopping distance envelopes must be provided to ensure sight distances are achieved in the street layout; and

(x) industrial roads andhigher order roads including major collector roads must be designed to allow access for larger vehicles including B-doubles and multi-combination vehicles into these areas, including safe turning manoeuvres at intersections and to and from allotments.

(j) Crossfall

(i) Roads should be crowned in the centre. Typical pavement crossfalls on straight roads are:

Pavement Type	**Crossfall**
Bituminous seal coat	3%
Asphalt seal	3%
Cement concrete	3%

(ii) There are many factors affecting levels in urban areas which force departures from these crossfalls. Differences in level between road alignments can be taken up by offsetting crown lines or adopting one- way crossfalls. Sustained crossfalls should not exceed 4%, although up to 6% may be used where unavoidable with Council approval. The rate of change of crossfall should not exceed those adopted in Clause SC6.4.6.1(3)(h) Superelevation above.

(iii) The use of one-way crossfalls should be limited taking into consideration overland drainage and the impact on open space, public footpaths, and private properties.

(iv) The crossfall on a higher order transport route should take precedence over the grade in minor side streets. Standard practice is to maintain the crossfall on the major road and adjust the minor side street levels to suit. The crossfall in side streets should be warped quickly either to a crown or a uniform crossfall depending on the configuration of the side street. A maximum change of grade of 2% in the kerb line of the side street relative to the centre line grading is acceptable.

(k) Verge and property access

(i) A suitable design for the verge will depend on utility services, the width of footpath, access to adjoining properties, likely pedestrian usage, and preservation of trees. General design criteria applying to verges are detailed on Section SC6.4.3 Standard drawing SD-015.

(ii) Low level footpaths may only be used if normal crossfalls are impracticable. Crossfalls in footpath paving should not exceed 2.5%, in accordance with Austroads' *Guide to Road Design - Part 6A: Pedestrian and Cyclist Paths*. Longitudinal grade usually parallels that of the road, and this may be steeper than 5%.

(iii) Differences in level across the road between road reserve boundaries may be accommodated by:

1. cutting at the boundary on the high side and providing the verge at normal level and crossfall;
2. battering at the boundary over half the verge width with the other half against the kerb constructed at standard crossfall;
3. a uniform crossfall across the carriageway; and
4. the lower verge being depressed below the gutter level.

(iv) The above measures can be used singularly or combined. The verge formation should extend with a 0.5m berm beyond the road reserve boundary.

(v) The designer must design a vehicular driveway centreline profile for the property access and check this design using critical car templates, to ensure that vehicles can use the driveway satisfactorily.

(vi) Where commuter, pedestrian, and cyclist paths are proposed, appropriate shading and rain protection should be provided. An approved landscaping master plan must be provided for approval.

(l) Intersections

(i) Intersections are defined as junctions of roads or streets and include junctions described as:

1. Signalised intersections;
2. Roundabouts;
3. Priority controlled intersections that maybe either stop or give way controlled; and
4. Uncontrolled intersections, i.e., simple intersections without any signage.

(ii) The design of intersections or junctions should allow all movements to occur safely without undue delay. Projected traffic volumes should be used in designing all intersections, junctions or roundabouts on major collector roads, sub arterial roads and arterial roads.

(iii) Intersection design for the junction of subdivision roads and streets with existing state rural or urban roads and national highways should generally be in accordance with the publication Austroads' *Guide to Road Design – Part 4, Intersections and Crossings*.

(iv) Intersections with state roads or national highways are to be designed, approved, and constructed in accordance with the requirements of the Department of Transport and Main Roads.

(v) Where major intersections are required to serve a development complete reconstruction of the existing road pavements may be necessary.

(vi) Intersections should be generally located in such a way that:

1. the streets/ roads intersect preferably at right angles and not less than 70º;
2. the landform allows clear sight distance on each of the approach legs of the intersection;
3. the minor street intersects the convex side of the major street;
4. the vertical grade lines at the intersection do not impose undue driving difficulties;
5. the vertical grade lines at the intersection will allow for any direct surface drainage;
6. intersection spacing and median breaks on sub arterial roads and arterial roads should be minimum 150m;

7. intersection spacing and median breaks on major collector roads should be minimum100m;

8. spacing of intersections on minor collector streets and local streets should be not less than 50m, this is particularly important when two minor side streets intersect a minor collector street in a left right staggered pattern, the minimum centre-line spacing of 50 m provides for a possible right turn auxiliary lane on the minor collector street; and

9. a right left manoeuvre between the staggered streets / roads is preferable, avoiding the possibility of queuing in the major street / road.

(vii) Adequate stopping and sight distances are to be provided for horizontal and vertical curves at all intersections.

(viii) Appropriate provision should be made for vehicles to park safely, where required. Safe intersection sight distance - refers to Clause SC6.4.6.1(3)(h)(ix) above.

(ix) The drainage function of the carriageway and/or road reserve must be satisfied by the road reserve cross- section profile.

(x) All vehicle turning movements are accommodated utilising Design Vehicles and Turning Templates, as follows:

1. for intersection turning movements involving major collector, sub arterial or arterial roads the minimum size vehicle is a "design semi-trailer" with turning path radius 15m;

2. for intersection turning movements involving minor collector streets, the minimum size vehicle is a "design single unit" bus with turning path radius 13 m;

3. for turning movements involving access streets the minimum size vehicle is a “design single unit” truck; and

4. at the head of cul-de-sac of access places, sufficient area is provided for the "design single unit" truck to make a three-point turn, driveway entrances are not to be used for turning movements. The minimum cul-de-sac head radius is 9 m to kerb lip.

(xi) On bus routes 3-centred curves with radii 15m, 10m, 30m are to be used at junctions and intersections.

(xii) Unsignalized intersections on major collector roads, sub arterial roads and arterial roads at grade should have a median width of at least 5.5m to allow for a two-stage crossing from the side street and possible conversion of the median to 2.5m wide with a 3.0m wide right turn lane.

(xiii) Design of traffic signals on major collector roads, sub arterial roads and arterial roads must be in accordance with the Department of Transport and Main Roads’ *Road Planning and Design Manual* (RPDM), Chapter 18. Council approval is required for use of equipment that is uniquely associated with traffic signals.

(xiv) Barrier kerb and channel must be used at intersection kerb turnouts extending to the tangent point. A one metre kerb transition must be used to connect barrier kerb and channel turnout with adjacent layback kerb and channel.

(m) Roundabouts

(i) Roundabouts are to be approved by Council.

(ii) Roundabouts should be avoided if they exhibit the following characteristics:

1. In urban areas near schools where off-road bicycle lanes are not provided.

2. Locations frequented by the elderly or people with disabilities, e.g., near aged care facilities and medical centres.

3. On principal bicycle network, (existing or future routes) as defined by the Department of Transport and Main Roads.

4. Locations where there is high pedestrian demand to cross the road at the intersection.

5. Elliptical central islands.

(iii) Roundabouts should generally be designed in accordance with the requirements of Austroads *Guide to Road Design - Part 4B - Roundabouts*. Designs adopting alternative criteria will be considered on their merits. Roundabout design should generally comply with the following:

1. safe provision for pedestrians, cyclists, and public transport movements;

2. entry width to provide adequate capacity;

3. adequate circulation width, compatible with the entry widths and design vehicles E.g., buses, trucks, and cars;

4. central islands of diameter in accordance with the minimum prescribed in Austroads *Guide to Road Design - Part 4B - Roundabouts* and sufficient to give drivers guidance on the manoeuvres expected;

Editor's Note – Central island diameter should be determined by the existed posted limit of the road, reducing the posted speed limit on the approach to a roundabout is not an acceptable design solution to achieve minimum central island diameter compliance.

5. deflection of the traffic to the left on entry to promote gyratory movement and not bypass of the circular lane.

6. adequate deflection of crossing movements to ensure low traffic speeds;

7. a simple, clear, and conspicuous layout; and

8. design to ensure that the speed of all vehicles approaching the intersection will be less than 40 km/h, this can be achieved using deflection curves on the approaches to the roundabout.

(n) Local area traffic management

(i) Local area traffic management (LATM) devices are unnecessary for appropriately designed new streets but may be used to address speed and safety issues in existing streets and must be approved by Council.

(ii) Calming devices such as thresholds, slow points, speed humps, chicanes and splitter islands should be designed in accordance with the requirements of the publication Austroads *Guide to Traffic Management Part 8: Local Area Traffic Management (LATM)* and the *Manual of Uniform Traffic Control Devices*. Device designs should generally comply with the following.

1. Streetscape:

a) reduce the linearity of the street by segmentation;

b) avoid continuous long straight lines (E.g., kerb lines);

c) short straights and short distances between intersections;

d) enhance existing landscape character;

e) maximise continuity between existing and new landscape areas;

f) on street parking; and

g) mixed activity precincts.

2. Location of devices/changes:

   a) devices other than at intersections should be located to be consistent with streetscape requirements;

   b) existing street lighting, drainage pits, driveways, and services may decide the exact location of devices; and

   c) slowing devices are optimally located at spacings of 100-150 m.

3. Design vehicles:

   a) emergency vehicles, garbage trucks and furniture vehicles must be able to reach all residences and properties;

   b) local streets with a “feeding” function between arterial roads and streets must be designed for an Austroads Design Single Unit Truck/Bus;

   c) where bus routes are involved, buses should be able to pass without mounting kerbs or travelling over speed humps and with minimised discomfort to passengers; and

   d) in newly developing areas where street systems are being developed in line with LATM principles, building construction traffic must be provided for.

4. Control of vehicle speeds

   a) maximum vehicle speeds can only be reduced by deviation of the travelled path. Pavement narrowing has only minor effects on average speeds, and usually little or no effect on maximum speeds;

   b) speed reduction can be achieved using devices which shift vehicle paths laterally (slow points, roundabouts, corners) or vertically (humps, platform intersections, platform pedestrian/school/bicycle crossings); and

   c) speed reduction can be helped by creating a visual environment conducive to lower speeds. This can be achieved by “segmenting” streets into relatively short lengths (less than 300 m), using appropriate devices, streetscapes, or street alignment to create short sight lines and by inducing in drivers a feeling of constriction through the introduction of side friction.

5. Visibility requirements (sight distance)

   a) adequate critical sight distances should be provided such that evasive action may be taken by either party in a potential conflict situation. Sight distances should relate to likely operating speeds;

   b) sight distance to be considered include those of and for pedestrians and cyclists, as well as for drivers; and

   c) night-time visibility of street features must be adequate. Speed control devices particularly should be located near existing street lighting if practicable, and all street features/furniture should be delineated for night-time operation. Additional street lighting must be provided by the developer at proposed new speed control devices located away from existing street lighting.

6. Critical dimensions

   Many devices will be designed for their normal use by cars, but with provision (such as mountable kerbs) for larger vehicles. Some typical dimensions include:

   a) pavement narrowing in accordance with Austroads *Guide to Traffic Management;*

   b) bicycle lanes (including adjacent to pavement narrowing) – 1.5 m minimum, 1.2 m absolute minimum with Council approval (in accordance with Austroads *Guide to Traffic Management*, and *Guide to Road Design);*provision of a 600 mm wide painted separation strip between the traffic lane and the cycle lane should be provided where sufficient pavement width is available.

   c) ;plateau or platform areas 75 mm to 100 mm height maximum, with 1 in 15 ramp slope;

   d) width of clear sight path through slowing devices;

   e) the width of the portion of carriageway which does not have its line of sight through the device blocked by streetscape materials, (usually vegetation);

   f) dimensions of mountable areas required for the passage of large vehicles to be determined by appropriate turning templates; and

   g) on bus routes, devices must allow the full bus length to be contained between ramps.

(o) Road safety audits

   (i) Road safety audits (RSA) are to be carried out in accordance with Austroads *Guide to Road Safety Part 6: Road Safety Audit*. Council will advise if an RSA is required to support a development proposal / project and the stages required in the RSA. The following stages of the project should be considered for an RSA, as appropriate:

      1. feasibility design;
      2. completion of design development;
      3. completion of final design;
      4. during construction, where temporary traffic management measures are proposed;
      5. two weeks prior to opening to traffic; and
      6. within one week of opening to traffic.

(p) Bicycle lanes

   (i) On-road bicycle lanes shall comply with Section SC6.4.4 Active transport infrastructure, Clause SC6.4.4.6 Pathway and cycleway design characteristics.

   (ii) Bicycle lanes should be marked on roads with posted speed limits within the range of 60 km/h to 80 km/h, these roads are typically defined as Major Collector, Sub Arterial and Arterial roads.

   (iii) The width of on-road bicycle lanes will generally be in accordance with the dimensions on SC6.4.3 Standard drawings SD-001, SD-002, SD-003, SD-004 and as detailed in Section SC6.4.5 Road network infrastructure, Attachment A - Road Hierarchy Typical Cross Section Characteristics.

(iv) All on-road bicycle lanes are to be a minimum 1.5 m wide located adjacent to the marked traffic lanes. Where there is sufficient width within the carriageway a 0.6 m wide separation strip (painted chevron) should also be provided between the bicycle lane and the traffic lane.

(v) Bicycle lane separation strip line marking should be as per Australian Standard 1742.2, Figure 5.26 with only one strip provided between the traffic lane and the bicycle lane.

(vi) Roads and streets that have speed limits of 50 km/h or less do not have marked bicycle lanes, the design of these roads and streets should, however, allow for bicycles to share and use the carriageway with vehicle traffic.

(vii) Roads with speed limits above 80 km/h are not permitted to have bicycle lanes, these roads are designed for high-speed vehicle traffic and cycling facilities within the road corridor should be separated from the road carriageway.

(viii) Where there is insufficient width within the road carriageway to accommodate bicycle lanes off-road cycling facilities must be provided. These off-road facilities may include a dedicated cycleway that is separated from the footpath or a shared use pathway facility that is a minimum of 2.5m wide. Where a combination of on-road bicycle lanes and off-road cycling facilities is used, bicycle ramps and signage must be provided to allow the cyclist to easily transition from on-road to off-road cycling infrastructure.

(q) Parking

(i) Parking shall comply with Section SC6.4.5 Road network infrastructure, Clause SC6.4.5.4 Car parking

(ii) The parking requirements for normal levels of activity associated with any land use should be accommodated on-site.

(iii) The width of on-road parking facilities will generally be in accordance with the dimensions on Section SC6.4.3 Standard drawings SD-001, SD-002, SD-003, SD-004, SD-005 and as detailed in Section SC6.4.5 Road network infrastructure, Attachment A: Road Hierarchy Typical Cross Section Characteristics.

(iv) All on-site parking should be located and have dimensions that allow convenient and safe access and usage. All designs must account for a B99 (AS 2890) vehicle requirement.

(v) Adequate parking should be provided within the road carriageway for visitors, service vehicles and any excess resident parking since a particular use may generate a high demand for parking. Such parking is to be convenient to the use.

(vi) Parking on a footpath or grassed verge area of a street or road either partly or completely is not permitted.

(vii) Where there is demand for parking and there is insufficient width to park on the carriageway, indented parking bays is an option or alternatively parking on-site must be provided.

(viii) All indented parking areas are to be constructed of concrete, interlocking pavers, bitumen with crushed rock or other Council approved base material and are designed to withstand the loads and manoeuvring stresses of vehicles expected to use those spaces.

(ix) The availability of parking should be adequate to minimise the possibility of driveway access being obstructed by cars parked on the opposite side of the street / road.

(x) For non-residential land uses, the opportunity for joint use of parking should be maximised by being shared by several complementing uses.

(xi) Right angled kerbside parking is provided only on streets where posted speeds do not exceed 40 km/h.

(xii) On single lane local streets indented parking spaces should be provided. Such parking should be well defined, and an all-weather surface provided. Such parking may not restrict the safe passage of pedestrians using the road verge.

(xiii) On Access Places (Section SC6.4.3 Standard drawings SD-001) limited parking should be possible for a B99 (AS2890) vehicle on one side of the street sufficient for a council rubbish truck to pass.

(xiv) On Access Streets (Section SC6.4.3 Standard drawings SD-001) limited parking should be possible for B99 (AS2890) vehicles to be parked on both sides of the street sufficient for a council rubbish truck to pass between the parked vehicles.

(xv) On Minor Collector Streets (Section SC6.4.3 Standard drawings SD-001) on-street parking must be provided on both sides of the street sufficient for two-way traffic to pass between the parked vehicles, Minor collected streets will be line marked with edge lines which will define the area of the carriageway that can be used for parking. Parking should be possible for B99 (AS2890) vehicles to be parked on the street between the lane edge line and kerb whilst allowing sufficient space for a cyclist to ride between the parked vehicle and the edge line.

(xvi) On Major Collector Roads (Section SC6.4.3 Standard drawings SD-002) and Sub Arterial Roads (Section SC6.4.3 Standard drawings SD-003) on-road parking must be provided on both sides of the road. Major collected roads and sub arterial roads will be line marked with edge lines and bicycle lanes which will define the area of the carriageway that can be used for parking. Parking should be possible for B99 (AS2890) vehicles to be parked on the road between the bicycle lane edge line and kerb. Where parking demand is high, marked parking bays should be provided.

(xvii) On Arterial Roads (Section SC6.4.3 Standard drawings SD-004) parking will be provided to the same standard as Sub Arterial Roads except when addition lane capacity is enabled by clearways or parking restrictions during peak traffic periods when traffic volumes are very high.

(r) Bus routes

(i) It is important that the road hierarchy adequately caters for buses. The main criteria in determining the location of bus routes is that no more than 5% of residents should have to walk more than 5 minutes to catch a bus. Section SC6.4.5. Road network infrastructure, Clause SC6.4.5.3 Public transport infrastructure details minimum criteria for bus route design, though local conditions, including climate and topography should be taken into consideration to demonstrate that bus routes are readily accessible to the majority of residents.

(ii) Bus shelters on bus routesd are subject to Council's requirements, refer Section SC6.4.3 Standard drawings

(4) Rural design criteria (road geometry)

(a) General

(i) In addition to the above, this clause specifically applies to all those sites identified as being suited to rural subdivisions inclusive of rural home sites and hobby farm types of developments.

(ii) Design speed is to be generally used as the basic parameter of design standards and the determination of the minimum design value for other elements in rural subdivisions is to be based on the concept of a "speed environment" as outlined in Austroads *Guide to Road Design.*

(iii) Superelevation, widening and centreline shift and their associated transitions are to comply with Austroads guides, where appropriate.

(iv) Where the table drain is likely to scour, a stone-pitched or suitably lined dish drain is to be constructed along the invert. For grades of less than 0.5%, the inverts of the drain are to be lined to prevent siltation. Drains with a minimum gradient of 0.25% are to be concrete lined.

(v) All rural subdivisions should be designed to restrict access to major roads.

(vi) Access should be limited to one point on major collector roads, sub arterial roads and arterial roads.

(b) Sight distance

(i) Stopping sight distance should be provided at all points on the road.

(ii) Stopping sight distance is the sum of the braking distance and the distance the vehicle travels during areaction time of 2.5 seconds.

(c) Horizontal and vertical alignment

Horizontal and vertical curves are to be designed generally to the requirements of Austroads *Guide to Road Design*. These requirements are essential to satisfy the safety and performance of proper road design. Roads having both horizontal and vertical curvature should be designed to conform with the terrain to achieve aesthetic quality and being in harmony with the landform.

(d) Intersections

(i) Intersections should generally be designed in accordance with the publication Austroads *Guide to Road Design Part 4: Intersections and Crossings* and *Guide to Traffic Management Part 6: Intersections, interchanges and crossings*. The type of intersection required will depend on existing and planned connecting roads.

(ii) Adequate sight distance should be provided at intersections both horizontally and vertically. Each intersection location must be examined for conformance with the criteria for Approach Sight Distance (ASD), Entering Sight Distance (ESD) and Safe Intersection Sight Distance (SISD).

1. ASD relates to the ability of drivers to observe the roadway layout at an anticipated approach speed.

2. ESD relates to the driver entering the intersection from a minor road and ability to observe the roadway layout and assess traffic gaps. SISD relates to an overall check that vehicles utilising the intersection have sufficient visibility to allow reaction and deceleration to provide adequate stopping distance in potential collision situations.

3. Tabulated speed/sight distance requirements together with detailed explanations for each of the sight distance criteria are given in the relevant sections of the *Austroads Guide to Road Design*. Repositioning of an intersection may be required to obtain conformance with the sight distance criteria.

4. Stopping distance envelopes must be provided to ensure sight distances are achieved in the street layout.

(e) Carriageways

Carriageway widths for rural roads should generally be as per Section SC6.4.3 Standard drawings SD-010 Typical Road Cross Sections – Rural Roads.

(f) Superelevation

Use of maximum superelevation will be considered where the radius of the curve in approaching the minimum speed environment. Reference should be made to Austroads *Guide to Road Design for superelevation calculation*. At low and intermediate ranges of design speed (I.e., below 80 km/h) all curves should be superelevated to at least a value equal to the normal crossfall of straights.

(g) Table drains

Table drains to rural roads must comply with Austroads *Guide to Road Design Part 3: Geometric Design*. Minimum longitudinal grade of table drains is 0.50%. Refer to Austroads *Guide to Road Design Part 6: Roadside Design, Safety and Barriers* for capacity of drains.

(h) Scour protection

Scour protection of roadside drainage and table drains is required. The level of protection will depend on the nature of the soils, road gradients and volume of stormwater runoff. Protection works may involve concrete lined channels, turfing, rock pitching, grass seeding, individually or any combination of these. Geotechnical investigations should be carried out to determine the level and extent of any protection works prior to proceeding to final design stage.

SC6.4.6.2 Pavement design & seal design

(1) Introduction

(a) This section covers the design guidelines for road pavement to meet the required design life, based on the subgrade strength, traffic loading and environmental factors, and including the selection of appropriate materials for select subgrade, subbase, base and wearing surface, and the design of the subsurface drainage system for the road pavement and/or subgrade.

(b) Pavements shall be designed to provide the following minimum design life.

Road or street type	**Minimum design life**
Urban streets and roads	20 years
Rural streets and roads	20 years
Rigid (concrete)	40 years
Segmental block	25 years

(c) Pavement thickness

Notwithstanding subgrade testing and subsequent pavement thickness design, the minimum pavement thickness on local streets must not be less than 250 mm. This is necessary to ensure that council has sufficient thickness for future insitu stabilisation of pavements (without the risk of mixing the subgrade into the pavement during the process). Additionally, individual compacted layer thickness must be no less than 125 mm nor greater than 250 mm for optimal compaction and to avoid lamination of layers.

(d) Documentation – pavement design criteria and calculations

(i) All considerations, assumptions, subgrade test results, and calculations and other documentation required under this design specification must be submitted with the pavement design for approval by Council.

(ii) The drawings must clearly indicate the structure, material types and layer thicknesses of the proposed pavement and surfacing.

(iii) Pavement design criteria must be shown on the pavement drawings and include the ESA, CBR and expected design life.

(2) References and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(a) Austroads:

Guide to Pavement Technology Set

Guide to Road Design

AP-T179/11 – Review of Primes and Primerseal Design

(b) Department of Transport and Main Roads:

Pavement Design Supplement – Supplemental to *Part 2: Pavement Structural Design* of the *Austroads Guide to Pavement Technology.*

MRTS05	*Unbound Pavements*
MRTS07A	*Insitu Stabilised Subgrades using Quicklime or Hydrated Lime*
MRTS07B	*Insitu Stabilised Pavements using Cement or Cementitious Blends*
MRTS08	*Plant-Mixed Stabilised Pavements using Cement or Cementitious Blends*
MRTS11	*Sprayed Bituminous Surfacing (Excluding Emulsion)*
MRTS12	*Sprayed Bituminous Emulsion Surfacing*
MRTS17	*Bitumen and Multigrade Bitumen*
MRTS18	*Polymer Modified Binder (including Crumb Rubber)*
MRTS19	*Cutter*
MRTS20	*Cutback Bitumen*
MRTS21	*Bituminous Emulsion*
MRTS22	*Supply of Cover Aggregate*
MRTS30	*Asphalt Pavements*
MRTS32	*High Modulus Asphalt*
MRTS36	*Recycled Glass Aggregate*
MRTS38	*Pavement Drains*
MRTS39	*Lean Mix Concrete sub-base for Pavements*
MRTS40	*Concrete Pavement Base*

(c) Concrete Masonry Association of Australia:

CMAA – MA57	*Concrete Segmental and Flag Pavements – Guide to Specifying, 2010*
CMAA - T45	*Concrete Segmental Pavements - Design Guide for Residential Access Ways and Roads*
CMAA - T46	*Concrete Segmental Pavements - Detailing Guide*

Clay Brick and Paver Institute	*Design Manual 1 - Clay Segmental Pavements, A Design and Construction Guide for Sites Subjected to Vehicular and Pedestrian Traffic*

(3) Pavement design parameters

(a) Vehicle loads

(i) Standard Axle Repetition (SAR) is the term given to the loading of one (1) axle with 4 tyres on a road pavement with each tyre exerting a load of 20 kN and the complete axle exerting a load of 80 kN.

(ii) The term Equivalent Standard Axles (ESA) is a measure of the number of SARs passing over a section of road during the design life of the road pavement.

(iii) For the above tyre loading configuration DTMR adopt a tyre-pavement contact stress of 750 kPa as the representative loading of a heavy commercial vehicle on Queensland roads. This is the same contact stress adopted by Austroads in the derivation of Figure 8.4 the design chart used for flexible pavement design, refer Austroads *Guide to Pavement Technology Part 2.*

(iv) For new subdivisions, the design traffic loading must take account of the construction traffic associated with the subdivision development, and the in-service traffic for the subdivision and any future developments linked to that subdivision.

(v) When designing staged developments, the number of vehicle trips (design loading) must take into consideration the ultimate development that will eventually access each segment of the road under consideration with appropriate allowances for bus, garbage, construction, and in-service traffic.

(vi) For interlocking concrete segmental pavements, the simplification of replacing ESAs with the number of commercial vehicles exceeding 3 tonne gross weight contained in CMAA-T45 is acceptable up to a design traffic of 10^6 ESAs. Beyond this, ESAs should be calculated.

(vii) The total number of ESAs travelling on the pavement over its design life is the Design ESA (DESA).

(viii) In the absence of other traffic data, the following traffic values (in ESAs) may be taken as a guide to the minimum design traffic but are subject to variation depending on the circumstances for the particular development.

Table SC6.4.6.2 - Design ESAs

Road / Street Type	Design ESAs - 20-year design life (minimum)
Urban Residential (Local Streets)	
- Access Place / Lane	2×10^4
- Access Street	1×10^5
- Minor Collector Street	1×10^6
Urban - Major Collector	2×10^6
Urban - Sub-arterial / Arterial and Industrial	5×10^6
Rural Roads	1×10^6

(ix) For new residential developments where traffic data is not readily and accurately available, the design may consider the following data to determine the design traffic loading:

1. traffic generation – 10 vehicles per day/allotment plus 20 ESAs per equivalent allotment for consideration of construction traffic;

2. traffic growth rates – 0.5% – 2% for streets. Annual traffic growth rates for roads are subject to confirmation by council and will be based on available traffic data;

3. commercial vehicles – 3%-7% for streets. Commercial vehicle percentages for roads are subject to confirmation by Council and will be based on available traffic data; and

4. ESA per heavy vehicle (ESA/HVAG) - Local Urban 0.7, Local Rural 0.9, and Trunk Roads 1.3.

(x) The calculation of design traffic loading for industrial roads will require a detailed assessment addressing the following factors and must be designed using a mechanistic approach:

1. traffic generation, including peak hour traffic volumes and truck volumes;

2. details of the types of heavy vehicles that are expected to utilise the road; and

3. predicted route patterns (heavy vehicles).

(4) Design subgrade CBR

(a) The road subgrade is the natural material underneath a constructed road or the material on which a new road will ultimately be built.

(b) The strength of the subgrade to support the road loads is typically measured as the California Bearing Ratio (CBR) which is the ratio of the bearing load that penetrates a material to a specific depth compared with the load giving the same penetration into crushed stone.

(c) The subgrade Design CBR adopted for the pavement design must consider the effect of moisture changes in the pavement and subgrade during the service life, and hence consideration must be given to the provision of subsurface drainage in the estimation of equilibrium in-situ CBRs, and hence in the design of the pavement structure.

(d) Design CBR of untreated subgrade must be no greater than 3% unless otherwise approved by council who reserves the rights to carryout independent 3rd party geotechnical investigations to confirm adopted design CBR's and respective pavement designs.

(e) Subgrade treatment must be carried out in accordance with this document on all natural subgrade CBRs ≤ 3% (97% maximum dry density standard compaction at OMC). The equivalent design subgrade CBR of the treated subgrade must be determined in accordance with this document. Pavement design over treated subgrades may adopt the equivalent CBR determined in accordance with this document.

(5) Pavement structure - general

(a) Unbound granular materials used must comply with the requirements of MRTS05. Bound layers must comply with the requirements under MRTS08.

(b) The subbase layer must extend a minimum of 150 mm behind the rear face of any kerbing and/or guttering. The base and surfacing must extend to the face of any kerbing and/or guttering. Where the top surface of the subbase layer is below the level of the underside of the kerbing and/or guttering, the base layer must also extend a minimum of 150 mm behind the rear face of the kerbing and/or guttering.

(c) For un-kerbed roads, the subbase and base layers must extend for the full width of the formation.

(d) The pavement designer must make specific allowance for traffic load concentrations within car park areas (E.g., entrances/exits).

(e) The pavement designer must make provision for pavement layer drainage on the assumption that during the service life of the pavement ingress of water will occur. Compaction of the subbase, including 150 mm behind the rear face of the kerb and channel, must be carried out before trenching for the subsoil drain behind the kerb.

(6) Subgrade treatment - general

(a) Subgrade treatment may be required subject to ground conditions defined in Table SC6.4.6.3 Ground Conditions for Subgrade Treatment below.

Table SC6.4.6.3 - Ground Conditions for Subgrade Treatment

Category	Condition	Definition	Treatment Type
A	Excessively wet subgrade anticipated prior to construction and/or excessively wet subgrade encountered during construction	"Wet" subgrade	Working Platform
B	Low Design Subgrade Strength*	Soaked CBR ≤ 3%	Capping Layer
C	Highly or very highly expansive subgrade	Swell ≥ 2.5%	Pavement Cover
D	Ground beneath pavement will be exposed to water (due to the effect of capillary rise and/or positive head)	"Water Exposure"	Drainage Layer

* CBR swell at OMC and 97% MDD using Standard compactive effort; 4-day soak based on 4.5 kg surcharge.
(Source: Austroads *Guide to Pavement Technology – Part 2*)

(b) Design subgrade CBR = 3% must be adopted into the pavement design if the subgrade soaked CBR is > 3% but with CBR swell of ≥ 2.5% (classified as highly or very highly expansive).

(c) This specification clause does not provide direct criteria for determining the required depth of subgrade treatment in highly or very highly expansive soils (Category C). However, as Category C subgrade will need to be designed with CBR of ≤ 3%, the subgrade treatment of Category B (low design subgrade strength) will ensure that the total "Pavement Cover" is adequate to meet the cover requirements for an expansive subgrade soil. It is noted that the type of subgrade treatment that is acceptable will depend on the expansive nature of the soil. A subgrade with CBR swell of ≥ 2.5% will require capping material to include a low permeability layer.

(d) Subgrade Treatment selection is outlined in Table SC6.4.6.5 - Selection of Subgrade Treatment Type. Subgrade treatment may comprise one or a combination of the alternatives listed.

(7) Expansive soils

(a) Highly expansive materials are classified as highly reactive with high plasticity. Refer to the classification in Table SC6.4.6.4 below, Guide to Classification of Expansive Soils, with prominence give to classification based on the CBR swell.

(b) Expansive soils have the potential to exhibit significant volume changes with the variation in moisture content leading to possible loss of pavement shape and longitudinal cracking in the future pavement. For this reason, if test results indicate highly expansive materials (classified as "High" or "Very High"), the design CBR must be 3% or less.

(c) Materials having a measured CBR swell ≥2.5% must incorporate a low permeability treatment 'Capping Layer' to minimise significant moisture changes in the underlying subgrade.

Table SC6.4.6.4 - Guide to Classification of Highly Expansive Soils

Expansive Nature	Liquid Limit (%)	Plastic Index	PI x % <0.425mm	Potential Swell (%)*
Very High	>70	>45	>3200	>5.0
High	>70	>45	2200-3200	2.5-5.0
Moderate	50-70	25-45	1200-2200	0.5-2.5
Low	<50	<25	<1200	<0.5

*Swell OMC and 97% MDD using Standard compactive effort; 4-day soak based on 4.5 kg surcharge.(Source: Guide to Pavement Technology – Part 2).

(8) Selection criteria for subgrade treatment type

Table SC6.4.6.5 - Selection of Subgrade Treatment Type

Treatment	Soaked CBR ≤ 3%	Wet at construction	Swell < 2.5%	Water Exposure	Treatment Name
L0			✓		Pavement cover (Select Fill)
L1			✓	✓	Drainage layer
L2		✓	✓		Working platform
L3		✓	✓	✓	Drainage layer & working platform
L4	✓		✓		Capping layer
L5	✓		✓	✓	Capping layer & drainage layer
L6	✓				Capping layer & pavement cover
L7	✓			✓	Capping layer, pavement cover & drainage layer
L8	✓	✓	✓		Capping layer & working platform
L9	✓	✓	✓	✓	Capping layer, drainage layer & working platform
L10	✓	✓			Capping layer, pavement cover & working platform
L11	✓	✓		✓	Capping layer, pavement cover, drainage layer & working platform

(a) Treatment L0 – pavement cover (select fill)

(i) Pavement cover is a layer of Select Fill material used as part of a subgrade treatment solution when additional gravel material is required to achieve the subgrade level. “Pavement Cover” is often used to replace wet in-situ subgrade material that has been removed during road excavation.

(ii) Select Fill may comprise a naturally occurring material from on site or imported to site or may comprise a natural material that has its properties improved by addition of cement or lime. The natural material or improved product must meet the minimum requirements in Table SC6.4.6.6 Material Properties for Select Fill below.

Table SC6.4.6.6 - Material properties for select fill and treated material

Property	Depth below Working Platform [1]	
	≤ 150 mm	**> 150 mm**
Laboratory CBR (%) [a]	≥ 10	≥ 10
Maximum aggregate size (mm)	75	75
Plasticity index	≥7	≥7
Weighted plasticity index (WPI)	< 1200	< 2200
Swell (%)	≤ 0.5	≤ 2.5
% Passing 0.075 mm	15–30 inclusive	4–30 inclusive

a. material may be chosen with a minimum CBR greater than specified above, if this is considered to provide a better overall design solution. However, for design purposes, the layer may not be modelled with CBR of greater than 15%.

(b) Treatment L1 - drainage layer

(i) A drainage layer must be provided where water exposure occurs, or is likely to occur, from beneath the pavement (due to the effect of capillary rise and/or positive head).

(ii) A drainage layer is often used to replace soft subgrade material which is found to be wet during earthworks.

(iii) The drainage layer must be a minimum 300mm thick and covered by a minimum 150 mm thick “Working Platform” or “Capping Layer” to provide a foundation for additional pavement layers.

(iv) The drainage layer may be as follows:

1. open-graded 20 mm crushed rock (having no more than 3% of material finer than 75 µm), produced by blending size 20mm, 14mm and 10mm aggregates; or

2. 125 mm nominal size rock fill wrapped in a suitable geotextile. The rock fill must meet the quality requirements for rock fill in TMR Specification MRTS04 and the Geofabric must be selected in accordance with TMR Specification MRTS27.

(c) Treatment L2 - working platform

(i) A working platform is typically a cementitiously stabilised granular layer that is used to overlay a “Drainage Layer” or “Capping Layer”.

(ii) A working platform is required to meet the following minimum standards necessary for it to function when it becomes part of the subgrade for the operating service life of the pavement structure:

1. have a minimum compacted thickness of 150 mm;

2. have a surface maintained with a geometric tolerance of ± 10 mm of the specified height and a maximum deviation from a 3 m straight edge of 8 mm at all points on the surface; and

3. where plant mixed cement stabilised gravel is used; gravel must be of a standard no less than DTMR Type 2.3 with a minimum UCS of 0.8 MPa and a maximum UCS of 3.5 MPa at 28 days.

(d) Treatment L3 - drainage layerl and working platform

Treatment L3 combines treatments L1 & L2 with the 150 mm thick ‘Working Platform’ sitting on top of the 300 mm drainage layer.

(e) Treatment L4 - capping layer

(i) A Capping Layer must be provided where the in-situ untreated subgrade has a design CBR ≤ 3% and is typically used to replace a wet layer of in-situ subgrade material which will be subject to ongoing water exposure.

(ii) The thickness of the capping layer is dictated by the natural ground subgrade CBR as follows:

Table SC6.4.6.7 - Material properties for select fill and treated material

Natural subgrade CBR	Capping Layer Thickness
< 1.5 %	400mm
1.5% - 1.9%	300mm
2.0% - 2.4%	200mm
2.5% - 2.9%	150mm

(iii) The Capping Layer can comprise the following options based on the underlaying subgrade material:

1. In-situ lime stabilisation of the subgrade soil is the preferred means of satisfying "Capping Layer" requirements when the subgrade comprises plastic clay soils.
2. Plant mixed cement stabilised gravel is used where in-situ lime stabilisation is not suitable; gravel must be of a standard no less than DTMR Type 2.3 with a minimum UCS of 0.8 MPa and a maximum UCS of 3.5 MPa at 28 days.
3. Rock fill (geofabric wrapped) can be utilised when the required thickness of the capping layer is at least 300 mm. The rock fill must meet the quality requirements for rock fill in TMR Specification MRTS04 and the Geofabric must be selected in accordance with TMR Specification MRTS27.
4. Select Fill maybe used where the natural subgrade CBR is 3% or higher and the layer thickness is min. 150 mm.

(f) Treatment L5 – capping layer and drainage layer

Treatment L5 combines treatments L4 & L1 with the 'Capping Layer' sitting on top of the 300 mm 'Drainage Layer'.

(g) Treatment L6 – capping layer and pavement cover

Treatment L6 combines treatments L4 & L0 with the 150 mm thick 'Pavement Cover' sitting on top of the 'Capping Layer'.

(h) Treatment L7 – capping layer and pavement cover and drainage layer

Treatment L7 combines treatments L4 & L0 & L1 with the 150 mm thick 'Pavement Cover' sitting on top of the 'Capping Layer' which covers the 300 mm 'Drainage Layer'.

(i) Treatment L8 – capping layer and working platform

Treatment L8 combines treatments L4 & L2 with the 150 mm thick 'Working Platform' sitting on top of the 'Capping Layer'.

(j) Treatment L9 – capping layer and drainage layer and working platform

Treatment L9 combines treatments L4 & L1 & L2 with the 150 mm thick 'Working Platform' sitting on top of the 'Capping Layer' which covers the 300 mm 'Drainage Layer'.

(k) Treatment L10 – capping layer and pavement cover and working platform

Treatment L10 combines treatments L4 & L0 & L2 with the 150 mm thick 'Working Platform' sitting on top of the min. 150 mm thick 'Pavement Cover' which covers a 'Capping Layer'.

(l) Treatment L11 – capping layer and pavement cover and drainage layer and working platform

Treatment L11 combines treatments L4 & L0 & L1 & L2 with the 150 mm thick 'Working Platform' sitting on top of the min. 150 mm thick 'Pavement Cover' which covers a 'Capping Layer' and 300 mm 'Drainage Layer'.

(9) Rural unsealed gravel pavements

(a) An unsealed gravel pavement may be acceptable for assigned traffic volumes of less than 100 vpd on lightly trafficked roads in rural areas.

(b) Where the connecting road to a reconfiguration is also unsealed, it must be upgraded to at least the gravel pavement standard, and, if the assigned traffic volume equals or exceeds 100 vpd, it must be fully sealed, from its connection with an existing sealed road to a threshold point where the assigned traffic volume on the connecting road falls below 100 vpd.

(c) Where an existing rural road is specified as upgraded to gravel pavement standard, the minimum pavement thickness is 100 mm.

(10) Unbound flexible pavement

(a) Generally unbound flexible pavements are the preferred pavement choice on the basis that they are the least expensive option. The disadvantage however of using unbound pavements is that the overall depth of pavement is generally thicker than bound pavements which may cause issues if there are some level constraints which necessitates using a thinner pavement option, such as tying into existing kerb levels.

(b) The design of unbound flexible pavements, including those with cement or lime modified granular materials, is based on the empirical design procedure detailed in the Austroads *Guide to Pavement Technology - Part 2: Pavement Structural Design* and Queensland Department of Main Roads – Supplement to *Part 2: Pavement Structural Design* of the Austroads *Guide to Pavement Technology*.

(c) Figure 8.4 of Austroads *Guide to Pavement Design* - Part 2 : *Pavement Structural Design,* describes the use of DESA to determine the thickness of granular material in an unbound pavement that should be placed above various subgrade CBR strengths. Figure 8.4 has been developed into an empirical design equation for use in flexible pavement design.

(d) The Figure 8.4 pavement design equation is copied below.

$$t = \left[219 - 211(\log CBR) + 58(\log CBR)^2\right]\log(DESA/120)$$

Where t = pavement thickness
CBR = Subgrade CBR
DESA = Design ESAs

(e) Unbound flexible pavements typically comprise 3 layers as follows:

(i) Top Layer – Base (CBR 80) minimum thickness 150mm – DTMR Type 2.1 (MRTS05).

(ii) Mid Layer – Sub-base (CBR 45) minimum thickness 75mm – DTMR Type 2.3 (MRTS05).

(iii) Working Platform / Capping Layer – (Design subgrade CBR 10 or 15) minimum thickness 150mm.

(11) Bound flexible pavement

(a) A bound flexible pavement has a base or sub-base layer that is defined as being composed of either:

(i) Cement stabilised crushed rock with not less than 5% by mass cementitious content to ensure satisfactory erosion resistance (verifiable by laboratory erodability testing) – the cementitious content may include cement, lime/fly ash and/or ground granulated blast furnace slag.

(ii) Dense-graded asphalt.

(iii) Rolled lean concrete having a characteristic 28-day strength of not less than 5 MPa.

(b) Where a bound pavement is being considered a cement stabilised pavement layer is the preferred option and is generally referred to as a Cement Treated Base (CTB) layer. (UCS > 1.5 MPa).

(c) CTB pavements are generally more expensive to construct than unbound pavements and the cement treated layer tends to crack which requires the use of a Strain Alleviating Membrane Interlayer (SAMI) to control cracking and to limit opportunity for water ingress through the pavement via the cracks. The advantage however is the overall pavement thickness being less than unbound pavement and this may be of benefit if underground services are shallow.

(d) The design of bound pavements requires a mechanistic procedure using load calculations based on linear elastic modelling. The computer program CIRCLY is generally used in this design procedure.

(e) Bound flexible pavements typically comprise 4 layers as follows:

(i) Top Layer – Asphalt structural layer and wearing course minimum thickness 50mm (MRTS30).

(ii) Interlayer – SAMI Seal.

(iii) Mid Layer – Plant Mixed Stabilised Sub-base DTMR CAT.1 Standard (MRTS08) 150mm min.

(iv) Working Platform / Capping Layer – (Design CBR 10 or 15) minimum thickness 150mm.

(12) Rigid concrete pavements

(a) Rigid (concrete) pavements, with design traffic up to 1 x 10^6 ESAs must be designed in accordance with either CACA -T51 or Austroads, *Guide to Pavement Technology Part 2: Pavement Structural Design.*

(b) Rigid (concrete) pavements for design traffic above 1 x 10^6 ESAs, the design must be in accordance with Austroads, *Guide to Pavement Technology Part 2: Pavement Structural Design.*

(13) Concrete segmented pavements

(a) Concrete segmental pavements with design traffic up to 1 x 10^6 estimated commercial vehicles exceeding 3T gross must be designed in accordance with CMAA T45.

(b) For design traffic above 1 x 10^6 ESAs estimated commercial vehicles exceeding 3T gross the design must be in accordance with Austroads, *Guide to Pavement Technology Part 2: Pavement Structural Design*, with the calculation of design traffic in terms of ESAs.

(14) Clay segmented pavements

(a) Clay segmental pavements with design traffic up to 1 x 10^6 ESAs must be designed in accordance with Austroads, *Design Manual 1 - Clay Segmental Pavements.*

(b) For design traffic above 1 x 10^6 ESAs and up to 1 x 10^7 ESAs the design must involve consideration of both Austroads, *Design Manual 1 - Clay Segmental Pavements* and Austroads, *Guide to Pavement Technology Part 2: Pavement Structural Design*, with the thicker and more conservative

design of each of the two methods adopted.

(c) For design traffic above 1 x 10^7 ESAs, the pavement must be designed in accordance with Austroad, *Guide to Pavement Technology Part 2: Pavement Structural Design.*

(15) Preferred surfacing design configuration

(a) Except where the pavement is designed for concrete or segmental paver surfacing, the preferred surfacing design should be a bituminous wearing surface configured as follows:

(i) Urban roads - asphalting new pavement

1. Apply SAMIprime-K2 Emulsion Prime @ 1.0 L/m^2 (12 hours curing); or
CRS67 Emulsion Primer Seal (10 mm) @ 1.1 L/m^2 & 110 m^2/m^3 (24 hours curing); or
cutback bitumen AMC0 Prime @ 0.9 L/m^2 (72 hours curing); or
AMC7 Primer Seal (10 mm) @ 1.1 L/m^2 & 110 m^2/m^3 (3 months curing).

2. After curing apply PMB S25E SAMI Seal (10 mm) @ 1.8 L/m^2 & 170 m^2/m^3
(No Traffic).

3. After SAMI Seal apply DG10 A15E PMB Asphalt 30mm Thickness (Local Streets); or
DG14 A15E PMB Asphalt 50 mm Thickness (Trunk Roads); or
DG14 HS Asphalt 50 mm Thickness (Industrial Roads).

(ii) Urban roads - asphalting overlay of existing oxidised and/or milled surfaces

1. Apply SAMIprime-K2 Emulsion Prime @ 0.5 L/m^2 (12 hours curing).

2. After curing apply PMB S25E SAMI Seal (10 mm) @ 1.8 L/m^2 & 170 m^2/m^3
(No Traffic).

3. After SAMI Seal apply DG10 A15E PMB Asphalt 30 mm Thickness (Local Streets); or
DG14 A15E PMB Asphalt 50 mm Thickness (Trunk Roads); or
DG14HS Asphalt 50 mm Thickness (Industrial Roads).

(iii) Rural roads – incl. Rural Sub Arterial Road, Rural Major Collector Road, Rural Local Street

1. Apply SAMIprime-K2 Emulsion Prime @ 1.0 L/m^2 (12 hours curing); or
CRS67 Emulsion Primer Seal (10 mm) @ 1.1 L/m^2 & 110 m2/m3 (24 hours curing); or
Cutback bitumen AMC0 Prime @ 0.9 L/m^2 (72 hours curing); or
AMC7 Primer Seal (10 mm) @ 1.1 L/m^2 & 110 m^2/m^3 (3 months curing).

2. After curing apply 1st Seal (14 mm) Class 170 @ 1.2 L/m^2 & 110 m^2/m^3 precoated.

3. Immediately following 2nd Seal (10 mm) Class 170 @ 1.1 L/m^2 & 145 m^2/m^3
precoated.

(iv) Car parking areas (off-road)

1. Apply Cutback bitumen AMC0 Prime @ 0.9 L/m^2 (72 hours curing).

2. After curing apply Class 170 bitumen seal 10mm @ 1.0 L/m^2 & 145 m^2/m^3 - or
DG10 Class 320 Asphalt 30 mm Thickness.

(b) Variations to these requirements may be approved by council in special circumstances.

SC6.4.6.3 Subsurface drainage design

(1) Subsoil and sub pavement drains

(a) Warrants for use

(i) Subsoil drains are designed to drain groundwater or seepage from the subgrade and/or subbase in cuttings and fill areas.

(ii) Sub pavement drains are designed to drain water from base and subbase pavement layers in flexible pavements, and to drain seepage or groundwater from the subgrade.

(iii) Subsoil or sub pavement drains must be provided on both sides of the formation in the following locations, unless the geotechnical report indicates the absence of subsurface moisture at the time of investigation and the likelihood that changes in the subsurface moisture environment will not occur within the design life of the pavement and/or the pavement has been specifically designed to allow for likely variations in subgrade and pavement moisture contents:

1. cut formations where the depth to finished subgrade level is equal to or greater than 400 mm below the natural surface level;
2. locations of known hillside seepage, high water table, isolated springs or salt affected areas;
3. irrigated, flood prone or other poorly drained areas;
4. highly moisture susceptible subgrades, I.e., commonly displaying high plasticity or low soaked CBRs;
5. use of moisture susceptible pavement materials;
6. existing pavements with similar subgrade conditions displaying distress due to excess sub surface moisture; and
7. at cut to fill transitions.

(b) Layout, alignment, and grade

(i) Typical cross sections of subsoil drains are shown in Standard drawing SD-080 – Subsoil Drain. In kerbed roads, the only acceptable location for the line of the trench is directly behind the kerb-line. Pavement layers must extend to at least the line of the rear of the trench.

(ii) In un-kerbed roads, subsoil and sub pavement drains must be located within the shoulder, preferably at the edge of the pavement layers.

(iii) The minimum desirable longitudinal design grade is 1.0%. For non-corrugated pipes, an absolute minimum grade of 0.5% is acceptable.

(iv) Trench widths must be a minimum of 300 mm for a 100 mm diameter slotted pipe or a minimum of 100 mm for strip drains. Outlets must be spaced at maximum intervals of 150 m into gully pits or outlet headwalls. As a salinity prevention measure and where practical, discharge must be on the downhill side of the embankment or in the cut/fill area to reduce the risk of recharge to the sub surface water table. Unless otherwise authorised, where sub surface drains outlet through fill batters, unslotted plastic pipe of the same diameter as the main run must be specified. A small precast concrete headwall must be installed at the drain outlet with a marker post to assist maintenance and protect the end of the pipe.

(v) Cleanouts must be provided at the commencement of each run of drain, and at intervals not exceeding 80 m. Cleanouts must generally be located directly at the rear of kerb or at the edge of shoulder, as applicable.

(vi) In salinity affected areas, the designer should consider providing a separate drainage system for subsurface drains to discharge to a basin where controlled release or desiccation treatment and removal can be facilitated as a maintenance operation. Saline subsurface drainage should not be routinely discharged directly into natural watercourses. Reference to water quality targets for downstream watercourses is essential and the designer must provide advice on discharge operations and maintenance compatible with water quality targets and the requirements of the relevant land and water resource or environmental protection authority.

(2) Foundation drains

(a) Warrants for use

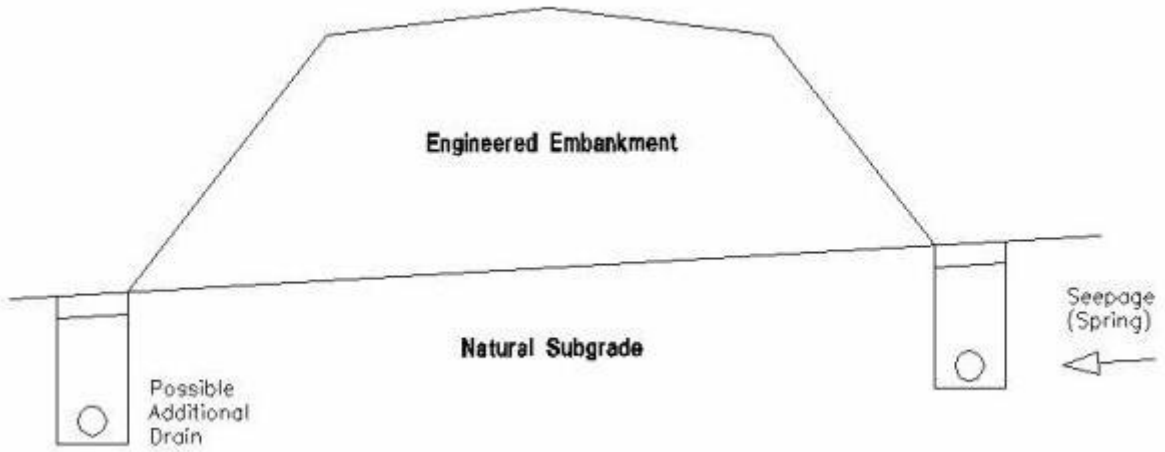
(i) Foundation drains are designed to drain excessive ground water areas within the foundation of an embankment or the base of cutting, or to intercept water from entering these areas.

(ii) The need to provide foundation drains may be apparent from the results of the geotechnical survey along the proposed road formation alignment, and in this case the location must be shown on the drawings. However, more commonly, the need to provide foundation drains is determined during construction, and hence in this situation requirements and locations cannot be ascertained at the design stage.

(iii) Where the road formation traverses known swampy, flood prone, salt affected areas or water charged strata, the drawings must be suitably annotated for the potential need for foundation drains at various locations, in addition to those shown on the drawings.

(b) Layout, alignment, and grade

(i) Typical cross sections of foundation drains are shown below.



1. The minimum desirable design grade is 1%. For non-corrugated pipes an absolute minimum grade of 0.5% is acceptable.

2. Foundation drains must have a minimum trench width of 300 mm, with a variable trench depth to suit the application and ground conditions on site.

3. Outlets must be spaced at maximum intervals of 150 m.

4. Where practicable, cleanouts must be provided at the commencement of each run of foundation drain and at intervals not exceeding 60 m. Where not practicable to provide intermediate cleanouts, outlets must be spaced at maximum intervals of 100 m.

(3) Drainage mats (blankets)

(a) Warrants for use

(i) Type A drainage mats are designed where there is a need to ensure continuity of a sheet flow of water under fills, to collect surface seepage from a wet seepage area, or for protection of vegetation or habitat downstream of the road reserve where a fill would otherwise cut the flow of water. Type A drainage mats are constructed after the site has been cleared and grubbed and before commencement of embankment construction.

(ii) Type B drainage mats are designed where there is a need to intercept water which would otherwise enter pavements by capillary action or by other means on fills and to intercept and control seepage water and springs in the floors of cuttings. Type B drainage mats must be constructed after completion of the subgrade construction and before construction of the pavement.

(iii) The need to design for the provision of drainage mats should be apparent from the result of the geotechnical survey along the proposed road formation alignment.

(4) Documentation – subsurface drainage drawings and calculations

The proposed location of all subsurface drains must be clearly indicated on the drawings, including the nominal depth and width of the trench, and the location with respect to the line of the kerb/gutter or edge of pavement. The location of outlets and cleanouts must also be indicated on the drawings.

SC6.4.6.4 Roadworks construction

(1) Introduction

Generally, the process of road construction is dictated by the materials being used and the latent / site specific conditions encountered during the conduct of the works, hence road works are generally administered using a construction contract.

Contract documents used for road construction typically include construction specifications, design drawings, a bill of quantities and contract provisions which describe how to manage site specific construction challenges and latent conditions if they are discovered during the conduct of the works.

In the absence of a construction contract, minor roadworks maybe undertaken in accordance with the requirements described in the roadworks standard drawings that show the minimum standard that council has adopted regarding roadworks.

To ensure the constructed works are ‘fit-for-purpose’ and comply with the requirements described within the planning scheme and associated roadworks standard drawings, council will inspect the works during construction in accordance with an inspection and test plan agreed between the works contractor and the council inspector.

The inspection requirements set out in this section comply generally with the requirements described in Department of Transport and Main Roads construction specifications and are intended to inform the Developer and the Developer’s Contractor of the inspections process followed by Townsville City Council whilst inspecting roadworks involving existing and future Council assets.

(2) Who attends the inspections

Inspections are carried out by a Council works Inspector and if the works also involve a State Controlled Road a TMR works Inspector may also attend the same inspection. It is recommended that the developer's engineer who holds RPEQ qualifications who will certify the works also attends the inspection. If possible, the developer will be advised beforehand if Council or Main Road's inspectors will be attending the inspection.

(3) When are inspections required

The development approval conditions and / or the Contract and works specification describe various hold points in the work that require inspection before subsequent work can proceed. Similarly, the Council have specific inspection requirements that must be satisfied before the work is accepted as complete. The following list sets out the mandatory inspections that must be carried out in order to comply with Council inspection requirements, additional inspections may also be required, these are detailed in the development approval conditions and / or the contract and works specification and will be advised by Council at the prestart meeting.

(a) Prestart meeting

(b) Subgrade inspection.

(c) Pre-seal inspection

(d) Works completion inspection

(e) Close-out workshop

(f) End of maintenance inspection

(4) Notifying inspections

The Developer's Contractor is responsible for notifying the Council when the work is ready for inspection. Council requires the following notification times, based on logistical considerations, to arrange for the Council Inspector and / or Main Roads to attend the inspection if they so choose. Note, not all inspections will be attended by Council and / or Main Road's inspectors, attendance is at their sole discretion.

(a) Prestart meeting – 2 complete working days.

(b) Subgrade inspection - 2 complete working days.

(c) Pre-seal inspection - 2 complete working days.

(d) Works completion inspection - 2 complete working days.

(e) Close-out workshop – seven (7) days minimum.

(f) End of maintenance inspection - seven (7) days minimum.

The notification times for inspections not listed above will vary, but as a general rule any inspection will require a minimum notification period of 2 complete working days.

(5) Acceptance of the works "works completion"

Acceptance of the works "works completion" is acceptance of Council of the constructed infrastructure as complete and complies with the approved design drawings and development approval conditions. It also allows the road to be operated under traffic.

This acceptance does not however, discharge the Developer's Contractor from their obligation to provide infrastructure free of defects. Any defect which is discovered after the acceptance of "works completion" and prior to "end of maintenance" and attributed to the failure to deliver the work in accordance with the approved design drawings and development approval conditions (if relevant), shall be repaired at the Developer's cost.

(6) As constructed drawings

Following a satisfactory “works completion” inspection, the Contractor shall supply “as constructed drawings” comprising one print of each drawing marked “As Constructed”, excluding Council / TMR standard drawings, and including amendments (shown in red) incorporated in the construction of the work, and overprinted with a certificate or stamp of an approved Surveyor as follows:

“I/We (Name) of (Firm) hereby certify that the works as shown on the ‘as constructed’ drawings reflect any changes that were made during the course of construction (signed with RPEQ No and dated)”.

The survey information obtained by the Surveyor performing the as constructed survey must include levels at all design level locations shown on the originally approved drawing or at 25 m intervals whichever is the more severe, as set out below:

(a) Dimensions detailing traffic lane widths, width from edge line to lip of kerb, and footpath width.

(b) Levels at the crown and at the line of lip of kerb and channel.

(c) Rural Roadworks:

(d) Dimensions detailing traffic lane widths and width of shoulder.

(e) Levels on the finished pavement, at the crown and at the edge of bitumen.

(f) Levels on the invert of the table drains.

(7) Workmanship guarantee

As part of the contractual requirements between the Developer and the Contractor, at the completion of the works, Council requires a certificate from the Contractor guaranteeing that the works have been constructed in accordance with the drawings and specifications approved for construction.

An acceptable form of certificate follows.

WORKMANSHIP GUARANTEE

Development description:

_____

Development address/property legal description: _____

Development application number (stage number): _____

Name of developer: _____

I/We.....being a civil engineering construction firm (Contractor) and having been commissioned, by way of contract or otherwise, to carry out the construction of works comprising of:

Earthworks, Roads and Strom Water Drainage, Sewer Reticulation and Water Reticulation, Electrical and Telecommunications Services (add or delete as appropriate)

do hereby certify that:

The works have been constructed in accordance with the drawings and specifications of the project, and relevant Australian Standard Codes of Practices. During the course of construction, I/we have called for inspections and testing required in the documentation and the inspections and tests have met specifications in all respects. I/We further guarantee that the standard of workmanship between inspections has been maintained at all times and the materials used in the construction have been approved and are in compliance with the specifications and where required stamped by the manufacturer to guarantee their authenticity.

I/We hereby certify the works free of defect for a period of one (1) year.

Name:	.....
Position:	.....
Name of consulting company	.....
Contact postal address	.....
Contact phone number	.....
Signature:	.....
Date	.....

Click here to download a copy of this form

(8) “Maintenance period” and “on Maintenance”

The period of time between the acceptance of the works "works completion" and the acceptance of the works "end of maintenance" is termed the “maintenance period”. During the maintenance period the constructed work is deemed to be “on Maintenance”. The length of time for the maintenance period will be as set out in the contract documentation and will generally be 12 months.

If for any reason during the “maintenance period” a defect of substantial proportions is discovered then Council reserves the right to extend the “maintenance period”, for a further period from the date of correction of the defects.

(9) Close-out workshop inspection

Within 21 days of acceptance of the works “work vcompletion” the Contractor must notify the Council that the Developer’s Contractor is ready to participate in a close-out workshop. As part of the close-out workshop the work “on maintenance” is to be thoroughly inspected by the Council and / or Main Road’s inspector, all defects identified during the inspection will be recorded and agreed by the Contractor, Developer’s representative / Superintendent and inspectors.

Following this inspection, the Contractor and Council inspector will conduct a workshop to identify any necessary corrective work required to close-out any defects.

Decisions made at the workshop will be recorded by the Council Inspector and a copy of the workshop decision summary will be provided to the Developer’s representative / Superintendent.

(10) “End of maintenance” inspection

Acceptance of the works "end of maintenance" is acceptance of Council of the constructed infrastructure in a defects free condition.

The “end of maintenance” inspection will be carried out following the repair of all of the defects identified during the close-out Workshop inspection and expiration or the maintenance period. This final inspection will be attended by the Council inspector. Notice as detailed in Section 4 is required for the booking of "end of maintenance" inspection. If during this final inspection, the Council Inspector is satisfied that all the defects have been satisfactorily repaired and no new defects are evident in the works performed by the Contractor, the work shall be accepted “end of maintenance” and the maintenance period shall be deemed expired.

(11) What to expect at roadworks inspections

(a) Subgrade inspection

The subgrade is to be inspected and approved by the Council inspector prior to placing pavement material.

At the inspection the Council Inspector will inspect the following elements of the work and will:

(i) Confirm by visual inspection that the surface of the subgrade is free from organic material such as large tree roots and no “soft” or “boggy” areas are present.

(ii) Check the level and profile of the subgrade. Tolerances shall be in accordance with the approved specification. If necessary, the Contractor shall present the work in a manner such that the level can be verified.

(iii) Check that the required subgrade compaction (density) tests have been carried out in accordance with the approved specification. The subgrade compaction certificates are to be provided to the Council Inspector at the inspection.

(iv) If the subgrade is considered suspect the Council inspector will require a loaded water truck to traverse the subgrade at the time of the subgrade inspection and may request further compaction tests if it is considered necessary.

(b) Pre-seal pavement inspection

The pavement is to be inspected and approved by the Council’s Inspector prior to sealing.

The Council’s inspector will inspect the following elements of the work and will:

(i) Check the quality of the different courses of the pavement in accordance with the approved specification. This will be confirmed by the supply of the following pavement test certificates from a registered laboratory:

1. Compaction results for each course of pavement.
2. Grading, atterberg limits and a CBR test of each course of pavement material in accordance with the approved specification.

(ii) Confirm the total depth of pavement at the location of each base course compaction test. This depth is to be recorded on the compaction test certificate from the Soil Testing Officer and is to be not less than the design pavement depth. Any asphalt surfacing is not to be included in the pavement depth.

(iii) Check the level and profile of the finished pavement surface. Tolerances shall be in accordance with the approved specification. If necessary, the Contractor shall present the work in a manner such that the level can be verified.

(iv) Check the level and grade of the kerb and channel and / or table drains. This may require a runoff water flow test to be performed involving a release of water from a water truck to observe the drainage system is graded sufficiently. The tolerances shall be in accordance with the approved specification.

(c) Asphalt or bituminous surfacing

The bitumen or asphalt surfacing is to be inspected and approved by the Council Inspector prior to the acceptance of the works "works completion" inspection.

The Council inspector will inspect the following elements of the work and will:

(i) Confirm by visual inspection and the supply of bituminous spray sheets by the Contractor that the bitumen / binder type, aggregate sizes, spray rates and aggregate spread rates comply with the approved seal design. The Council Inspector will be looking for consistency in the spread of aggregate over the spayed bitumen.

(ii) Any variation to the approved seal design must be pre-approved by the Council Inspector and if requested by the Council Inspector may require an initial trial spray to be performed to prove the application rate. Should the spray show flushing on the initial trial it may be necessary to reduce the application rate.

(iii) Excess loose aggregate must be swept from the road surface and cleared from the kerb and channel and/ or table drains.

(iv) Where asphaltic concrete surfacing has been performed, the Contractor must supply test results on samples of the material supplied to the site taken at the asphalt plant together with field tests to confirm asphalt depth and percentage of voids filled.

(d) Pavement line marking

Where pavement line marking is to be completed, particularly involving passing and turning lanes at major intersections, such work is to be completed within 48 hours of surfacing. Where the surface to be line marked is a chip seal, then the surface is to be thoroughly swept to remove loose aggregate prior to line marking.

All pavement markings shall be in accordance with the approved specification.

Removal of line marking errors shall be carried out using sandblasting or water blasting methods, blacking out using paint will not be accepted.

Development manual planning scheme policy (PSP)
SC6.4.7 Clearing, grubbing and earthworks

Index

SC6.4.7.1 Clearing and grubbing

(1) Introduction
(2) Clearing
(3) Grubbing
(4) Biosecurity

SC6.4.7.2 Earthworks introduction

(1) Objectives
(2) Scope
(3) Reference and source documents

SC6.4.7.3 Earthworks design

(1) Purpose
(2) Lot grading and stormwater flows
(3) General standard of lot preparation
(4) Standard of fill for lots
(5) Temporary diversion drains
(6) Compliance with the Department of Environment, Science and Innovation
(7) Cartage of soil
(8) Effect on adjoining properties

SC6.4.7.4 Earthworks construction

(1) Introduction
(2) Reference and source documents
(3) Natural surface and earthworks materials
(4) Protection of earthworks
(5) Erosion and sediment control
(6) Setting out of earthworks
(7) Stockpile sites
(8) Suppression of dust

SC6.4.7.5 Removal of topsoil

(1) Scope
(2) Topsoil stockpiles

SC6.4.7.6 Cuttings

(1) Scope
(2) Excavation
(3) Batter tolerances
(4) Benching in cuttings
(5) Subgrade of cuttings
(6) Transition from cut to fill

SC6.4.7.7 Blasting

(1) General
(2) Presplitting
(3) Blasting records
(4) Control of air blast over-pressure
(5) Control of ground vibration

SC6.4.7.8 Unsuitable material

SC6.4.7.9 Embankment construction

(1) Scope
(2) Embankment material
(3) Foundations and embankments
(4) Hillside embankments
(5) Placing fill for embankment construction
(6) Embankment batters
(7) Rock facing to embankments
(8) Trimming tops of embankments
(9) Select material zones
(10) Fill adjacent to structures
(11) Treatment at weep holes
(12) Selected backfill
(13) Spoil
(14) Borrow

SC6.4.7.10 Acid sulphate soils

(1) Objective
(2) References and source documents
(3) Safety requirements
(4) Environmental requirements
(5) Equipment and materials
(6) Method

SC6.4.7.11 Compaction and quality control

(1) Compaction and moisture requirements
(2) Test locations
(3) Deflection monitoring
(4) Widening of formation
(5) Subgrade testing and treatment

SC6.4.7.12 Summary of limits and tolerances

SC6.4.7.13 Clearing and grubbing hold points

SC6.4.7.14 Clearing and grubbing witness points

SC6.4.7.15 Earthworks hold points

SC6.4.7.16 Earthworks witness points

SC6.4.7.1 Clearing and grubbing

(1) Introduction

(a) Scope

This section provides standards, advice, and guidelines for the clearing of all vegetation, both living and dead, all minor man-made structures (such as fences and livestock yards), all rubbish and other materials, including the chipping of the crowns of trees and the branches of shrubs, and the grubbing of tree stumps from the area. The work also includes the disposal, in accordance with Clause SC6.4.7.1 (3)(b) Chipping of cleared vegetation and Clause SC6.4.7.1 (3)(c) Disposal of materials, of all materials that have been cleared and grubbed.

(b) General requirements

Site works shall take all measures to prevent damage to existing underground and overhead utility services.

Before commencing earthworks, locate and mark existing underground services in the areas to be affected by the works including clearing, excavating, and trenching.

All existing utilities, natural landscape features, including natural rock outcrops, natural vegetation, trees to be preserved, soil and watercourses are to remain undisturbed.

Explosives shall not be permitted to be used in clearing, grubbing or other demolition activities.

BEFORE YOU DIG is a free service, from anywhere in Australia, through which underground pipe and cable locations can be reviewed. For more information go to the Before You Dig website www.byda.com.au.

(2) Clearing

(a) Clearing operations

The area within the limits of clearing shall be cleared of all vegetation, both living and dead, all minor man-made structures (such as fences and livestock yards), all rubbish and other materials, which are unsuitable for use in the works with the exception of certain trees marked for preservation. The Contractor shall plan clearing operations such that wherever possible, clearing is carried out progressively and only the minimum area of land is left disturbed at any time.

The contractor shall give the Superintendent written notice of seven days of the intention to clear any area of the work. The Superintendent shall mark or indicate to the Contractor the trees that shall be preserved. The contractor shall arrange for an inspection by an authorised Council officer and shall obtain Council's approval to proceed with clearing and grubbing. The Contractor must conform to the requirements of Section SC6.4.23 Construction management, quality management, inspect and testing, Clause SC6.4.23.1 (4)(s)(i) when protecting identified trees and bushland within or adjacent to the construction site.

The erection of structures, excavation and filling, changes to soil profiles, stockpiling of spoil, storage of other materials and driving or parking of any vehicle or machinery within 4 m of the trunks of trees to be retained shall not be permitted.

The Contractor shall plan all operations to ensure that there is no damage to any trees outside the limits of clearing specified or directed by the Superintendent. No growing trees shall be destroyed or damaged by the Contractor other than those specified and those indicated by the Superintendent.

Any tree remaining within the road reserve but outside the limits of clearing which is, in the opinion of the Superintendent, unsound and likely to fall upon the roadway shall be

cleared and disposed of in accordance with Clause SC6.4.7.1 (3)(b) Chipping of cleared vegetation, subject to prior approval of Council.

If directed by the Superintendent, any branch, which overhangs the road formation, shall be cut back to within 0.5 m of the tree trunk and disposed of in accordance with Clause SC6.4.7.1 (3)(b) Chipping of cleared vegetation.

Developers shall provide offset planting where required under the Council's Public Tree Management Policy and Public Tree Management Guidelines.

(b) Fallen timber and tree damage

Every precaution shall be taken to prevent timber from falling onto private property. The Contractor shall dispose of any timber that has fallen onto private property or produce written consent from the property owner to its remaining there.

The cost of disposal of such fallen timber shall be borne by the Contractor. Prior to entering the private property, the Contractor shall obtain consent from the Superintendent and the property owner. Damage of any kind, including damage to trees, fencing, etc, occurring during clearing operations shall be made good by the Contractor. The cost of making good such damage shall be borne by the Contractor. Any damage to trees or vegetation which in Council's opinion, will require its removal, is to be in rectified in accordance with Section SC6.4.23 Construction management, quality management, inspection and testing, Clause SC6.4.23 1(4)(s)(iv).

(3) Grubbing

(a) Grubbing

All trees and stumps, on or within the limits of clearing, unable to be felled and removed by the clearingmethods used by the Contractor shall be removed by grubbing.

Grubbing operations shall be carried out to a depth of 0.5 m below the natural surface or 1.5 m below the finished surface level, whichever is the lower.

Holes remaining after trees and stumps have been grubbed shall be backfilled promptly with sound material to prevent the infiltration and ponding of water. The backfilling material shall be compacted to at least the relative density of the material existing in the adjacent ground.

(b) Chipping of cleared vegetation

The Contractor shall produce a wood-chip mulch derived from crowns of trees and branches of shrubs cleared under this section. The wood-chip mulch produced shall be stockpiled for subsequent use or for use at other locations as appropriate, where a biosecurity risk has not been identified.

The wood-chip mulch shall be produced from branches having a maximum diameter of 100 mm and the chipped material produced shall not have two orthogonal dimensions exceeding 75 mm and 50 mm.

(c) Disposal of surplus material

Unless a biosecurity risk is identified, all surplus materials cleared and grubbed in accordance with this section shall either be removed from the site or used for landscaping within the site in accordance with the approved plans and any conditions set by Council.

(d) Burning of cleared vegetation

Unless otherwise approved by Council in writing, disposal of timber and other combustible materials by burning shall not be permitted.

(4) Biosecurity

Vehicle and machinery hygiene (washdown / blowdown) is the one of the best spread reduction measures for weed seeds and biosecurity risks (E.g., Yellow Crazy Ants). All machinery must be clean when entering a site and machines must be cleaned before leaving the site. Contractors shall keep a log of where the machine's next movements are. This will assist biosecurity tracing efforts for any weed or pest that may arise.

Machinery hygiene is relevant for Yellow Crazy Ants (YCAs), where nests can be in clumps of dirt that spread to the next site. In addition, if it is a known YCA site, a parking pad shall be created for vehicles to park outside of the infestation. YCAs start to nest in machines (or material) that has been sitting longer than 24hrs. As such, any vehicles and machinery kept onsite should be parked outside the YCA infestation when not in use for the day. Once a project finishes, spraying a general ant control product on the machine is required.

Developers and Contractors shall view Yellow Crazy Ant (YCA) hot spot mapping before commencing any works on a site.

SC6.4.7.2 Earthworks introduction

(1) Objectives

This section provides advice, guidelines, and standards for earthworks to ensure the:

(a) efficient, sustainable, and economical design;

(b) enhancement of the environmental character of the site whilst maintaining the natural features of the site;

(c) provision of safe conditions for construction commensurate with the proposed purpose of the development;

(d) equality of building conditions for residential development; and

(e) earthworks do not impact on adjoining properties and developments.

(2) Scope

(a) This section sets out requirements for earthworks involved in land development and subdivision.Conceptual requirements are presented as necessary considerations when preparing designs for earthworks.

(b) The scope of this section assumes that the designer is familiar with requirements cited in the various construction specifications, specifically those related to earthworks, clearing, and grubbing and erosion and sedimentation. Additionally, the designer is required to make reference to the associated design sections related to stormwater drainage design, geometric road design and stormwater quality management, and any other relevant best practice documents.

(3) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(a) SC6.4 Development manual planning scheme policy sections:

Section SC6.4.8 Stormwater management.

Section SC6.4.12 Landscaping and open space.

Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.1 Geometric road design

Section SC6.4.9 Stormwater quantity.

(b) Australian Standards:

AS3798 *Guidelines on earthworks for commercial and residential developments*

AS2870.1 *Residential slabs and footings - construction.*

(c) Qld Government Legislation:

Work Health and Safety Act 2011

SC6.4.7.3 Earthworks design

(1) Purpose

(a) Areas of a site proposed for earthworks, building, or recreational purposes may not be suitable in their natural state for their intended function without improvement works to:

(i) alleviate flooding of low-lying ground;

(ii) fill gullies or create emergency flow paths after underground stormwater piping has been installed;

(iii) allow improved runoff from flat ground;

(iv) regrade excessively steep slopes that would preclude economical construction of dwelling foundations;and

(v) allow effective recreational use or give reasonable access.

The designer must review the natural surface contours as determined and identified on site and where necessary must design finished surface levels that ensure the land is suitably prepared.

(b) Areas should be regraded to minimise the necessity for underground drainage systems with surface inlet pits and allow surface water to flow naturally to roads or drainage reserves without excessive concentration.

(c) The designer must consider the implications of earthworks in relation to the existing natural environment.Generally, earthworks must be minimised in heavily treed areas.

(d) Care must be taken to provide depressions for overland flow from low points and over major drainage lines, to direct stormwater for storms up to a 1% annual exceedance probability (AEP).

(e) The design of earthworks areas in conjunction with the design of roadworks must be considered with the objective of balancing cut to fill and achieving both an economic development and minimising haulage of imported fill or spoil to and from the development site. Bulk haulage should always be considered as having an adverse effect on adjacent development and infrastructure.

(2) Lot grading and stormwater flows

(a) All lots must be regraded to a minimum level at the 1% AEP flood level. In doing so, the designer must ensure that other areas are then not affected by flooding. The site must be identified on the drawings with appropriate notation of site-specific requirements. As a guide, minimum lot grading should be 1:200 for residential development and 1:400 for commercial development. Minimum lot grading should be 1:400 for rural residential development if cut/filling is proposed over the entire development site, or if the applicant is to provide a building pad, the building pad must be above 1% AEP and the minimum grading for the building pad should be 1:200.

(b) Where an area is known to be affected by or inundated by local stormwater flows, the designer must investigate the existing conditions as they relate to the proposed development and advise the developer in the preliminary design report on all data obtained in the investigation and recommend appropriate contour adjustments. The report should be accompanied by sketch plans to clarify recommendations and any other relevant data.

(c) Site constraints, either natural or otherwise may be required to be identified as a burden on developed property. The designer must take this into account when preparing the design. The property may ultimately be affected by a "restriction as to user", which may be controlled by a legal Instrument placed on the title to the land and/or by a message advising

prospective purchasers of any restrictions affecting the land.

(d) The finished surface of filled areas must be designed to levels allowing an adequate cover depth over the pipeline (if piped) and permit surface stormwater flow to be guided to inlet pits if depressions are retained in the finished surface contouring.

(e) The location of such features must be clearly defined on the earthworks plans and defined by distance to corner boundaries etc. for purposes of relocation. A geotechnical report specifying the site-specific preparation and compaction requirements, must be incorporated in the earthworks plan. A description of the minimum acceptable quality of the fill must also be specified on the plans, supported by geotechnical recommendations. All documentation necessary from various authorities to support the filling of dams and water courses must be supplied with the drawings.

(f) The finished level of any building area must be designed to ensure a desirable surface grading of 1:200 minimum oriented in the direction of the drainage system designed to cater for its catchment.

(3) General standard of lot preparation

(a) Special requirements will apply where necessary but generally lots are to be cleared of low scrub, fallen timber,debris, stumps, large rocks, and any trees which in the opinion of Council are approaching the end of their functional life or are dangerous or will be hazardous to normal use of the development. Prior consultation with Council's officer responsible for tree preservation, or other authorised Council officer, is necessary. Such requirements must be shown on the drawings.

(b) All timber and other materials cleared from lots must be removed from the site. All roots, loose timber, etc. which may contribute to drain blockage must be removed. Such requirements must be shown on the drawings.

(c) Burning or burying of waste vegetation on site is not permitted unless otherwise approved by Council. Clearing and grubbing of the development site shall otherwise be undertaken in accordance with Clause SC6.4.7.1 Clearing and grubbing.

(d) Selected trees must be preserved by approved means to prevent destruction normally caused by placement of conventional filling or other action within the tree drip zone. The Tree Preservation Officer, or other authorised Council officer, must be consulted for advice and all specific requirements noted on the drawings.

(4) Standard of fill for lots

(a) The following notations are to be incorporated in the drawings. "Filling is to be of sound clean material, and be free from large rock, stumps, organic matter, and other debris". "Placing of filling on the prepared areas shall not commence until the authority to do so has been obtained from the Council".

(b) All work must be in accordance with AS3798. Fill must be placed in layers not exceeding 150 mm compacted thickness. All filling must be compacted to 95% standard maximum dry density. Maximum particle size is 2/3 of the layer thickness.

(c) Fill comprising of natural sands or industrial wastes, or by-products may only be used after the material type and location for its use is approved by Council and will be subject to specific requirements determined by prevailing conditions.

(d) It is essential that prior advice be given of intended use of such materials. It should be noted that failure to obtain Council's approval may lead to an order for removal of any material considered by Council or other relevant authorities as unsuitable or in any way unfit for filling.

(e) All areas where filling has been placed must be dressed with clean arable topsoil, fertilised and sown with suitable grasses. This work must be carried out in accordance with the Section SC6.4.12 Landscaping and open space.

(5) Temporary diversion drains

Where temporary drains are required to divert surface flows away from the earthworks area, the location and silt/erosion control treatment must be clearly identified on the drawings. The scale of such works must reflectthe volume of water to be diverted.

The objective will be to ensure minimal soil disturbances and material loss off the site.

The requirements identified in Section C6.4.8 Stormwater management, SC6.4.9 Stormwater quantity, and SC6.4.10 Stormwater quality must be addressed for technical details and any additional requirements.

(6) Compliance with the Department of Environment, Science and Innovation

The designer is recommended to refer to the Department of Environment, Science and Innovation regarding any items requiring specific consideration when preparing an earthworks plan. Such plans may need to incorporate sediment/siltation/erosion control devices with specific reference to the stage at which these are to be provided. The responsibility rests with the developer to make enquiries with the Department of Environment, Science and Innovation and to subsequently obtain Council approval to proposed measures.

(7) Cartage of soil

The designer must refer to Council for acceptable haul roads with applicable load limits. This detail must beshown on the earthworks plan. The payment of a bond, as determined by Council, may be required from the Contractor where Council has some concern about the ability of a haul road to sustain the loads without undue damage or maintenance requirements.

Unless specific application is made to Council and approval obtained, the plans must be annotated as follows:"All topsoil must be retained on the development site and utilised effectively to encourage appropriate revegetation."

No soil shall be removed from site where a biosecurity risk exists.

(8) Effect on adjoining properties

(a) Where it is proposed to divert or direct piped stormwater into adjoining properties, drainage easement rights must be created over the adjoining lots in accordance with the Section SC6.4.9 Stormwater quantity.

(b) A written agreement between the developer and adjoining property owners to carry out construction work on adjoining properties must be submitted to Council prior to works commencing.

(c) Works must not cause ponding of stormwater on adjacent allotments and no stormwater formerly flowing onto the site may be diverted onto other neighbouring allotments or reserves.

(d) Earthworks must be graded so that the new landforms are free draining and all stormwater naturally falling into the site is collected within the property boundaries and discharged to a lawful point of discharge as agreed with Council.

SC6.4.7.4 Earthworks construction

(1) Introduction

(a) This section provides standards, advice and guidelines for earthworks and associated construction, including:

(i) removal of topsoil;

(ii) all activities and quality requirements associated with site regrading, the excavation of

cuttings, the haulage of material and the construction of embankments to the extent defined in the drawings and this section;

(iii) removal and replacement of any unsuitable material;

(iv) any spoil or borrow activities associated with earthworks; and

(v) any additional processing of selected material for the selected material zone.

(b) Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in Section SC6.4.23 Construction management, quality management, inspection and testing and in the inspection tables below.

(2) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(a) SC6.4 Development manual planning scheme policy sections:

Section SC6.4.6 Road works and traffic control

Section SC6.4.8 Stormwater management

Section SC6.4.9 Stormwater quantity,

Section SC6.4.10 Stormwater quality.

(b) Australian Standards:

AS1141.11.1	*Methods for sampling and testing aggregates - Method 11.1: Particle size distribution - Sieving method*
AS1141.11.2	*Methods for sampling and testing aggregates - Method 11.2: Particle size distribution for vision sizing systems*
AS1289.3.3.1	*Methods of testing soils for engineering purposes – Method 3.3.1: Soil classification test - Calculation of the plasticity index of a soil*
AS1289.5.1.1	*Methods of testing soils for engineering purposes - Method 5.1.1: Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using standardcompactive effort*
AS1289.5.4.1	*Methods of testing soils for engineering purposes - Method 5.4.1: Soil compaction and density tests – Compaction control test - Dry density ratio, moisture variation and moisture ratio*
AS1289.5.7.1	*Methods of testing soils for engineering purposes - Method 5.7.1: Soil compaction and density tests—Compaction Control Test Hilf density ratio and Hilf moisture variation (Rapid Method)*
AS1289.6.1.1	*Methods of testing soils for engineering purposes - Method 6.1.1: Soil strength and consolidation tests - Determination of the California Bearing Ratio of a soil - Standard laboratory method fora remoulded specimen*
AS1289.7.1.1	*Methods of testing soils for engineering purposes - Method 7.1.1: Soil reactivity tests – Determination of the shrinkage index of a soil*
AS2187.0	*Explosives - Storage, transport and use - Part 0: Terminology*
AS2187.1	*Explosives - Storage, transport and use - Part 1: Storage*
AS2187.1	*Explosives - Storage, transport and use - Part 2: Use of explosives*

(c) QLD Government Legislation:

Environmental Protection Act 1994

Environmental Protection (Noise) Policy 2019

Explosives Act 1999

Explosives Regulation 2017

Planning Act 2016

Work Health and SafetyAct 2011

(d) Other:

Department of Transport and Main Roads, Queensland	MRTS55	*Use of Explosives in Roadworks*
International Erosion Control Association (IECA)		*Best Practice Erosion and Sediment Control*
Workplace Relations Ministers' Council		*Australian Code for the Transport of Explosives by Road and Rail*

(3) Natural surface and earthworks materials

(a) Natural surfaces

The Contractor must verify the accuracy of the model by field surveys. If the Contractor considers anyareas of the model not to be representative of the approved plans, the Contractor shall give not less than seven days' notice, prior to commencement of works to the Superintendent to allow checking. If the subsequent check survey reveals the ground model to be incorrect, any plans that are affected are to beresubmitted for approval.

(b) Earthworks - materials

The Contractor shall be responsible for any assumptions made by the Contractor in relation to the nature and types of the materials encountered in excavations and the bulking and compaction characteristics of materials incorporated in embankments.

The estimated quantity for general earthworks at any cutting includes all types of materials which may beencountered in the cutting.

Where material from excavations is acceptable for use in embankments, but the Contractor elects to:

(i) spoil it; or

(ii) use it for the Contractor's own purposes; or

(iii) use it as a source of pavement materials; or

(iv) construct embankments with dimensions in excess of those specified.

and a deficiency of material for embankment construction is thereby created, the Contractor shall make good that deficiency from sources of material meeting the quality requirements specified in Clause SC6.4.7.9(2). The cost of making good such deficiency of material shall be borne by the Contractor.

(4) Protection of earthworks

The Contractor's responsibility for care of the works shall include the protection of earthworks.

The Contractor shall install effective erosion and sedimentation control measures in accordance with accepted *Best Practice Erosion and Sediment Control* procedures, prior to commencing the earthworks, and shall maintain these control measures for the duration of the works.

Adequate drainage of all working areas shall be maintained throughout the period of construction to ensure run- off of water without ponding, except where ponding forms part of a planned

erosion and sedimentation control system.

When rain is likely or when work is not proposed to continue in a working area on the following day, precautionsshall be taken to minimise ingress of any excess water into earthworks material. Ripped material remaining in cuttings and material placed on embankments shall be sealed off by adequate compaction to provide a smooth tight surface.

Should in-situ or stockpiled material become wet as a result of the Contractor not providing adequate protectionof earthworks, the Contractor shall be responsible for replacing and/or drying out the material and for any consequent delays to the operations.

(5) Erosion and sediment control

During the construction phase and up until Council accepts the development works or at the end of the defectliability period the Contractor shall be responsible for the installation and maintenance of all erosion and sediment control measures on site.

Details of the proposed sediment and erosion control measures and procedures are to be documented by a suitably qualified person in accordance with Council's soil and sediment erosion control standards. The proposed measures and procedures are to be approved by Council prior to implementation on site.

The approved erosion and sediment control plan (ESCP) submitted as part of the operational works or compliance application must be presented during the pre-start meeting. This plan must be presented to Council's nominated representative for review and "fit-for-purpose" implementation on the site. If the ESCP requires revision to suit the current conditions of the development site, the plan must be amended to achieve the approved set of water quality outcomes required by Council. Work must not commence until the revised ESCP has been approved by Council. Upon approval of the ESCP, the procedures and guidelines outlined in the plan for establishing, managing (inspection and monitoring) and maintaining water quality across the development site shall be the responsibility of the Contractor.

The Developer/Superintendent must submit to Council the as constructed plans for ESCP, at least 5 days priorto requesting the on maintenance inspection.

At the end of the agreed period of implementation and maintenance, all identified temporary sediment control measures must be removed by the developer and the ground reinstated to Council's satisfaction.

(6) Setting out of earthworks

The Contractor is responsible for setting out of the earthworks including installing sufficient batter pegs or GPS data to enable the earthworks to be carried out.

(7) Stockpile sites

Temporary erosion and sedimentation control measures shall be taken in accordance with *Best Practice Erosion and Sediment Control.*

Restoration of stockpile sites following completion of the work shall be carried out in accordance with IECA *Best Practice Erosion and Sediment Control.*

(8) Suppression of dust

At all times the Contractor shall ensure that dust resulting from the proposed works, including excavation,backfilling, grading, and stockpiles is kept to an absolute minimum and to the satisfaction of Council, by approved methods.

SC6.4.7.5 Removal of topsoil

(1) Scope

Topsoil is surface soil which is reasonably free from subsoil, refuse, clay lumps and stones.

Removal of topsoil from any section of the works shall only commence after erosion and sedimentation controls have been implemented and when clearing, grubbing and disposal of materials have been completed onthat section of the works in accordance with relevant parts of

Best Practice Erosion and Sediment Control.

Topsoil throughout the length of the work shall be removed and stockpiled separately clear of the work withcare taken to avoid contamination by other materials. The work shall include the following:

(a) Cuttings

Removal of the topsoil to a depth of 75 mm, or as directed by the Superintendent.

(b) Embankments

Removal of topsoil over the base of embankments up to 75 mmbelow the natural surface or as directed by the Superintendent. For those embankments or sections of embankment where the height of embankment from natural surface to underside of pavement is less than two metres, topsoil which is deeper than 75 mm shall be removed to its full depth as directed by the Superintendent.

(c) Other locations

Removal of topsoil as directed by the Superintendent.

(2) Topsoil stockpiles

The maximum height of stockpiles shall not exceed 2.5 m and the maximum batter slope shall not exceed2h:1v.

Topsoil stockpiles shall not contain any timber or other rubbish and shall be trimmed to a regular shape.

Keep topsoil and under burden stockpiles separate.

Stabilise stockpiles and batters that will remain bare for more than 28 days by covering with mulch or anchored fabrics or seeding with sterile grass.

Establish sediment controls around un-stabilised stockpiles and batters. Locate stockpiles away from drainage lines, at least 10 m away from natural waterways and where they will be least susceptible to wind erosion.

To minimise erosion, stockpile batters shall be track rolled or stabilised by other means acceptable to theSuperintendent.

Where seeding of stockpiles to encourage vegetation cover is specified, such work shall be carried out inaccordance with Section SC6.4.12 Landscaping and open space.

SC6.4.7.6 Cuttings

(1) Scope

Construction of cuttings shall include all operations associated with the excavation of material within the limitsof the batters including benching, treatment of cutting floors and transition from cut to fill.

(2) Excavation

Materials encountered in cuttings shall be loosened and broken down as required so that they are acceptablefor incorporation in the Works. In this regard, the Contractor's attention is drawn to Clauses SC6.4.7.8 Unsuitable material, SC6.4.7.9 (1) Scope, and SC6.4.7.9 (2) Embankment material.

Cuttings shall have batter slopes as shown on the drawings or as redetermined by the Superintendent on the basis of site inspection and investigation during the excavation.

The tops of all cuttings shall be neatly “rounded”.

In all cuttings, undulations in the general plane of the batter shall not be permitted, except that batters mayrequire progressive flattening at the ends of cuttings due to the presence of less stable material.

Cut faces shall be cleaned of loose or unstable material progressively as the excavation proceeds.

Where, after the removal of topsoil as specified in Clause SC6.4.7.5 (1) Scope, material of variable quality or moisture content is encountered, the Contractor shall adjust his excavation methods to ensure blending of the materials, to obtain material meeting the requirements of Clause SC6.4.7.9 (2) Embankment material.

(3) Batter tolerances

If the Contractor excavates the batter beyond the batter slope line and the tolerance applicable thereto, theSuperintendent may authorise a minor change in the general slope of the batter to suit the convenience of the Contractor, but such a change shall not be regarded as a redetermination of the batter slope under ClauseSC6.4.7.9(3)(b) Excavation. Alternatively, the Contractor shall submit details of the material and/or methods proposed to restore the specified slope and stability of the batter for the Superintendent's approval.

For batters steeper than 1:1, if any section of the batter up to a height of 3 m above the table drain level has been over excavated beyond the tolerance limit specified, the Superintendent may direct that the batter be restored to the average batter slope using randomly mortared stone. The stone shall be similar to the soundrock in the cutting and the mortar shall be coloured to match the colour of the rock.

The tolerances for the excavation of batters, measured at right angles to the design grade line, are given in Table SC6.4.7.1 Excavation Tolerances for Batters.

Table SC6.4.7.1 - Excavation Tolerances for Batters

Location	**Tolerance (mm)**	
	Slope 1:1 or flatter	**Steeper than 1:1**
Toe of batter and level of table drain	+ 0 - 150	+ 0 - 200
2m above table drain and higher	+ 300 - 300	+ 300 - 600
Between level of table drain and 2m above table drain	pro rata basis	pro rata basis

Editor’s Note - Tolerances are measured normal to the batter surface with (+) measured towards the roadway.

(4) Benching in cuttings

Cut batters shall be benched as shown on the drawings to provide drainage and erosion control. Notwithstanding the tolerances permitted under Clause SC6.4.7.6 (3) Batter tolerances, bench widths shall not be less than those shown on the drawings.

Benches shall be maintained and cleaned of loose stones and boulders regularly throughout the Contractperiod. The cost of such maintenance and cleaning of benches shall be borne by the Contractor.

(5) Subgrade of cuttings

The subgrade of cuttings shall be excavated, parallel to the designed grade line, to a designed subgrade level. The subgrade must then be trimmed to a level of not more than +0 mm, -50 mm from the designed subgrade level. Prior to ripping or removal of the cut material, the Contractor shall determine the California Bearing Ratio (CBR) of the material at the subgrade level in accordance with AS1289.6.1.1, Plasticity Index AS1289.3.3.1 and Shrink Swell Index AS1289.7.1.1. Sufficient tests shall be taken to represent all the various materials which may exist within thesubgrade.

Adequate sampling and testing shall be undertaken to satisfy all necessary requirements to verify the intended pavement design. Where the Superintendent considers that any underlying material is unsuitable for pavement support, the Superintendent may direct that it be removed in accordance with Clause SC6.4.7.8 Unsuitable material.The minimum CBR value used at cutting floors for the design of pavements shall be 3%.

The Contractor shall rip or loosen all material in the subgrade to a minimum depth of 200 mm below the designed subgrade level for the width of the selected material zone (or subbase layer, where no selected material zone), including areas of rock. The maximum dimension of any particles in the ripped or loosened zoneshall not exceed 150 mm.

After re-compaction, the subgrade within cuttings shall be re-trimmed parallel with the finished wearing surfaceso that their levels do not vary more than +0 mm, -50 mm from the designed subgrade level. It shall be recompacted in accordance with Clause SC6.4.7.11(1).

Horizontal tolerance – the width of the cutting at subgrade level for support of the pavement shall not be less than that specified.

Prior to placing any subsequent layers over the completed subgrade level, the Contractor shall present the completed surface to the Superintendent for inspection. The Contractor shall verify as part of the quality system that the completed surface has achieved full conformance with all respects to relevant specifications.

In placing subsequent layers, the Contractor shall use equipment and techniques to avoid surface heaving or other damage to the subgrade surface.

(6) Transition from cut to fill

The Contractor is to ensure that the transition from cut to fill is undertaken in accordance with best practice geotechnical procedures and guidelines.

SC6.4.7.7 Blasting

(1) General

When explosives are permitted to be used by Council, the Contractor shall obtain all necessary licences from the appropriate authorities and shall comply with all government and Council regulations relating to transport, storage, handling, and the use of explosives, and also to the rules set out in AS2187.1 and AS2187.2. The transport of explosives shall be in accordance with the *Australian Code for the Transport of Explosives by Railand Road. The requirements of the Explosives Act 1999* and *Explosives Regulation 2017* and Local laws, if applicable, shall be complied with.

The Contractor shall be liable for any accident, damage or injury to any person, property, or thing, resulting fromthe use of explosives.

Before the start of blasting operations, the Contractor, in the presence of the Superintendent, shall conduct a dilapidation survey to determine and record the existing condition of all structures likely to be affected by anyblast.

The survey shall include all structures including public utilities within 500 m of any blast but shall be extended where the maximum instantaneous charge proposed is likely to produce peak particle velocities greater than allowable at structures more remote from a blast site. A written report of the survey, supported by photographswhere necessary, together with a list of any existing defects in the structures, shall be submitted to the owner of each structure, to the Superintendent, and Council before blasting commences.

The Contractor shall advise the Superintendent of the proposed maximum instantaneous charge and the Contractor's validation of the adequacy of the proposed structural survey at least three working days before the survey is due to commence. The Superintendent may direct amendments to the scope of the survey as a resultof blast monitoring during the work. All costs associated with the surveys and reports shall be borne by the Contractor.

Before each blasting operation, the Contractor shall submit to the Superintendent written details of the proposed blasting procedure including the quantity and type of explosive to be detonated, the blasting pattern to be used, and measures proposed to limit noise and to ensure that vibration from blasting does not adversely affect nearby structures.

Ground vibration caused by blasting shall not exceed the values of peak particle velocity listed in Table SC6.4.7.2 Limiting Peak Particle Velocity.

Table SC6.4.7.2 - Limiting Peak Particle Velocity

Point of Potential Damage (within 1 km of blasting site)	**Peak Particle Velocity**
Completed and cured bridge structures or sub-structures (E.g., completed abutment).	25 mm/sec
Bridgeworks and structural retaining walls under construction.	20 mm/sec
Residential premises, schools, hospitals, and other buildings.	5 mm/sec (with 10% not to exceed10 mm/sec)
Buildings or monuments of historical significance.	2 mm/sec

The Contractor shall advise all residents within a radius of 1 km, by letter drop before blasting operations commence, of the likely times, frequency, and duration of blasting, and precautions being taken to ensure thatdamage to property will not result.

Unless otherwise approved, blasting operations shall be confined to the periods Mondays to Fridays (excludingpublic holidays), 9am to 3pm.

When blasting operations are being carried out, precautions shall be taken relating to the safety of persons andanimals and the road shall be closed to traffic and the appropriate signs erected. A standard warning procedure such as that given in the AS2187.2 shall be established and observed at all times.

(2) Presplitting

Where presplitting is carried out the spacing of presplit drill holes shall not exceed 750 mm centre to centre.

(3) Blasting records

The Contractor shall maintain accurate records of each blast showing the details listed below:

(a) date and time of blast;

(b) location, number, and diameter of holes loaded;

(c) depth of each hole loaded;

(d) inclination of holes;

(e) maximum and minimum burden;

(f) types of explosives used;

(g) charge distribution in each hole;

(h) maximum instantaneous charge;

(i) delay periods and sequence;

(j) total amount of charges in the blast; and

(k) length and type of stemming in each hole.

The records shall be prepared as holes are loaded and signed by the Powder man. A copy shall be provided to the Superintendent on the day of the blast.

(4) Control of air blast over-pressure

This clause shall apply only where a noise sensitive location exists within 1km of the blasting site.

The Contractor's attention is drawn to the recommendations given in the *Environmental Protection (Noise) Policy 2019* or as amended for the reduction of air blast over-pressure.

The noise emanating from blasting operations shall not exceed an over-pressure level of 115 dB (linear peak) at any noise sensitive location (such as residential premises, schools, or hospitals). Up to 10 per cent of the total number of blasts may exceed this value provided a level of 120 dB is not exceeded at any time.

The Contractor shall arrange for the monitoring of air blast over-pressure to ensure compliance with the specified limits. All monitoring shall be carried out by personnel possessing current NATA registration for suchmonitoring. All test results shall be reported on NATA endorsed test certificates which shall include a clear statement as to compliance or non-compliance with the requirements of this section. In general, a monitoring location will be near the perimeter of the noise sensitive location at the point closest to the maximum charge. The Contractor shall submit a copy of the monitoring record to the Superintendent.

In the event that the measured air blast over-pressure exceeds the specified limits, the Contractor shall suspend further blasting work and shall submit to the Superintendent proposals detailing any additional steps and precautions the Contractor shall take to ensure that for any future blast, the limiting over-pressure shall notbe exceeded. The Contractor shall not resume any blasting until such proposals have been submitted.

(5) Control of ground vibration

The Contractor shall arrange for the monitoring of ground vibrations to ensure compliance with the peak particle velocity limits shown in Table SC6.4.7.2 Limiting Peak Particle Velocity. All monitoring shall be carried out bypersonnel possessing current NATA registration for such monitoring. All test results shall be reported on NATA endorsed test certificates which shall include a clear statement as to compliance or non-compliance with the requirements of this part of the section. In general, a monitoring location shall be near the perimeter of the structure or building at

the point closest to the maximum charge. The Contractor shall submit a copy of the monitoring record to the Superintendent.

To minimise the risk of peak particle velocity limits being exceeded, the Contractor shall develop a blasting siterelationship between peak particle velocity, distance and blasting charge.

For the first blast, monitors shall be set up at not less than five points at varying distances away from the blasting site. The Maximum Instantaneous Charge for the first blast shall not exceed that calculated from thefollowing formula:

$$MIC = 0.5\left[\frac{D}{\left[\frac{PPV}{1140}\right]^{-0.625}}\right]^2$$

Where:

MIC = Maximum Instantaneous Charge in Kilograms

D = Distance in metres from charge to the point of potential damage

PPV = Limiting peak particle velocity (vertical axis) versus Scaled Distance (horizontal axis) shall be plotted

Where:

$$\text{Scaled Distance} = \frac{D}{\sqrt{MIC}}$$

The mean regression line shall be obtained by the least squares method.

For subsequent blasts, the MIC and other aspects of blast design may be adjusted provided that further groundvibration monitoring is undertaken and the mean regression line redetermined to demonstrate that peak particle velocity limits are not exceeded. The Contractor shall make the regression line plots available to the Superintendent, if so requested.

SC6.4.7.8 Unsuitable material

Unsuitable material is that occurring below the designed floor level of cuttings and below the nominated depth forstripping topsoil beneath embankments, which the Superintendent deems to be unsuitable for embankment orpavement support in its present position. Unsuitable material also includes material in cuttings which the Superintendent deems to be unsuitable for embankment construction.

Such material shall be excavated to the extent directed by the Superintendent. Material removed as unsuitable, asdirected by the Superintendent, may be incorporated in embankments in accordance with Clause SC6.4.7.9(2) Embankment material or spoiled in accordance with Clause SC6.4.7.9 (13) Spoil.

After removal of the unsuitable material, the floor of the excavation shall be re-presented to the

Superintendent for inspection, prior to backfilling with replacement material, to determine whether a sufficient depth of unsuitable materialhas been removed. Prior to placing replacement material, the excavated surface shall be compacted in accordance with Clause SC6.4.7.11 (1) Compaction and moisture requirements.

The unsuitable material which has been removed shall be replaced with material from cuttings, or with material borrowed in accordance with Clause SC6.4.7.9 (14) Borrow, of the quality specified in Clause SC6.4.7.9(6) Embankment materials. Replacement material is deemed to form part of embankment construction. It shall be placed in accordance with Clause SC6.4.7.9 (5) Placing fill for embankment construction and compacted in accordancewith Clause SC6.4.7.11 (1). Compaction and moisture requirements.

Reworking or replacing any material which the Superintendent deems to have become unsuitable because of inappropriate construction activities shall be borne by the Contractor.

Excavate and dispose of all contaminated material in an environmentally responsible manner including the following:

(1) assay material uncovered on-site prior to disposal. If the wastes include putrescibles wastes, then also analyseleachate and landfill gases;

(2) excavate material in a manner which avoids off-site environmental problems;

(3) seal remaining contaminated material or wastes, where only part of the tip has been excavated, to ensure thanthere is no off-site effect now or in the future;

(4) transport odorous wastes in covered vehicles; and

(5) dispose of contaminated material in a landfill licensed to take the type of contaminated material or wastesuncovered.

SC6.4.7.9 Embankment construction

(1) Scope

Embankment construction includes all operations associated with the preparation of the foundation areas on which fill material is to be placed, the placing and compacting of approved material within areas from which unsuitable material has been removed in accordance with Clause SC6.4.7.9(5) Unsuitable material, the placing and compacting of fill material and of materials of specified quality in nominated zones throughout the Works and all other activities required to produce embankments as specified to the alignment, grading and dimensions shown on the drawings. It also includes any pre-treatment such as breaking down or blending material or drying out material containing excess moisture.

(2) Embankment material

Material for embankment construction shall be obtained from the cuttings within the Works in accordance withClause SC6.4.7.9 (3)(b) Excavation supplemented by borrow in accordance with Clause SC6.4.7.9 (14) Borrow and from other sources as approved by the Superintendent if necessary. The material shall be free of tree stumps and roots, clay, topsoil, steel, organic material, and other contaminants and shall be capable of being compacted in accordance with Clause SC6.4.7.11 (1) Compaction and moisture requirements.

The work shall be programmed so that material of the quality specified in Clause SC6.4.7.9 (6)(e) Placing fill for embankment construction and SC6.4.7.9(9) Selected material zone for the upper zones of the formation is available when required.

(3) Foundations and embankments

(a) Removal of topsoil

Following removal of topsoil in accordance with Clause SC6.4.7.9 (2) Removal of topsoil, the embankment foundation area shall be made available for inspection by the Superintendent. Where the Superintendent considers that any underlying material is unsuitable, the Superintendent may direct that it be removed and replaced in accordance with Clause SC6.4.7.9 (5) Unsuitable material.

(b) Foundations for shallow embankments

Shallow embankments are those embankments of a depth less than 1.0 m from the top of pavement tonatural surface. After removal of topsoil the Contractor shall survey and work out the extent of the area ofshallow embankments.

Material in the foundations for shallow embankments which does not achieve a moisture content within the range of 60% to 90% of optimum , shall be deemed unsuitable in accordance with Clause SC6.4.7.9(5) Unsuitable material and shall be replaced by material of the specified quality.

(c) Other embankments

For all other embankments, the foundation shall be prepared by grading and levelling the general area, adjusting the moisture content where necessary and compacting the top 200 mm as specified in ClauseSC6.4.7.11(1) Compaction and moisture requirements.

The bridging layer shall consist of free draining granular material with or without geofabric interlayer as specified on the drawings. The granular material shall be end dumped and spread in a single layer and insufficient depth to allow the passage of earthmoving equipment with minimal surface heaving. The compaction requirements of Clause SC6.4.7.11 (1) Compaction and moisture requirements shall not apply to the bridging layer.

A bridging layer may also be employed, subject to the approval of the Superintendent, where ground water or seepage is encountered in the foundation area or where the Contractor demonstrates that it is impracticable to achieve the degree of compaction specified for the foundation in Clause SC6.4.7.11 (1) Compaction and moisture requirements. A bridging layer shall not be acceptable if its proximity to the pavement is likely to affect the pavement design. As an alternative to a bridging layer, approval of a working platform created by the chemical stabilisation of in situ material to conform Section SC6.4.6 Road works and traffic control, , may be required.

(4) Hillside embankments

Where embankments are to be constructed on or against any natural slopes or the batters of existing embankments, the existing slope or batter, if it is steeper than 4 horizontal to 1 vertical in any direction, shall be cut in the form of horizontal terraces over the whole area to be covered by new filling. The existing slope or batter shall be stepped in successive terraces, each at least 1m in width, the terraces to be cut progressively as the embankment is placed. Wherever possible terraces shall coincide with natural discontinuities. Subsoil drainage may be required in some instances. Material thus excavated shall be compacted as part of the new embankment material.

(5) Placing fill for embankment construction

The methods of excavation, transport, depositing and spreading of the fill material shall be selected so as to ensure that the placed material is uniformly mixed.

The embankment shall be constructed to derive its stability from the adequate compaction of the fine material embedding the large rock pieces rather than mechanical interlock of the rock pieces. The fine material shall be compacted to meet the requirements of Clause SC6.4.7.11 (1) Compaction and moisture requirements.

Fill material for embankment construction shall be placed in layers parallel to the grade line and compacted in accordance with Clause SC6.4.7.11 (1) Compaction and moisture requirements. The layers shall be of uniform compacted thickness not exceeding 200 mm, except that where more than 25% by volume of the filling consists of rock with any dimension larger than 150 mm, the Superintendent may approve an increase in the compacted layer thickness to 300 mm, provided that the relative compaction specified in Clause SC6.4.7.11 (1) Compaction and moisture requirements is attained.

The maximum dimension, measured in any direction, of rock pieces in the fill material for embankment construction shall not exceed two thirds of the approved compacted layer thickness. Any larger rock pieces shall be reduced in size for incorporation in the embankment layers.

Rock material shall be broken down and evenly distributed through the fill material, and sufficient fine material must be placed around the larger material as it is deposited to fill the voids and produce a dense, compact embankment. Where the Superintendent considers insufficient fine material is present to fill the voids, additional fine material shall be obtained from other places in the work or by a change in the method of winning fill material.

Stony patches with insufficient fine material to fill the voids shall be reworked with additional fine material being Sblended in to achieve a dense, compact layer.

In placing embankment layers, the Contractor shall use equipment and techniques to avoid surface heaving or other damage to the foundations and underlying embankment layers.

After compaction, embankment material in the zone(s) below the selected material zone (or subbase layer, where no selected material zone) shall have a 4-day soaked CBR value not less than 3%.

For the purpose of this clause, the CBR value of the material shall be determined by Test Method AS1289.6.1.1.

The Contractor shall be responsible for determining suitable sources of material and for any processing to satisfy these quality requirements.

(6) Embankment batters

The batter slopes shown on the drawings represent the estimated requirements for the expected types of materials and may be subject to redetermination by the Superintendent according to the Superintendent'sassessment of the materials encountered.

When completed, the slope of embankment batter shall conform to those shown on the drawings and conformto the following tolerances:

(a) for a vertical distance to 1m below the shoulder, no point on the completed batter to vary from thespecified slope line by more than 150 mm when measured at right angles to the slope line;

(b) at distances greater than 1m vertically below the shoulder, no point on the completed batter to vary fromthe specified slope line by more than 300 mm when measured at right angles to the slope; and

(c) in no case is the edge of the formation at the underside of the pavement to be nearer to the roadway thanshown on the drawings and the batter slope at no point be steeper than the specified slope.

However, in no case shall the edge of the formation at the underside of the pavement be nearer to the roadwaythan shown on the drawings. Undulations in the general plane of the batter shall not be permitted.

(7) Rock facing to embankments

Where shown on the drawings, embankment batters (including embankments at bridge abutments) shall beprovided with a facing of clean, hard, durable rock.

The rock facing shall be built up in layers ahead of each layer of filling. Rock may be placed by hand or plant but shall be placed in such a manner that its least dimension is vertical and that mechanical interlock between the larger stones occurs. Any rock deposited in the rock facing which has an excess of fine material surrounding it shall be removed together with the excess fine material and replaced.

The Contractor shall adjust its working methods and programme the work to obtain hard and durable rockof the specified dimensions as it is required. The space between larger batter rocks shall be filled with progressively smaller rocks to form a 'graded filter' which prevents the leaching out of fines from the fill material, but does not overfill the voids between the larger rocks or cause the larger rocks to lose contact with one another. Fine material shall not cover the outside of the rocks on the face of the batter.

The Contractor shall exercise extreme caution whilst placing the rock facing. Where embankment material isplaced above other roads in use the outer rock layer shall be placed in such a manner as to prevent spillage down the batter.

The Contractor shall ensure that, under no circumstances, could any rock be dislodged and roll onto anyadjacent roadway or track in use.

(8) Trimming tops of embankments

The tops of embankments shall be trimmed parallel to the designed grade line at levels equal to the finished surface level less the thicknesses of pavement courses and the selected material zone.

The tops of embankments at these levels shall be compacted to meet the requirements of Clause SC6.4.7.11 (1) Compaction and moisture requirements and trimmed so that they do not vary by more than ±50 mm from the calculated level. The width of the embankment at subgrade level shall not be less than thatspecified.

Prior to placing any subsequent pavement layers over the completed top of embankment filling, the Contractor shall present the completed surface to the Superintendent for inspection. The Contractor shall verify as part of the quality system that the completed surface has achieved full conformance with all respects of the relevant specifications.

(9) Select material zones

A selected material zone must be provided in accordance with the following quality requirements:

(a) it shall be free from stone larger than 75 mm maximum dimension and have no less than 50% passing the 19 mm AS sieve;

(b) a 4-day soaked CBR value not less than 10 for the fraction passing AS 19 mm sieve;

(c) a depth of 200 mm; and

(d) Plasticity Index of 15 maximum.

If chemical stabilisation is specified these requirements must apply to the selected material immediately prior to incorporating the stabilising agent.

The Contractor shall use working methods to yield material for the selected material zone by breaking down oversize rock or by other means, including processing through a crusher, to ensure that the resulting materialconforms to the requirements of this clause.

The Contractor shall ensure that any material encountered of the quality specified for the selected material zoneshall be either placed directly in the selected material zone or stockpiled at locations approved by the Superintendent for future use by the Contractor in the selected material zone until at least sufficient material is reserved to complete the selected material zone over the whole work. Should the Contractor fail to conserve material of the specified quality, the Superintendent may direct that material of equivalent quality be provided.

The selected material zone shall be placed and compacted in layers with the compacted thickness of each layer not exceeding 150 mm. The selected material shall be homogeneous and free from patches containing segregated stone or excess fines. There shall be no areas containing material which does not comply with thespecified requirements of this clause and compaction shall be as specified in Clause SC6.4.7.11(1) Compaction and moisture requirements.

The top of the selected material zone shall be compacted and trimmed parallel with the designed grade line at alevel equal to the finished surface level minus the thickness of pavement layers adopted. Construction tolerances for Selected Material Zones is to be +50mm of the designed grade and crossfall profile.

Prior to placing any subsequent pavement layers over the completed select material zone surface, the Contractor shall present the completed surface to the Superintendent for inspection. The Contractor shall verify as part of the quality system that the completed surface has achieved full conformance with all respects of Council's requirements.

(10) Fill adjacent to structures

For the purpose of this clause, structures shall include bridges, precast and cast-in-situ box culverts and retaining walls. Fill adjacent to other culverts and drainage structures to be provided in accordance with Section SC6.4.9 Stormwater quantity, Clauses SC6.4.9.12 Drainage structures construction, SC6.4.9.13 Pipe drainage construction, and SC6.4.9.14 Precast box culverts.

No filling shall be placed against structures, retaining walls, headwalls or wingwalls within 21 days after placingof the concrete, unless the walls are effectively supported by struts to the satisfaction of the Superintendent, orwhen the Contractor can demonstrate that 85% of the design strength of

the concrete has been achieved. This includes concrete in bridge decks and fill placement that impacts the position, stability, and serviceability of bridge deck member bearings.

(11) Treatment at weep holes

Drainage adjacent to weepholes shall be provided by either a layer of broken stone or river gravel consisting ofclean, hard, durable particles graded from 50 mm to 10 mm such that:

(a) the maximum particle dimension shall not exceed 50 mm; and

(b) no more than 5% by mass shall pass the 9.5 mm A.S. sieve.

The broken stone or river gravel shall be continuous in the line of the weepholes, extend at least 300 mmhorizontally into the fill and extend from 200 mm below to at least 450 mm vertically above the level of the weepholes, where practicable.

Alternatively, the Contractor may provide a synthetic membrane (geotextile) of equivalent drainage characteristics. It shall be stored and installed in accordance with Manufacturer's instructions. The use of asynthetic membrane (geotextile) shall be subject to the Superintendent's approval.

(12) Selected backfill

(a) Selected backfill shall be placed adjacent to structures in accordance with Table SC6.4.7.3 Selected Backfill, Width and Height. The selected backfill shall consist of a granular material having a maximum dimension not exceeding 50 mm and a Plasticity Index, determined by AS1289.3.3.1, neither less than 2 nor more than 12.

Table SC6.4.7.3 - Select Backfill, Width and Height

Structure Type	Selected Backfill	
	Width	Height
Bridge abutments	2 m	H
Cast-in-situ Box Culverts and Precast Culverts	H/3	H + 300 mm
Corrugated Steel Pipes and Arches	0.5 m	H + 500 mm
Retaining Walls	H/3	H

(Where H = height of structure)

The selected backfill shall be placed in layers, with a maximum compacted thickness of 150 mm. Layers shall be placed simultaneously on both sides of box culverts to avoid differential loading. Compaction shall start at the wall and proceed away from it and shall meet the requirements of Clause SC6.4.7.11(1) Compaction and moisture requirements.

The existing embankment slope behind the structure shall be cut in the form of successive horizontal terraces,each terrace being at least 1m in width, and the selected backfill shall be placed in accordance with Clause SC6.4.7.9(5) Placing fill for embankment construction.

Where a bridge deck is being concreted adjacent to an abutment, no filling shall be placed against the abutment within 21 days after placing concrete in the bridge deck, unless approved by the Superintendent.

In the case of spill through abutments, rocks shall not be dumped against the columns or retaining walls butshall be built up evenly by individual placement around or against such

structures.

In the case of framed structures, embankments at both ends of the structure shall be brought up simultaneously, the difference between the levels of the embankments at the respective abutments, shall notexceed 500 mm.

(13) Spoil

Spoil is surplus material from excavations which is not required to complete the Works as specified or othermaterial from excavations whose quality the Superintendent deems to be unacceptable for incorporation in the works.

Where there is surplus material, the Superintendent may direct that flatter batter slopes be provided on embankments which have not been commenced, and/or direct that the excess material be used in the uniform widening of embankments, the surface of which shall be shaped to provide a tidy appearance and effective drainage. The surplus material shall be spread and compacted as specified in Clauses SC6.4.7.9 (5) Placing fill for embankment construction, and SC6.4.7.11 (1) Compaction and moisture requirements, for material in embankments.

Alternatively, spoil shall be disposed of in the manner and at locations approved by the Superintendent withinthe specified working area for the Works or be removed and disposed of off-site by the Contractor. Surplus material so deposited shall be compacted as specified in Clause SC6.4.7.11 (1) Compaction and moisture requirements, for material in embankments or to such lesser extent as may be approved by the Superintendent.

(14) Borrow

Borrow will only be authorised by the Superintendent if, in constructing cuttings and embankments to the batterslopes specified or directed by the Superintendent or in providing materials of the quality specified, and not by reason of excess widening of embankments or wastage by the Contractor of material of the quality specified in Clauses SC6.4.7.9 (2) Embankment material, SC6.4.7.9 (7) Rock facing of embankments, SC6.4.7.9.(8) Trimming tops of embankments or SC6.4.7.9 (10) Fill adjacent to structures, there is an overall deficiency in either the quantity or the quality of material required to complete the works.

Where borrow material is required to complete the Works as specified, the location of borrow sites shall be asapproved by the Superintendent, and the quality of material shall be acceptable to the Superintendent in accordance with Clauses SC6.4.7.9 (2) Embankment material, SC6.4.7.9 (7) Rock facing of embankments, or SC6.4.7.9 (10) Fill adjacent to structures, as appropriate. The edges of borrow sites must be no closer than 3 m from any fence line, or edge of excavation or embankment. Adequate clearance shall be provided for the construction of catch drains. Borrow sites shall have drainage outlets acceptable to the Superintendent, cut batter slopes not steeper than 4h to 1v, and shall be left by the Contractor in a tidy and safe condition (I.e., stabilising disturbed areas).

For borrow within the defined working area for the Works as specified, site preparation shall be in accordancewith Clauses SC6.4.7.1 Clearing and grubbing, and SC6.4.7.5 Removal of topsoil. restoration of borrow sitesshall be carried out by Contractor in accordance with *Best Practice Erosion and Sediment Control.*

If borrow material is obtained by uniformly widening a cutting, the requirements of Clauses SC6.4.7.6 (2) Excavation, SC6.4.7.6 (3) Batter tolerances and SC6.4.7.6(5) Treatment of floors of cuttings as to the redetermination of batter slopes, the trimming of batters and the compaction of floors of cuttings respectively shall apply to the borrow area.

The Contractor shall be responsible for obtaining any permits required for entry on land and for the payment ofany royalty for such borrow material. The Contractor shall also comply with any

requirements of the *Planning Act 2016* – as amended, Townsville City Plan, Local laws, and landowners, as appropriate.

SC6.4.7.10 Acid sulphate soils

(1) Objective

To minimise disturbance to areas of potential acid sulphate soils (PASS) and/or actual acid sulphate soils (ASS). If disturbance of PASS/ASS cannot be avoided, appropriate treatment is required to minimise the potential for environmental harm.

PASS and ASS are soils that have the potential to generate acid through oxidation of iron sulphides whenexposed to air. ASS and PASS are generally found in coastal areas, and generally in soils at an elevation of5m AHD or lower.

(2) References and source documents:

Reference and source documents that must be read in conjunction with this section are as follow:

(a) Queensland Government

Queensland Acid Sulphate Soil Technical Manual Soil Management Guidelines

State Planning Policy

(3) Safety requirements

Works shall comply with provisions of the *Work Health and Safety Act 2011* and subsequent regulations. Personnel are responsible for their own Personal Protective Equipment (PPE) and the safety of the surrounding workplace during works.

Care is to be taken when using hydrogen peroxide, including gloves and eye protection.

(4) Environmental requirements:

Compliance with *Environmental Protection Act 1994* and subordinate legislation.

Compliance with *Queensland Acid Sulphate Soil Technical Manual Soil Management Guidelines*

Compliance with the *State Planning Policy*.

Compliance with TCC Environmental Policy.
Compliance with all other environmental legislation.

(5) Equipment and materials

Testing should be undertaken by a suitably qualified laboratory.

(6) Method

(a) Identifying ASS/PASS on site

The following points can assist in determining if soil has a likelihood of containing ASS/PASS. Affirmativeanswers to the following questions may indicate the presence of ASS/PASS. Field observations and tests should be complemented by laboratory testing.

(i) Is the site elevation 5m AHD or less?

(ii) Are mangroves, she-oaks or melaleuca species (I.e., paper barks) present on site?

(iii) Is there other vegetation that is stunted or dying?

(iv) Does the soil have a dark grey to grey appearance?

(v) Is there a rotten egg smell (hydrogen sulphide) to disturbed soil?

(vi) Is there a mottled yellow mineral present in the soil (Jarosite)?

(vii) Are there water bodies nearby that have a very clear blue-ish appearance, or does it appear to be reddish (rust) in colour?

(viii) Is the pH of the excavated sediment, or water, below 4?

(b) Managing and treating ASS and PASS

(i) Determine if works can be undertaken without disturbing ASS/PASS material.

(ii) If ASS/PASS is to be disturbed as a result of project activities, then undertake testing to determinethe severity of the potential acidification and extent of ASS/PASS material.

(iii) ASS/PASS material excavated on site must either be treated on site or transported to a treatmentlocation. A treatment pad should be set up as per the *Queensland Acid Sulphate Soil Technical Manual, Soil Management Guidelines.*

(iv) ASS material should be transported as regulated waste as it has the potential to be generatingacid while exposed to the atmosphere.

(v) All treatment of PASS/ASS must be undertaken in compliance with the *Queensland Acid Sulphate Soil Technical Manual, Soil Management Guidelines.*

(vi) ASS/PASS treatment must be undertaken as per the laboratory recommendations.

(c) Corrective/emergency actions

If PASS and/or ASS are identified through site inspection and confirmed through lab testing, followprocedure outline in (6) above.

If corrective actions are identified, an Incident, Hazard, Improvement Report is to be completed andsubsequent review of this procedure undertaken in accordance with these guidelines.

(d) Waste control

Treat PASS and ASS in accordance with guidelines (State Policy).

Ensure wastes generated from field testing or work activities are disposed of correctly.

(e) Responsibilities

(i) Site foreperson/works controller is responsible for:

1. monitoring and testing soils; and

2. minimising disturbance to PASS/ASS.

(ii) The Environmental Engineer is responsible for ensuring any environmental noncompliance's are reported.

(iii) The Executive Manager, Engineering Services is responsible for:

1. notifying relevant personnel of changes to this procedure; and

2. delivering training to personnel (if required).

(f) Monitoring and reporting

The foreperson will monitor and test soils prior to commencement of works and record results of fieldtests on daily checklist.

SC6.4.7.11 Compaction and quality control

(1) Compaction and moisture requirements

In areas listed below, all layers shall be uniformly compacted to not less than the relative compaction specifiedbefore the next layer is commenced. Each layer of material shall be trimmed prior to and during compaction to avoid bridging over low areas. A smooth surface shall be presented at the top of each layer.

(a) The following areas shall be compacted to provide a relative compaction, determined by AS1289.5.1.1using AS1289.5.4.1 or AS1289.5.7.1 for standard compactive effort, of not less than 95%.

(i) each layer of material replacing unsuitable material as detailed in Clause SC6.4.7.9(5) Unsuitable material;

(ii) each layer of material placed in embankments, up to 300 mm from the top of the sub-grade;

(iii) fill placed adjacent to structures up to 300 mm from the top of sub-grade;

(iv) material in unsealed verges and within medians up to the level at which topsoil is placed;

(v) spoil (excluding unsuitable material); and

(vi) all other areas except those where a higher relative compaction is specified.

Unsuitable material shall be stockpiled as directed by the Superintendent and compacted by track rolling.

(b) The following areas shall be compacted to provide a relative compaction of not less than 97% as determined by AS1289.5.1.1 using AS1289.5.4.1 or AS1289.5.7.1 for standard compactive effort:

(i) foundations for shallow embankments;

(ii) foundations other than shallow embankments;

(iii) the whole area on the floors of cuttings;

(iv) each layer of the embankment or cutting within 300 mm from the top of sub-grade;

(v) each layer of the selected material zone as specified in Clause SC6.4.7.9 (9) Selected material zone;

(vi) any areas of material of specified quality which may be shown on the drawings or specifiedelsewhere behind kerbs and/or gutters or adjacent to rigid pavements; and

(vii) the fill material placed adjacent to structures as specified in Clauses SC6.4.7.9 (10) Fill adjacent to structures, and SC6.4.7.9 (12) Selected backfill in each layer within 300 mm from the top of the sub-grade.

Where the vertical alignment design is such that a substantial portion of the road is required to be built at orclose to the natural surface, cut the prepared subgrade to a depth below natural surface of less than 0.5 m. Approval is required when shallow cutting conditions occur, the specified transition from cut to fill may be modified such that the depth of terrace excavation at the transition from cut to fill is reduced from 900 mm to250 mm.

Treat the floor of shallow cutting as specified in Clause SC6.4.7.6 (5) Treatment of floors of cuttings, and Clause SC6.4.7.6 (6) Transition from cut to fill and compact to provide a relative compaction of not less than100% for a depth of 200 mm determined by AS1289.5.4.1, for standard compactive effort.

At the time of compaction, the moisture content of the material shall be adjusted so as to permit the specified compaction to be attained at a moisture content which, unless

otherwise approved by the Superintendent, is within the range of 60% to 90% of the optimum moisture content as determined by AS1289.5.1.1 or AS1289.5.7.1. Material which becomes wetted up after placement shall not be compacted until it has dried out so that the moisture content is within this range. The drying process may be assisted by aeration, or, where approved by the Superintendent, by the use of hydrated or quick lime. Alternatively, the Contractor may transport the wet material to a stockpile site for drying out and later use as fill material. If there is insufficient moisture in the material for it to be compacted as specified, water shall be added. The added water shall be applied uniformly and thoroughly mixed with the material until a homogeneous mixture is obtained.

Compaction shall be undertaken to obtain the specified relative compaction for the full depth of each layer in embankments and for the full width of the formation over the entire length of the work. Compaction shall be completed promptly to minimise the possibility of rain damage.

Any material placed by the Contractor that has attained the specified relative compaction but subsequently becomes wetted up so that the moisture content is greater than the apparent optimum, determined by AS1289.5.4.1, shall be dried out and uniformly recompacted to the required relative compaction in accordance with this clause before the next layer of material is placed. Alternatively, the Contractor may remove the layer ofwetted material to a stockpile site for drying and later re-use.

(2) Test locations

The specified compaction and moisture tests shall be taken at the random test locations established in eachlot in accordance with the specified minimum testing frequency. Prior to testing the Contractor shall work thelot to ensure uniform moisture content and compaction of all material within the lot.

The test(s) then taken shall be considered to represent the total volume of material placed within the lot.

Where the Superintendent considers that the material which is present has not achieved uniformity required by this clause or Clause SC6.4.7.9 (5) Placing fill for embankment construction, the Superintendent may take or direct further testing. The Superintendent shall nominate the area represented by the additional testing.

If such testing confirms that material not conforming to the Specification, the Contractor shall carry out remedialwork as necessary to achieve conformance to the requirements of Clause SC6.4.7.11 (1) Compaction and moisture requirements.

(3) Deflection monitoring

Following completion of the formation to the underside of the selected material zone in accordance with Clauses SC6.4.7.9 (3) Foundations for embankments and SC6.4.7.9 (5) Placing fill for embankment construction, completion of the selected material zone in accordance with Clauses SC6.4.7.9 (9) Selected material zone, and SC6.4.7.6 (5) Treatment of subgrade of cutting, the Contractor shall make the work available in lots, for the Superintendent or Council to carry out deflection monitoring.

A lot for deflection testing shall consist of a continuous length of formation, in compliance with council requirements, and a single carriageway width which is generally homogeneous with respect to material andappearance. The Contractor shall identify the boundaries of each lot with stakes clearly labelled to the satisfaction of the Superintendent.

Prior to the release of the lot, a proof roll is to be performed with a single drive axle truck with an axle load of 8.2 t covering all lanes of carriage way including parking bays having no evident movement.

(4) Widening of formation

Road shoulders and formation shall be widened to accommodate footpaths, guard fence, street light plinths,emergency telephone bays and vehicle standing areas as shown on the drawings.

(5) Subgrade testing and treatment

Refer to Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.2(6) Subgrade treatment.

SC6.4.7.12 Summary of limits and tolerances

The limits and tolerances applicable to the various clauses in this section are summarised in Table SC6.4.7.4 Summary of Limits and Tolerances below.

Table SC6.4.7.4 - Summary of Limits and Tolerances

Item	Activity	Limits / Tolerances
(1)	Batter Slopes (a) Excavation (b) Embankment	 (a) ± 300 mm (b) ± 300 mm
(2)	Subgrade (a) Vertical Tolerance (b) Horizontal Tolerance	 (a) Parallel to designed grade line. Tolerance is to bewithin +0 mm - 50 mm of the levels specified. (b) The width of the cutting at subgrade level for support ofthe pavement shall not be less than that specified on the drawings or documentation.
(3)	Tops of Embankments (a) Vertical Tolerance (b) Horizontal Tolerance	(a) Parallel to the designed grade line. Tolerance is to bewithin, ± 50 mm from the levels specified (b) The width of an embankment at subgrade shall not beless than that specified on the drawings or documentation.
(4)	Selected Material	Refer to SC6.4.7.9 Embankment construction and SC6.4.7.11 Compaction and quality control

Editor's Note - Tolerances are measured at right angles to design surfaces.

SC6.4.7.13 Clearing and grubbing hold points

Please click here to view SC6.4.23.5 Table SC6.4.23.38 – Clearing and Grubbing Hold-Points

SC6.4.7.14 Clearing and grubbing witness points

Please click here to view SC6.4.23.5 Table SC6.4.23.39 – Clearing and Grubbing Witness-Points

SC6.4.7.15 Earthworks hold points

Please click here to view SC6.4.23.5 Table SC6.4.23.36 – Earthworks Hold-Points

SC6.4.7.16 Earthworks witness points

Please click here to view SC6.4.23.5 Table SC6.4.23.37 – Earthworks Witness-Points

Development manual planning scheme policy (PSP)
SC6.4.8 Stormwater management

Index

SC6.4.8.1 Introduction

SC6.4.8.2 Planning for stormwater

(1) Pre-lodgement meeting

(2) Stormwater management

(3) Best practice management

SC6.4.8.3 Suitably qualified person

SC6.4.8.4 Pre-lodgement

SC6.4.8.5 Temporary water quality management

SC6.4.8.6 Permanent water quality management

SC6.4.8.7 Asset hand-over

SC6.4.8.8 Water quality asset maintenance plan

SC6.4.8.9 Water quality monitoring

SC6.4.8.10 Stormwater management plans

(1) Overview

(2) Concept stormwater management plans

(3) Stormwater management plans

SC6.4.8.11 Erosion and sediment control

(1) Pre-lodgement

(2) Erosion Hazard Assessments

(3) Information requirements

(4) Erosion and sediment control plans

(5) Erosion and sediment control program

(6) Soil testing

(7) Design standards

(8) Design and inspection certificates

(9) Work within waterways

(10) Effective stabilisation and plan sealing

(11) Release limits

(12) Delays

SC6.4.8.12 Terminology

SC6.4.8.13 References and source documents

SC6.4.8.14 Forms and checklists

Checklist A - Concept Stormwater Management Plans

Checklist B - Stormwater Management Plans

Form A – Erosion Hazard Assessment (EHA) form and Supporting Technical Notes

SC6.4.8.1 Introduction

Urban waterway protection that can maintain or improve the environmental values and uses of urban waterways requires integrated, adaptable waterway health-based approaches that are directed at managing both volume and rate of catchment run-off, the quality of the run-off, and protecting the riparian vegetation and the habitats necessary for supporting aquatic ecosystem health. Public safety and flood management remain as fundamental objectives of stormwater system planning and design. Stormwater management measures for waterway health enhancement should in no way compromise these objectives.

As detailed in the *State Planning Policy 2017*; development must be located, designed, constructed and operated to avoid or minimise adverse impacts on environmental values of receiving waters arising from:

(1) altered stormwater quality and hydrology;

(2) wastewater (other than contaminated stormwater and sewage);

(3) the creation or expansion of non-tidal artificial waterways; and

(4) the release and mobilisation of nutrients and sediments.

SC6.4.8.2 Planning for stormwater

(1) Pre-lodgement meeting

Prior to the lodgement of a development application, it is recommended that the applicant meet with Council to confirm acceptable stormwater management practices (for example, wetland, sediment basin and bioretention system designs) and discuss how stormwater treatment may influence overall design. Implementation of the water quality performance outcomes and design objectives defined in the *State Planning Policy 2017* is a requirement for all applications.

(2) Stormwater management

Stormwater management should be based on the following hierarchy of control mechanisms:

(a) Preserving existing valuable elements of the natural stormwater system, such as natural channels, wetlands, and riparian vegetation.

(b) Protecting environmental values by avoiding impacts on urban stormwater quality flow with forward planning.

(c) Limiting changes to the quantity and quality of stormwater at or near the source of potential contaminants or changes to flow such as by using best practice erosion and sediment control and water sensitive urban design principles.

(d) Managing remaining impacts by maintaining water pollutants on the development site and managing flows adequately using source control.

(e) Using structural measures, such as treatment techniques or retention basins, to improve water quality and control run-off.

(f) Applying structural treatment measures on or off site before the run-off enters a waterway is required to capture mobilised pollutants and mitigate geomorphological damages.

(g) As a last line of control, receiving waters should be managed to maintain environmental values in consideration of any residual impacts from stormwater pollutants or flows.

(3) Best practice management

Council supports best practice management approaches in water cycle management and will refer proponents to follow the guidance prepared by reputable organisations including;

(a) Stormwater quality best management practices provided by the International Erosion Control Association Best Practice Manuals for temporary / construction best practice water quality management strategies.

(b) Permanent and holistic best practice water quality management strategies including water quantity, water quality, stream stability, frequent flow management and waterway corridor issues provided by Water by Design, and Water Sensitive Cities Australia.

(c) Commitment to best practice modelling of water quality control measures using eWater's MUSIC software for modelling Water Sensitive Urban Designs.

(d) Best practice asset management and maintenance programs provided by Water by Design, and Water Sensitive Cities Australia.

SC6.4.8.3 Suitably qualified person

CSMP's and SMP's are to be prepared by a suitably qualified person.

Editor's Note - A suitably qualified person is one (or more) of the following:

- For urban stormwater quality and flow management
  A person with relevant tertiary qualifications or equivalent, including a registered practising engineer of Queensland (RPEQ) (civil engineering, environmental engineering). Such persons may be responsible for a Concept Stormwater Management Plans (CSMP) and/or stormwater management plan (site SMP).

- For erosion and sediment control
  A person who is a certified practising soil scientist (CPSS) or certified professional in erosion and sediment control (CPESC), or an RPEQ (or equivalent) with experience and training in soil science and erosion and sediment control. Such persons may be responsible for erosion and sediment control plans (ESCP). The necessary requirements (CPESC and/or RPEQ) are determined commensurate with the risk identified by the Erosion Hazard Assessment.

- For wastewater management
  A person with appropriate tertiary qualifications or equivalent such as an RPEQ with experience in environmental engineering or environmental scientist (or similar) incorporating wastewater management. Such persons may be responsible for a site wastewater management plan for the design, operation or construction of a development.

- For management of non-tidal artificial waterways
  A person with tertiary qualifications or equivalent such as an RPEQ (environmental engineering) or environmental scientist (or similar) and experience in incorporating waterway management. Such persons may be responsible for a waterway management plan for the design, operation or construction of a development with artificial waterways.

- For coastal algal blooms
  A person with tertiary qualifications (that is, science) or equivalent and experience in planning and managing for soil nutrients, water quality, hydrology and acid sulfate soils (for example, certified practising soil scientist or certified environmental practitioner).

- For acid sulfate soils
  A person with tertiary qualifications (that is, science) or equivalent and experience in planning and managing for soils and acid sulfate soils (for example, certified practising soil scientist).

SC6.4.8.4 Pre-lodgement

In order to make pre lodgement more beneficial, it is recommended that applicants undertake a preliminary site assessment and provide a range of baseline information to Council to assist and inform pre-lodgement discussions.

This baseline information ideally will include accurate survey plans which demonstrate information on pre-development site conditions including:

(1) Topography

A suitable ground survey of the site is required to allow an assessment of existing grades and flow pathways.

(2) Drainage characteristics

Drainage infrastructure and flow paths upstream, within, and downstream of the development must be surveyed for size, location, and level; this includes both drainage systems and waterways.

(3) Proposed discharge points and invert levels.

Critically, levels must be collected for inverts of drainage systems that will accept treated water from the stormwater treatment systems. If water is ponding in these drainage systems, the water level must also be surveyed.

(4) Waterways & wetlands

If the site contains waterways and/or wetlands identified by Council mapping (refer to Part 8 Overlays and SC2.5 Overlay Maps), they should be identified on preliminary plans.

(5) Soils

A soil evaluation undertaken in accordance with AS 1289 including a hydrometer analysis, dispersion index, and particle size distribution.

(6) Site disturbance

An indication of the current extent of disturbance across the site during the previous 12 months.

This baseline information is critical to facilitate designs which suitably respond to site constraints and opportunities. Consideration of constraints and opportunities early in the design process minimises redesigns and expedites the assessment process.

The recommended approach allows the information request stage to then be used to clarify minor issues in the report (should this be required). This will ensure that stormwater treatment matters are suitably addressed prior to a decision notice being issued and do not contribute to extended assessment timeframes.

The design and location of stormwater treatment measures has the potential to influence several things, including lot configuration and as a result, needs to be resolved prior to lodgement of site development plans for approval. Designers should be aware that the design of stormwater treatment measures will not only influence site design due to footprint but also potentially due to specific drainage requirements. Ensuring that treatment systems can freely drain becomes an increasingly important issue on sites with flat topography and must be resolved on every site prior to plan approval.

SC6.4.8.5 Temporary water quality management

Temporary water quality controls are erosion and sediment control measures. There are the first elements to implement for managing water quality when work commences. ESC measures are used to control and filter run-off from disturbed areas during construction.

Clause SC6.4.8.11 Erosion and sediment control contain Council's requirements for protecting waters from the impacts of development using erosion and sediment control and provides guidance on how risk is managed. The purpose of this section is to provide standards for land disturbance during development which when applied will achieve protection of waters from the impacts of development.

SC6.4.8.6 Permanent water quality management

Permanent water quality controls are implemented to control run-off water quality beyond the initial construction and maintenance stages and need to be described within a Stormwater Management Plan (SMP).

Minimum reductions in mean annual pollutant loads from unmitigated developments prescribed by the *State Planning Policy 2017* (to be achieved by new developments) are:

- 80% total suspended solids (TSS).
- 6 65% total phosphorus (TP).
- 40% total nitrogen.
- 90% gross pollutants > 5mm.

These design objectives shall be met for the following applications;

(1) Material change of use for an urban purpose that involves premises 2,500 m² or greater in size and;

  (a) will result in six or more dwellings; or

  (b) will result in an impervious area greater than 25 per cent of the net developable area; or

(2) reconfiguring a lot for an urban purpose that involves premises 2500 m² or greater in size and will result in six or more lots; or

(3) operational works for an urban purpose that involves disturbing a land area 2500 m² or greater in size.

Where these set of circumstances exist a stormwater management plan shall be required. Stormwater Management plans may also be requested in association with other applications at the discretion of the assessment manager, commensurate with best practice principles.

SC6.4.8.7 Asset hand-over

(1) Council is required to accept responsibility of stormwater quality control/management infrastructure that is, or will be, located on public land such as in parks, drainage reserves and road reserves. Where the asset is located in a park or drainage reserve, the minimum maintenance period will be 24 months.

(2) Water quality assets entirely located within road reserves will only require a 12-month maintenance period. These normally constitute swales, small bioretention systems, street tree bioretention treatments and gross pollutant traps.

(3) Where the bioretention basin is protected by a geo-textile and turf to protect the asset during construction, the planting of the basin will be required after rehabilitation of building and construction works is complete with a following 24 months maintenance period for the planting. This would require an uncompleted works bond to cover turf removal and geo-textile and planting/landscaping.

(4) Hand-over of vegetated stormwater assets (WSUD assets) should be undertaken as a process rather than an event, in accordance with Section 2 of Transferring Ownership of Vegetated Stormwater Assets (Water by Design, 2012).

(5) The asset hand-over process will include a pre-start inspection, practical completion inspection, on maintenance inspection and off maintenance inspection. Assets considered non-compliant are required to be rectified prior to completion of the off maintenance phase.

SC6.4.8.8 Water quality asset maintenance plan

(1) A water quality asset maintenance plan will be required for bioretention basins and wetlands located in parks or drainage reserves (or any other Council asset).

(2) A water quality asset maintenance plan sets out how the proposed methods of water quality control are to be maintained addresses such issues as:

  (a) inspection frequency;

  (b) expected clean-out frequency;

  (c) dewatering and waste disposal procedures;

  (d) access;

(e) consumables (e.g., oil-absorbing pillows);

(f) staff training and equipment needs;

(g) occupational health and safety requirements;

(h) estimated annual maintenance costs; and

(i) performance monitoring.

SC6.4.8.9 Water quality monitoring

(1) Water quality monitoring will give an indication as to whether the design predictions were accurate, the pollutant removal performance of the water quality control methods, and whether alternative or additional stormwater quality management practices may need to be employed.

(2) The approved Site Based Stormwater Management Plan (SBSMP) will nominate whether water quality monitoring is required for the proposed development, monitoring and assessment requirements.

SC6.4.8.10 Stormwater management plans

(1) Overview

Where permanent water quality management strategies are required to meet the reductions prescribed by the *State Planning Policy 2017*. The approach and design will be articulated in stormwater management plans. Concept Stormwater Management Plans (CSMP) and Stormwater Management Plans (SMP) set out how water quality, water quantity and waterway corridor management issues are to be managed during the stages of a specific development. Such plan/s may also be required for a development being assessed against Council's Stormwater code or to fulfil a condition of development.

Proponents must ensure that land use activities potentially discharging contaminated run-off or wastes to waterways during land development, construction and operation phases are sited and managed to minimise such discharges and to protect the quality and quantity of water entering natural and constructed waterways, natural and constructed wetlands, as well as groundwater resources.

To assist planning and decision making on a development that may result in stormwater erosion of disturbed soil and sediment transport to land and waters, potentially having an impact on receiving waters environmental values under the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* (the EPP Water), the environmental values established under the EPP (Water and Wetland Biodiversity) need to be protected, in part, by:

(a) providing natural water infiltration and flows;

(b) using Water Sensitive Urban Design (WSUD) principles and effective erosion and sediment control; and

(c) using best practice urban stormwater quality and quantity management.

Table. SC6.4.8.1 below, outlines the documentation required for Council to assess applications for stormwater management. Proponents may be required to lodge two types of stormwater plans as detailed below.

Site based stormwater management plans are flagged as a requirement in Section SC6.4.2 Development application guidelines, Clause SC6.4.2.6 (4) Minimum documentation required with application.

Table: SC6.4.8.1 When Stormwater Management Plans Required

Documentation	Material Change of use	Reconfiguring a Lot	Operational Work / Compliance Inspection
Concept Stormwater Management Plan (CSMP)	√	√	
Stormwater Management Plans (SMP)	√	√	√

Checklists are available in SC6.4.8.12 Checklist A - Concept Stormwater Management Plan Checklist and SC6.4.8.12 Checklist B - Concept Stormwater Management Plan Checklist.

(2) Concept stormwater management plans

A Concept Stormwater Management Plan (CSMP) is required to provide certainty in the early planning stages that adequate space is being provided for stormwater flows, stormwater quality treatment both during and after construction, for flood flow management and/or where waterway stability infrastructure is provided.

Please refer to SC6.4.8.12 Checklist A - Concept Stormwater Management Plans or click here to view the document.

(3) Stormwater management plans

(a) When required

Stormwater management plans are required at the operational works stage, or where an application for operational works or compliance inspection exists in isolation.

The provision of a Site Based Stormwater Management Plan (SBSMP) for development should:

(i) conform with principles of ecologically sustainable development;

(ii) maximise the social value of stormwater and stormwater infrastructure;

(iii) protect riparian zones from disturbance;

(iv) adopt water conservation and recycling principles;

(v) not cause or worsen flooding, or create nuisance ponding; and

(vi) minimise the cost to the Council of maintaining permanent stormwater infrastructure.

(b) Reduction in pollutant loads

Minimum reductions in mean annual pollutant loads from unmitigated developments, (to be achieved by new developments) are 80% total suspended solids (TSS), 65% total phosphorus (TP), 40% total nitrogen and 90% gross pollutants > 5mm.The water quality treatment strategy and design solution provided in the SBSMP may be derived either by:

(i) Computer Modelling Software (MUSIC) where reporting follows the procedures detailed in Chapter 7 of the Water by Design publication ‘MUSIC Modelling Guidelines’; or

(ii) adoption of a relevant best practice solution with supporting evidence and calculations to demonstrate the solution has been adopted correctly.

(c) Proprietary stormwater treatment devices

If a proprietary stormwater treatment device(s) is included in the design solution, independent verification of the performance-metrics of this device shall be demonstrated by Stormwater Australia SQIDEP Verification Certificate, and these certified performance-metrics shall be reflected in modelling and/or calculations provided.

The design of the permanent water quality controls is to be in accordance with the following publications:

(i) *Environmental Protection (Water and Wetland Biodiversity) Policy 2019.*

(ii) Publications by Healthy Waterways including *Water Sensitive Urban Design Technical Design Guidelines* (WSUD TDG)

Please refer to SC6.4.8.12 Checklist B - Stormwater Management Plans or click here to view the document .

SC6.4.8.11 Erosion and sediment control

Erosion and Sediment Control (ESC) is an inherent requirement for all development involving earthworks, however applications will be assessed on a risk basis. The *Planning Regulation2017* and *State Planning Policy 2017* contain planning provisions for ESC requirements in Queensland. Proponents must also ensure they meet their obligations under the *Environmental Protection Act 1994* and associated policies. Adherence to reputable sources such as the *International Erosion Control Association* for best practice guidance is recommended.

(1) Pre-lodgement

Hydrological, hydro-geological, hydraulic, vegetation, soils, and geological assessments will help applicants determine relevant site constraints that may affect the focus or details of erosion and sediment control programs/ plans.

(2) Erosion hazard assessments

(a) Assessment and certification

Erosion hazard assessment and certification must be undertaken by a suitably qualified and experienced professional as defined in the most current version of the Townsville City Council's Erosion Hazard Assessment (EHA) form and Supporting Technical Notes (Refer to SC6.4.8.12 Form A or click here to view the document).

(b) Concept erosion and sediment control plan and inspection certification

Concept erosion and sediment control plans, erosion and sediment control plans, design certificates and inspection certificates must be prepared and certified by a suitably qualified and experienced professional with an RPEQ qualification. This person must have successfully completed an advanced specialised training course in erosion and sediment control, provided under the auspices of a reputable body such as the International Erosion Control Association (IECA), and be able to provide documentary evidence of such training to the Council upon request.

Council also recognises the Certified Professional in Erosion and Sediment Control (CPESC) accreditation as meeting this requirement.

Where engineering structures (either temporary or permanent) such as inlets, outlets, spillways and sediment basin embankments form part of an Erosion and Sediment Control Plan, the design certification and inspection of such structures must be undertaken and certified by a Registered Professional Engineer of Queensland (RPEQ).

A completed Erosion Hazard Assessment Form provided to assessment staff at the pre-lodgement stage will enable an efficient approach to site planning by providing an indication of risk associated with the site. This risk rating will guide the qualification requirements for staff involved in design.

(3) Information requirements

An application for any development, including material change of use, reconfiguring a lot or operational work (where not previously addressed as part of MCU or RAL), which will result in land disturbance or exposure of soil and involve an issue listed in Column 1 of Table SC6.4.8.2 below, is to include the information summarised in Column 2 at the time specified in Column 3

Table SC6.4.8.2 - When Information is to be Lodged with Application

Column 1	Column 2	Column 3
All Applications	Submit a completed Erosion Hazard Assessment (EHA) form (Refer To SC6.4.8.12 Form A or click here to view the document). See below for additional requirements.	With development application
EHA Low Risk	Best practice erosion and sediment control (ESC) must be implemented but no erosion and sediment control plans need to be submitted with the development application. Documents outlining best practice ESC can be found at https://waterbydesign.com.au/download-category/erosion-and-sediment-control. (1) Sediment Management on Construction Sites; (2) ESC Factsheet Suite; and (3) ESC House Site Checklist.	Conditioned with development approval
EHA Medium Risk	The applicant will need to engage a Registered Professional Engineer (RPEQ) or Certified Professional in Erosion and Sediment Control (CPESC) to prepare an ESC Program and Plan and supporting documentation in accordance with the requirements of the Planning Scheme Policy.	Conditioned with development approval
EHA High Risk	The applicant will need to engage a RPEQ and CPESC to prepare an ESC Program and Plan and supporting documentation — in accordance with the requirements of the Planning Scheme Policy. The plans and program will need to be certified by a CPESC.	Conditioned with development approval
and/or where the development proposal involves any of the issues as described below		
Applications involving the endorsement of a staging plan	Submit an ESC program and plan and supporting documentation which demonstrate that the proposed staging will facilitate provision of effective ESC during construction.	With operational works application
Applications involving works which are located within the	Submit an ESC program and plan and supporting documentation which demonstrate how impacts on waterways have been minimised through appropriate route selection and	With operational works application

TCC Environmental Importance overlay	type of crossing and how construction of the crossing will be managed.	
Applications for which 1ha or greater external catchment area contributes stormwater run-off to the subject site	Submit an ESC program and plan and supporting documentation which demonstrates that clean stormwater from up-slope external catchment(s) can be diverted around or through the site without causing either an increase in sediment concentration of the flow, or erosion on site or off site. Alternatively, if it is not feasible to divert clean stormwater from up-slope external catchment(s) around or through the site, the ESC program and plan must demonstrate that there is sufficient land area available to install and operate a sediment basin which is sized to accommodate the stormwater run-off from the whole up-slope catchment.	With operational works application
Applications for which 1ha or greater of land disturbance will occur	Submit an ESC program and plan and supporting documentation which demonstrates that: • there is sufficient land area available to install and operate an appropriately sized sediment basin; • the run-off from all disturbed areas can be directed to a sediment basin throughout construction and until such time as the up-slope catchment is adequately stabilised against erosion.	With operational works application
Applications proposing works below 5m AHD	Submit an ESC program and plan and supporting documentation which demonstrates that: • the run-off from all disturbed areas can be directed to a sediment basin throughout construction and until such time as the up-slope catchment is adequately stabilised against erosion; • it is feasible to install sediment basins which will have sufficient storage volume to contain the design storm event I.e., the sediment basin will not be inundated with groundwater.	With operational works application
Applications proposing works on land having a slope of greater than 15%	Submit an ESC program and plan and supporting documentation which demonstrates that: • there is sufficient land area available to install and operate an appropriately sized sediment basin; • the run-off from all disturbed areas can be directed to a sediment basin: • preliminary engineering sections of proposed sediment basins showing that they may be practically implemented on the slopes proposed; • preliminary earthworks plan showing proposed extent of land disturbance; • geotechnical report which assesses the probability of landslip instability as a result of the construction phase ESC measures.	With operational works application

Information required in support of the operational works phase and construction phase for all Development involving a total area in excess of 2,500 m^2 of either land disturbance and/or exposure of

soil, and/or an issue listed in Column 1 of Table SC6.4.8.3 below is required to submit the information summarised in Column 2 at the time specified in Column 3.

Table SC6.4.8.3 - Information to be Lodged with Application

Column 1	Column 2	Column 3
All works subject to an operational works development approval with an EHA rating of 'medium'.	Erosion and sediment control plan(s) and orogram(s) – Refer to Clause SC6.4.8.11 (4) and SC6.4.8.11 (5) below for requirements.	As indicated in the condition timing of the development approval.
	Soil testing – Refer to Clause SC6.4.8.11 (6) below for requirements.	As indicated in the condition timing of the development approval.
	Design certificate – Refer to Clause SC6.4.8.11 (7) below	As indicated in the condition timing of the development approval.
All works subject to an operational works development approval with an EHA rating of 'high'.	Erosion and sediment control program(s) and plan(s) – Refer to Clauses SC6.4.8.11 (4) and 6.4.8.11 (5) below for requirements.	As indicated in the condition timing of the development approval.
	Soil testing – Refer to Clause SC6.4.8.11 (6) below for requirements.	As indicated in the condition timing of the development approval.
	Design certificate – Refer to Clause SC6.4.8.11 (7) below for requirements and erosion sediment control measures.	As indicated in Clause SC6.4.8.11 (7) below.
	Inspection certificate – Refer to Clause SC6.4.8.11 (7) below requirements and erosion sediment control measures.	As indicated in Clause SC6.4.8.11 (7) below.

(4) Erosion and sediment control plans

The primary purpose of erosion and sediment control plans (ESC plans) is to inform those persons constructing the development on what controls need to be implemented throughout all stages of the development from site establishment to project completion. Typically, a separate ESC Plan is required for each phase of the development including the bulk earthworks, civil construction (typically roadworks and stormwater drainage), services installation, final stabilisation, and the decommissioning of construction phase sediment basins. These plans could be considered an element of complying with the *general environmental duty*, that is, doing all that is reasonable and practicable to prevent or minimise environmental harm.

(a) ESC plans

ESC plans must:

(i) Be prepared by a suitably qualified and experienced professional as detailed in Clause SC6.4.8.3 above.

(ii) Be consistent with this standard and a current best-practice document (such as the IECA, *Best Practice Erosion and Sediment Control 2008*). For issues where a document (I.e.,

manual or guideline) is not consistent with this standard, this standard prevails to the extent of the inconsistency.

(iii) Be based on an assessment of the physical constraints and opportunities of the development site, including those for soil, landform type and gradient, and hydrology.

(iv) Be supported by on-site soil testing (See Clause SC6.4.8.11 (6) below, and Revised Universal Soil Loss Equation (RUSLE) calculations.

(v) Provide a set of contour drawings showing existing and design contours, the real property description(s), north point, roads, site layout, boundaries, and features. Contours on, and surrounding, the site should be shown so that catchment boundaries can be considered.

(vi) Be at a suitable scale for the size of the project (as a guide around 1:1000 at A3 for a 2ha development and 1:500 at A3 for a 3000 m^2 development).

(vii) Provide background information including site boundaries, existing vegetation, location of site access and other impervious areas and existing and proposed drainage pathways with discharge points also shown.

(viii) Show the location of lots, and stormwater drainage systems.

(ix) Details on the nature and specific location of works and controls (revegetation, cut and fills, run-off diversions, stockpile management, access protection), timing of measures to be implemented and maintenance requirements (extent and frequency as defined in IECA 2008, Chapter 6.8).

(x) Show all areas of land disturbance, the way that works will modify the landscape and surface and sub-surface drainage patterns (adding new, or modifying existing constraints).

(xi) For each phase of the works (including clearing, earthworks, civil construction, services installation, and landscaping) detail the type, location, sequence and timing of measures and actions to effectively minimise erosion, manage flows and capture sediment.

(xii) Describe the scheduling of progressive and final rehabilitation as civil works progress, including the stabilisation of up-slope catchments prior to sediment basin removal.

(xiii) Identify the riparian buffers and areas of vegetation which are to be protected and fenced off to prevent vehicle access.

(xiv) Indicate the location and provide engineering details with supporting design calculations for all necessary sediment basins and ESC-related drainage structures.

(xv) Indicate the location and diagrammatic representations of all other necessary erosion and sediment control measures.

(xvi) Identify the clean and disturbed catchments, and flow paths, showing:

1. diversion of clean run-off;
2. collection drains and banks, batter chutes and waterway crossings;
3. location of discharge outlet points; and
4. water quality monitoring locations.

(xvii) Show calculated flow velocities, flow rates and capacities, drain sizing and scour/lining protection, and velocity/energy checks required for all stormwater diversion and collection drains, banks, chutes, and outlets to waterways.

(xviii) Show waterways (perennial and non-perennial) and detail of stabilisation measures for all temporary waterway crossings.

(xix) Locate topsoil and/or soil stockpiles.

(xx) Prescribe non-structural controls where applicable, such as minimising the extent and duration of soil exposure, staging the works, identifying areas for protection, delaying clearing until construction works are imminent etc.

(xxi) Include a maintenance schedule for ensuring ESC and stormwater infrastructure is maintained in effective working order (refer IECA 2008, Chapter 6 and Chapter 7).

(xxii) Include an adaptive management program to identify and rectify non-compliances and deficiencies in environmental performance (refer IECA 2008, Chapter 6 & Chapter 7).

(xxiii) Provide details of chemical flocculation proposed, including equipment, chemical, dosing rates and procedures, quantities to be stored and storage location, and method of decanting any sediment basin.

(xxiv) Show how post-construction water sensitive urban design bioretention devices will be adequately protected against sediment ingress during land-disturbing activities, including where applicable the transition from construction-phase sediment basins to post-construction phase bioretention basins.

(5) Erosion and sediment control program

A construction phase erosion and sediment control (ESC) program is a set of management strategies, supporting documents and ESC plans that describe what controls are required throughout all stages of the construction of the development, including the integration and protection of post-construction stormwater management infrastructure (E.g., water sensitive urban design bioretention devices).

In addition to providing ESC plans, the ESC program must also:

(a) be consistent with this standard and a current best-practice document such as the IECA, *Best Practice Erosion and Sediment Control 2008*. For issues where a current best-practice document is not consistent with this standard, this standard prevails to the extent of the inconsistency;

(b) be supported by on-site soil testing and analysis (See Clause SC6.4.8.11(6) below) and RUSLE calculations;

(c) include contingency management measures for the site, for example to ensure ESC measures are always effective, particularly just prior to, during and after wet weather;

(d) be consistent with current best-practice standards, considering all environmental constraints including erosion hazard, season, climate, soil characteristics, and proximity to waterways;

(e) be prepared to a sufficient standard and level of detail such that compliance with this standard will be achieved if the construction phase ESC program is correctly implemented on site; and

(f) include an effective monitoring and assessment program to identify, measure, record, and report on the effectiveness of the erosion and sediment controls and the lawfulness of water releases (refer IECA 2008, Chapter 6 and Chapter 7).

(6) Soil testing

Proper assessment of site soil conditions is an integral component of best-practice civil construction and erosion and sediment control. Site soil characteristics are necessary to objectively inform the selection and design of site ESC measures, the suitability of in-situ soils for fill embankment construction and stability, construction-phase water quality treatment (such as for dispersive soils), future asset protection (such as stormwater outlet protection), topsoil fertility and amelioration requirements to ensure successful vegetative stabilisation and revegetation.

Soil testing compliant with this standard is undertaken in accordance with IECA 2008, Chapter 3.5 and Appendix C, and as varied below:

(a) for Chapter 3.5.4 provide full particle size grading including hydrometer analysis (AS 1289-3.6.1 and AS 1289-3.6.3). Refer Table 3.4a, Table 3.4b, and Table 3.4c for testing frequency and assessment levels;

(b) for Table 3.4a and Table 3.4b – Dispersion Index (AS 1289-3.8.2) applies to samples returning an Emerson class number of 1 or 2. Refer to tables for testing frequency and assessment levels; and

(c) for Table 3.4c – Particle size distribution (AS 1289 3.6.1) applies to representative subsoil samples. Refer to table for remaining requirements.

(7) Design standards

Design should meet best practice standards which can be reliably met by adherence to the International Erosion Control Association (IECA) best practice manuals. In addition, the following provisions apply:

(a) Design standards must meet the requirements contained in Appendix 2 of the *State Planning Policy 2017* (see Table A, parts 1,2, & 3.*Construction phase – stormwater management design objectives).*

(b) Temporary drainage control measures must be designed in accordance with the Council design standards in Section SC6.4.9 Stormwater quantity.

(c) The ESCP must incorporate “hold points” (where appropriate) detailing critical performance indicators of the various elements of the ESCP. The development must not be allowed to proceed without adherence to designated hold points at specified times.

The plan(s) must include all aspects of proposed site disturbance, temporary drainage works, erosion and sediment control measures, installation sequence, and site rehabilitation for the duration of the project, including (where appropriate) the nominated maintenance period. Adequate local site data, including soil data and the presence of sensitive receiving environments need to be included.

The ESCP must clearly state that no land disturbing activities on the site shall occur until all perimeter ESC measures, sediment basins, and associated temporary drainage controls, have been constructed in accordance with best practice erosion and sediment control.

(8) Design and inspection certificates

For any project assessed as having a ‘medium’ or ‘high’ risk according to the Erosion Hazard Assessment form, an ESC design certificate is required to be completed and lodged with Council at least 10 days prior to the prestart meeting or commencement of any bulk earthworks (not associated with ESC control installation) site works.

Designers must complete an erosion and sediment control design certificate as evidence that a suitably qualified professional has reviewed the erosion and sediment control plans for a project and can verify that the plans meet current industry best practice techniques and will effectively mitigate sediment migration from the project site. To meet this requirement, sign off must be provided by an RPEQ or CPESC for ‘medium’ risk sites and, an RPEQ and CPESC for ‘high’ risk sites.

(a) For ‘low’ risk sites best practice erosion and sediment control (ESC) must be implemented but no erosion and sediment control plans need to be submitted with the development application.

Documents outlining best practice ESC can be found at https://waterbydesign.com.au/download-category/erosion-and-sediment-control.

(i) Sediment Management on Construction Sites;

(ii) ESC Factsheet Suite; and

(iii) ESC House Site Checklist.

(b) It is a requirement that all ESCPs are signed by a suitably qualified and experienced professional commensurate with the erosion risk of the site as detailed below.

(c) Design, Construction and Maintenance phases must nominate a responsible person who will manage the ESCP requirements for all stages of development.

(d) For 'medium' risk sites the applicant will need to engage a Registered Professional Engineer of Queensland (RPEQ) that has completed an advanced course in Erosion and Sediment Control from an International Erosion Control Association (IECA) Australasia approved trainer (within a reasonable timeframe) OR a Certified Professional in Erosion and Sediment Control (CPESC) to prepare an ESC Plan and supporting documentation — in accordance with the IECA Best Practice Manuals and this policy.

(e) For 'high' risk sites if the development is approved, the applicant will need to engage a RPEQ AND a CPESC to prepare the ESC Plan and supporting documentation — in accordance with the requirements of the Townsville City Council Planning Scheme Policy. The plans will need to be certified by a CPESC.

(f) An erosion and sediment control inspection certificate is required as evidence that a suitably qualified professional has reviewed the erosion and sediment control construction and implementation for a project and can verify that the construction is in accordance with the certified design, meets current industry best practice techniques and will effectively mitigate sediment migration from the project site. Inspection certificates must be completed for 'medium risk sites following clearing activities and installation for ESC measures. This certificate shall be submitted to TCC prior to commencing any bulk earthworks (not associated with ESC control installation). Inspection certificates must be completed for 'high' risk sites as per 'medium' risk with additional inspections undertaken and certificate provided to TCC if bulk earthworks will be undertaken between December and April. Inspection certificates to be held onsite and presented to Council officers if an inspection is undertaken.

(g) When signing off on an ESCP, the signatory is deemed to be making the following statements:

(i) the ESCP satisfies the intent and design/performance standards established by all relevant local, state and federal policies relating to erosion and sediment control;

(ii) the ESCP has been reviewed and approved by personnel suitably trained and experienced professional (proportionate to the risk posed);

(iii) the ESCP is both reasonable and practicable; and

(iv) the ESCP contains sufficient information to allow the appropriate implementation of the plans.

(h) ESCPs that incorporate a sediment basin with a constructed earth embankment with a height greater than 1m, must be signed off by a geotechnical specialist.

(i) The approved ESCP, and accompanying design and inspection certificates must be available on-site for inspection by Council officers while work activities are occurring.

(9) Work within waterways

(a) waterways, including ephemeral and permanent waterways, must not be altered, nor riparian vegetation disturbed without prior written approval of the relevant administering authority;

(b) work within waterways:

(i) should only be undertaken during the lower rainfall hazard months (April - November);

(ii) must be promptly rehabilitated conforming to the natural channel form, substrates and riparian vegetation as far as possible;

(iii) are to be undertaken in accordance with IECA, *Best Practice Erosion and Sediment Control 2008*, Book 3 Appendix I – Instream works;

(c) temporary vehicular crossings of waterways must be designed and constructed to convey minimum pipe flows as defined within IECA 2008 Table 4.3.1, and remain structurally stable for all rainfall events up to the 10-year average recurrence interval event of critical duration; and

(d) erosion and sediment controls must not be constructed within the riparian zone, unless it is not feasible to site them elsewhere.

(10) Effective stabilisation and plan sealing

Prior to sealing of the plan of survey for the development, all site surfaces must be effectively stabilised using methods which will continue to achieve effective stabilisation in the medium to long term. For the purposes of this requirement, an effectively stabilised surface is defined as one that does not, or is not likely to, result in visible evidence of soil loss caused by sheet, rill or gully erosion or lead to sedimentation, or lead to water contamination.

A site is determined to be 'effectively stabilised' if at the time of the plan sealing inspection:

(a) Methods of stabilisation are:

(i) appropriate for slopes and slope lengths;

(ii) consistent with best-practice environmental management practices such as in IECA 2008; and

(iii) providing a minimum of 70% soil coverage (when viewed perpendicular to the soil surface) across any square metre of the site disturbance area.

(b) Stormwater run-off from the site is not currently and is not likely to result in visible evidence of sedimentation or erosion, or lead to water contamination, in the short, medium, and long term.

(c) If at the time of request for plan sealing, the method of stabilisation has not achieved a stability that has a high probability of enduring in the medium to long term, for example, inadequate grass cover or permanent approved landscape works are incomplete, the following will be taken into consideration in determining whether the site can achieve medium- to long-term stability:

(i) evidence of appropriate soil testing and amelioration having been adequately undertaken;

(ii) evidence of an adequate seed mix of annual and perennial grass species being applied at an adequate rate; and

(iii) evidence that appropriate grass strike and growth has been achieved for the type of stabilisation method selected.

For example, while hydro-mulch can provide an immediate and effective stabilising cover to soils, the protective cover can be relatively short lived if vegetation fails to establish before the thin layer of mulch decomposes. Similarly, where the hydro-mulch specification and application rate (I.e., t/ha) provides insufficient coverage and binding of the soil to prevent erosion whilst vegetation establishes, then the site will not be considered 'effectively stabilised'.

Therefore, if hydro-mulch is selected as the method of temporary stabilisation, it is important that perennial as well as annual grasses are well established at the time of plan sealing to reduce the risk of instability of the site in the medium to long term.

Editor's Note - The bonding of uncompleted works relating to erosion and sediment control (I.e., bonding of environmental outcomes) is not permitted where it is contrary to the purpose of this standard (I.e., the protection of Waters from the impacts of land and infrastructure development). This situation can be avoided through progressive stabilisation, supplementary watering, and effective site management.

(11) Release limits

(a) All releases of stormwater captured in a sediment basin, unless otherwise noted in this section, must not exceed the following limits:

(i) 50mg/L of total suspended solids (TSS) as a maximum concentration;

(ii) turbidity (NTU) value less than 10% above background;

(iii) pH value must be in the range 6.5 to 8.5 except where, and to the extent that, the natural receiving waters lie outside this range.

Editor's Note - It is recommended that a site-specific relationship between turbidity and suspended solids is determined for each sediment basin. Once a correlation between suspended solids and turbidity has been established for a sediment basin, testing stormwater for compliance with release limits, prior to release, can be done on site with a turbidity tube or calibrated turbidity meter. This has the advantage of providing immediate assessment to justify a release rather than waiting for laboratory results to confirm concentration levels and compliance. Note that post-release TSS validation is appropriate to demonstrate that the NTU/TSS correlation is being maintained.

Background refers to receiving water quality immediately upstream of the site location release point at the time of the release. Where there is no immediate upstream receiving water at the location and time of the release, then the turbidity release limit (NTU) will be equal to the release limit for 50mg/L total suspended solids (TSS) based upon the onsite correlation between TSS and NTU.

(12) Delays

Should the development be commenced and not completed within 12 months of approval of the ESCP, a revised ESCP must be prepared, with further revisions thereafter at half yearly intervals. For master planned developments this requirement applies for the ESCPs for each stage.

Additional erosion and sediment control measures are implemented, and a revised ESCP is submitted for approval (within five business days of any such amendments) in the event that:

(a) there is a high probability that serious, or material environmental harm may occur as a result of sediment leaving the site; or

(b) the implemented works fail to achieve the local government ESC standard/code, or state environmental protection requirements; or

(c) site conditions significantly change; or

(d) site inspections indicate that the implemented works are failing to achieve the "objective" of the ESCP.

In circumstances where it is considered necessary to prepare an amended ESCP, and the preparation of the amended ESCP is not imminent, then all necessary new or modified erosion and sediment control measures must be implemented in accordance with current best practice:

(a) in circumstances where there is significant risk of environmental harm, then upon receipt of the amended ESCP, all works must be implemented in accordance with the revised plan;

(b) otherwise, only upon acceptance of the amended ESCP by Townsville City Council shall works be implemented in accordance with the amended plan; and

(c) a copy of the amended ESCP must be forwarded to Council within 5 business days of any such amendments.

SC6.4.8.12 Terminology

CSMP	Concept Stormwater Management Plan
SMP	Stormwater Management Plan
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
RPEQ	Registered Professional Engineer of Queensland
CPSS	Certified Professional Soil Scientist
CPESC	Certified Professional in Erosion & Sediment Control
ESCP	Erosion and Sediment Control Plans
TSS	Total Suspended Soils
TP	Total Phosphorus
WSUD	Water-sensitive Urban Design
WSUD TDG	Water-sensitive Urban Design Technical Design Guidelines
SBSMP	Site Based Stormwater Management Plan
EPP Water	Environmental Protection Policy
SQIDEP	Stormwater Quality Improvement Device Evaluation Protocol
ESC	Erosion and Sediment Control
EHA	Erosion Hazard Assessment
IECA	International Erosion Control Association
MCU	Material Change of Use
RAL	Reconfiguring a Lot
RUSLE	Revised Universal Soil Loss Equation
NTU	Nephelometric Turbidity unit

SC6.4.8.13 References and source documents

Reference and source documents that must be read in conjunction with this section are as follows:

(1) Townsville City Plan scheme policy sections:

Part 8 Overlays

Section SC2.5 Overlay Maps

Section SC6.4.9 Stormwater Quantity

(2) Australian Standards:

AS1289.3.6.1 *Methods of testing soils for engineering purposes - Section 3.6.1: Soil classification tests - Determination of the particle size distribution of a soil - Standard method of analysis by sieving*

AS1289.3.6.3 *Methods of testing soils for engineering purposes - Section 3.6.3: Soil classification tests - Determination of the particle size distribution of a soil - Standard method of fine analysis using a hydrometer, (Refer Table 3.4a, Table 3.4b, and Table 3.4c for testing frequency and assessment levels.)*

AS1289.3.8.2 *Methods of testing soils for engineering purposes - Section 3.8.2: Soil classification tests - Dispersion - Determination of the percent dispersion of a soil, (Dispersion Index for samples with an Emerson class number of 1 or 2.)*

(3) QLD Government Legislations:

State Planning Policy 2017

Planning Regulation 2017

Environmental Protection Act 1994

Environmental Protection (Water and Wetland Biodiversity) Policy 2019

(4) Other:

Water by Design	*MUSIC Modelling Guidelines* (Refer current version)
Water by Design	*Water Sensitive Urban Design Technical Design Guidelines for South East Queensland* (Refer current version)
Water by Design	*Transferring Ownership of Vegetated Stormwater Assets* (Refer current version)
International Erosion Control Association (IECA)	*Best Practice Erosion and Sediment Control, Book 1 – Chapters, Book 2 – Appendices A – G and Book 3 Appendices H – N* (Refer current version)

SC6.4.8.14 Forms and checklists

Checklist A - Concept Stormwater Management Plan Checklist	Click here
Checklist B - Stormwater Management Plan Checklist	Click here
Form A – Erosion Hazard Assessment (EHA) Form and Supporting Technical Notes	Click here

Development manual planning scheme policy (PSP)
SC6.4.9 Stormwater quantity

Index

SC6.4.9.1 Introduction

(1) Objectives of stormwater drainage design
(2) Consultation and planning

SC6.4.9.2 Reference and source documents

SC6.4.9.3 Major and minor system design AEPs

SC6.4.9.4 Hydrology

(1) Design rainfall data
(2) Catchment area
(3) Rational method
(4) Hydrological models

SC6.4.9.5 Hydraulics
(1) Hydraulic grade line
(2) Major/minor system
(3) Minor system criteria
(4) Roadway flow width and depth
(5) Inlet pits and manholes
(6) Hydraulic losses
(7) Major system – minimum freeboard criteria
(8) Minimum grades
(9) Open channels
(10) Major structures
(11) Detention basins
(12) Tidal barriers
(13) Barriers at inlets and outlets

SC6.4.9.6 Stormwater detention

SC6.4.9.7 Inter-allotment drainage

SC6.4.9.8 Detailed design

(1) Conduits
(2) Design of pits
(3) Stormwater discharge
(4) Trench subsoil drainage

SC6.4.9.9 Documentation

(1) Drawings
(2) Easements and agreements
(3) Computer program files and program output

SC6.4.9.10 Drainage easements and drainage reserves

(1) Specifications for new easements and reserves
(2) Residential, commercial, and industrial areas
(3) Rural residential areas
(4) Rural areas

(5) Maintenance of easements
(6) Instrument relating to the terms – easements upon private property
(7) Townsville City Council standard drawings for drainage

SC6.4.9.11 Construction general

(1) Introduction
(2) General scope
(3) Extent of work
(4) Reference and source documents
(5) Temporary drainage during construction
(6) Siting of culverts
(7) Excavation
(8) Backfilling
(9) Compaction
(10) Concrete work
(11) Sprayed concrete
(12) Construction traffic
(13) Limits and tolerances

SC6.4.9.12 Drainage structures (construction)

(1) Scope
(2) References and source documents
(3) General
(4) Alignment
(5) Headwalls and wingwalls
(6) Pits
(7) Precast units
(8) Jointing
(9) Mass concrete bedding
(10) Backfill
(11) Limits and tolerances

SC6.4.9.13 Pipe drainage (construction)

(1) Scope
(2) Reference and source documents
(3) Common requirements
(4) Precast reinforced concrete pipes
(5) Steel pipes and pipe arches
(6) UPVC pipes
(7) Limits and tolerances

SC6.4.9.14 Precast box culverts

(1) Scope
(2) Reference and source documents
(3) Materials
(4) Construction
(5) Limits and tolerances

SC6.4.9.15. Drainage mats

(1) Scope
(2) Terminology
(3) Reference and source documents
(4) Order of construction

(5) Construction
(6) Limits and tolerances

SC6.4.9.16 Open drains

(1) Scope
(2) Terminology
(3) Reference and source documents
(4) General
(5) Types of open drains
(6) Inlet, outlet, and diversion drains
(7) Excavated material
(8) Lined open drains
(9) Rock filled wire mattresses and gabions
(10) Limits and tolerances

SC6.4.9.17 Terminology

SC6.4.9.1 Introduction

(1) Objectives of stormwater drainage design and construction

(a) Objectives

The objectives of stormwater drainage design and construction are as follows:

(i) to ensure that inundation of private and public buildings located in flood prone areas occurs only on rare occasions and that, in such events, surface flow routes convey floodwaters below the prescribed velocity/depth limits;

(ii) to provide convenience and safety for pedestrians and traffic in frequent stormwater flows by controlling those flows within prescribed limits; and

(iii) retain within each catchment as much incidental rainfall and runoff as is possible and appropriate for the planned use and the characteristics of the catchment.

(b) Principles

In pursuit of these objectives, the following principles apply:

(i) New developments are to provide a stormwater drainage system in accordance with the "major/minor" system concept set out in QUDM (Fourth Edition 2017) ; that is, the "major" system shall provide safe, well defined overland flow paths for infrequent storm runoff events while the "minor" system shall be capable of carrying and controlling flows from frequent runoff events.

(ii) Redevelopment - where the proposed development replaces an existing development, stormwater must be managed in a way that does not exacerbate flooding, and /or adversely impact on neighbouring land or road. The level of drainage provided must be consistent with new development.

(iii) The work to be executed under this section consists of the design of stormwater drainage systems for urban and rural areas.

(2) Consultation and planning

(a) Consultation with Council

Designers are encouraged to consult with the Council and other relevant authorities prior to and during the preparation of the stormwater design. Designers should, in addition to requirements of this section, ascertain the specific requirements of these authorities as they relate to the designs in hand.

(b) Existing service plans

The designer must obtain service plans from all relevant public utility authorities and organizations whose services may exist within the area of the proposed development. These services are to be plotted on the relevant drawings including the plan and cross-sectional views.

SC6.4.9.2 Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(1) SC6.4 Development manual planning scheme policy sections:

Section SC6.4.2 Development application guidelines
Section SC6.4.3 Standard drawings
Section SC6.4.8 Stormwater management
Section SC6.4.10 Stormwater quality
Section SC6.4.17 Structures
Section SC6.4.18 Concrete works
Section SC6.4.23 Construction management, quality management, inspection and testing

Section SC6.4.24 Acceptance of completed works
Section SC6.7 Flood hazard planning scheme policy.

(2) Australian Standards:

AS/NZS 1254	*PVC-U pipes and fittings for stormwater and surface water applications.*
AS/NZS 2032	*Installation of PVC pipe systems.*
AS/NZS 2566.1	*Buried flexible pipelines, Part 1: structural design.*
ASNZS 3725	*Design for installation of buried concrete pipes.*
AS/NZS 4058	*Precast concrete pipes (pressure and non-pressure).*
AS 4139	*Fibre reinforced concrete pipes and fittings.*

Institute of Public Works Engineering Australasia, *Queensland Urban Drainage Manual – Fourth Edition 2017.*

(3) Department of Transport and Main Roads:
Road Planning and Design Manual (2nd edition)

(4) Other:

Australian National Conference on Large Dams (ANCOLD)	*Guidelines on the Consequence Categories for Dams, 2012.*
Austroads	*Guide to Road Design Part 5: Drainage – General and Hydrology Considerations*
Chanson, H	*Hydraulic Design of Stepped Cascades, Weirs and Spillways, Pergamon, Oxford 1994.*
Chanson, H	*Hydraulics of Nappe Flow Regime Above Stepped Chutes and Spillways, Australian Civil Engineering Transactions, IEAust Volume 1 CE36 No. 1, January 1994.*
Concrete Pipe Association of Australia	*Hydraulics of Precast Concrete Conduits (Pipes and Box Culverts) 2012.*
Concrete Pipe Association of Australia	CPAA Technical Publications as a general reference
Commonwealth of Australia (Geosciences Australia) Australian Rainfall & Runoff (AR&R)	*A Guide to Flood Estimation 2019.*

SC6.4.9.3 Major and minor system design AEPs

(1) The Annual Exceedance Probability (AEP) is the probability of exceedance of a given rainfall intensity or discharge within a period of one year.

(2) The major system design AEP is the Defined Flood Event, being the 1% AEP, unless altered by the Part 8.2.6 Flood hazard overlay code.

(3) The Minor system design AEPs must be in accordance with Table SC6.4.9.1 below.

Table SC6.4.9.1 - Minor System Design AEP and Average Recurrence Interval (ARI)

Development Category	ARI (yrs)	AEP
Residential	2	39%
Commercial - Lower order (district centre and below)	2	39%
Commercial - Other (excluding Lower order commercial and Principal centre)	5	18%
Industrial	5	18%
Principal Centre (CBD)	10	10%
Rural Residential	20	5%
Parks and recreation areas (excluding community facilities)	1	1EY

(4) The Minor system design AEP for streets is as per the adjacent development category listed in Table SC6.4.9.1 above.

SC6.4.9.4 Hydrology

(1) Design rainfall data

Design rainfall data can be obtained from one of the following methods:

(a) Design intensity, frequency, duration (IFD) rainfall - IFD relationships shall be derived in accordance with Australian Rainfall & Runoff (AR&R 2019) for the catchment under consideration; and

(b) Design IFD rainfalls can be obtained from the Bureau of Meteorology website for specific locations, and these are to be submitted to Council.

(2) Catchment area

(a) The total area of land, both internal and external to the area of interest, contributing stormwater runoff to the point under consideration. Consideration must be given to likely changes to individual catchment areas and catchment parameters caused by the full development of the catchment in accordance with the zonings in the Townsville City Plan.

(b) Where no detailed survey of the catchment is available, datasources used to determine the catchments and to measure areas can be sourced in the form of digital elevation models from Council, Qld Open Data Portal or ELVIS for digital methods, otherwise contour maps produced from Council's GIS .can be used. A suitable scale shall be chosen for contours.

(c) Catchment area land use shall be based on current available zoning information or proposed future zonings, where applicable.

(3) Rational method

(a) Rational method calculations to determine peak flows shall be carried out in accordance with QUDM.

(b) All calculations shall be carried out or supervised by a qualified engineer (RPEQ certified) who is experienced in hydrologic and hydraulic design.

(c) The rational method is not appropriate for use in catchments with floodplain storage, timing effects due to multiple flow paths, and detention basins.

(d) Coefficients of discharge shall be calculated as per QUDM~~)~~. and full details of coefficients utilised shall be provided to Council.

(e) Details of fraction impervious for individual zonings are given in Table SC6.4.9.2 below.

(f) The time of concentration of a catchment is defined as the time required for storm run off to flow from the most remote point on the catchment to the outlet of the catchment. Most catchments will have multiple lengths of flow paths and gradients. The longest length flow path may not always govern the critical flow path. The hydrologic design should analyse several paths to assess any sensitivity to the catchment's time of concentration.

(g) Where the flow path is through areas having different flow characteristics or includes property and roadway, then the flow time of each portion of the flow path shall be calculated separately.

(h) The minimum time of concentration shall be taken as 5 minutes in urban and 10 minutes in rural catchments.

(i) Flow paths to pits must be designed to accommodate the flows from the fully developed catchment and provide for anticipated obstructions such as fences, building pads, buildings, and other likely obstructions. Any proposed changes to flow paths must be undertaken on a catchment wide basis to ensure flow paths are not diverted onto other land parcels which may result in damage or loss of enjoyment of the adjoining lands.

(j) Horton's roughness coefficient "n*" shall generally be derived from information in QUDM Section 4.6.. Values applicable to specific zoning types and overland flow path types are given below on the flow across:

(i)	Parks	0.35
(ii)	Rural residential land (vegetated)	0.3
(iii)	Rural residential land (short prairie grass)	0.15
(iv)	Residential low density	0.21
(v)	Residential high-density / industrial	0.06
(vi)	Commercial	0.04
(vii)	Paved areas and asphalt roads	0.01
(viii)	Gravel areas	0.02

(k) The design and analysis of stormwater drainage is to be based on the peak runoff flows from sub-catchments and from accumulated catchments. Designers are to show, by the assessment of partial catchment areas, that the peak flows have been identified.

(l) The fraction impervious for different types of land use zones is shown in Table SC6.4.9.2 below.

Table SC6.4.9.2 - Design AEPs and Fraction Impervious for Land Use Zones

Development Category	Land use	Fraction impervious (fi)
Residential zones category	Low density residential	0.65
	Medium density residential	0.7
	High density residential	0.9
	Rural residential	0.6

	Character residential	0.55
Centre zones category	Neighbourhood centre	0.9
	Local centre	0.9
	District centre	0.9
	Major centre	1.0
	Principal centre (CBD)	1.0
	Specialised centre	0.9
	Mixed use	0.9
Community facilities and Open space zone category	Sport & recreation	0.2
	Open Space	0.2
	Community facilities	0.95
	Environmental management & conservation	0.4
Industry zones category	Low impact industry	0.9
	Medium impact industry	0.9
	High impact industry	0.9
Rural zones category	Rural	0.1
Other zones category	Emerging community	-
	Special purpose	-

(4) Hydrological models

(a) Council has carried out flood modelling for most areas across Townsville. Hydrological models are available on request. The information from these models, such as peak flows, should be used during the design of the stormwater system.

(b) Other hydrological models may be used providing the requirements of Australian Rainfall & Runoff (AR&R) are met, summaries of calculations are provided and details are given of all program input and output.

(c) Details on the modelling requirements should be obtained from Section SC6.7 Flood hazard planning scheme policy.

(d) Where computer analysis programs are used, copies of the final data files shall be provided on submission of the design to Council and with the final drawings after approval by Council.

SC6.4.9.5 Hydraulics

(1) Hydraulic grade line

(a) Hydraulic calculations shall generally be carried out in accordance with Australian Rainfall & Runoff (AR&R) and shall be undertaken by a qualified person experienced in hydrologic and hydraulic design. The calculations shall substantiate the hydraulic grade line adopted for design of the system and shown on the drawings. Summaries of calculations are added to the plan and details of all calculations are given including listings of all programme input and output.

(b) The “major” system shall provide a safe, well defined overland flow path for larger storm events up to the maximum defined flood event. The “minor” system shall be capable of carrying and design flows from the lesser nominated flood events based on the land zoning of the area.

(c) Downstream water surface levels are to be obtained from Council’s existing flood studies. If flood study information is not available, the most appropriate of the below is to be used:

(i) known hydraulic grade line level from downstream calculations including pit losses at the starting pit in the design event;

(ii) where the downstream starting point is a pit and the hydraulic grade line is unknown, details of the downstream system shall be obtained, and further analysis performed to determine the hydraulic grade line;

(iii) where the outlet is an open channel and the design storm is the minor event, details of the downstream system shall be obtained, and further analysis performed to determine the hydraulic grade line. The top of the outlet pipe or the hydraulic grade line, or mean high water springs shallbe the downstream control, whichever is higher;

(iv) where the outlet is an open channel, the design storm is the major event and downstream flood levels are not known, details of the downstream system shall be obtained, and further analysis performed to determine the hydraulic grade line. The top of the outlet pipe or the hydraulic gradeline shall be the downstream control whichever is the higher;

(v) where the outlet is an open channel, the design storm is the major event and downstream flood levels are known, the downstream control shall be the highest of all duration events for the definedflood event;

(vi) mean high water springs (MHWS) where discharges are to river or creek systems within the intertidal zone;

(vii) In some instances, the downstream water surface level may need to be determined with the development of a flood study. Details on the flood study requirements should be obtained from Section SC6.7 Flood hazard planning scheme policy; and

(viii) the downstream water surface level used in the calculations should be provided to Council.

(2) Major/minor system

(a) Design of the drainage system should be in accordance with the major/minor flood management concept which recognises the dual requirements of the drainage system to provide for convenience and the protection of life and property for all storm events up to the defined flood event.

(b) All design work undertaken should follow the guidelines set down in the *Queensland Urban Design Manual* (QUDM) unless otherwise instructed in this section.

(3) Minor system criteria

(a) Minimum conduit sizes shall be as follows:

(i) pipes 375 mm diameter; and

(ii) box culverts 600 mm wide x 300 mm high.

(b) Maximum velocity of flow in stormwater pipelines shall be 4 m/sec. Minimum velocity shall be determined by ensuring self-cleansing velocity is achieved. This requirement shall be deemed to be satisfied providing the product of slope and diameter (S x D) is not less than 0.0008 m where S = slope (m/m) and D is pipe diameter (m).

(4) Roadway flow width and depth

(a) Flow width and depth criteria for major and minor storm events must comply with QUDM section 7.4.

(5) Inlet pits and manholes

(a) Inlet pits and manholes must be provided:

(i) to enable access for maintenance;

(ii) at changes in direction, grade, level, or class of pipe; and

(iii) at junctions.

(b) The maximum recommended spacing of pits and manholes where flow widths are not critical should be spaced every 80 m for ease of maintenance purposes. Kerb inlets shall be constructed in accordance with Section SC6.4.3 Standard drawings SD-200.

(c) Pit entry capacity calculations must be undertaken to provide for adequate spacing of pits, and to ensure flow capture has been adequately analysed. Flow under weirs and/or orifice conditions must be carefully considered. Information on pit entry capacities is available in the following sources:

(i) *Queensland Urban Drainage Manual* (QUDM);

(ii) Pit relationships given in Section 5.5, Book 9 of Australian Rainfall & Runoff (AR&R); and

(iii) Manufacturers' design specifications.

(d) Blockage factors to be applied to theoretical inflow capacities of inlet pits are given in Table SC6.4.9.3 below.

Table SC6.4.9.3 - Allowable Pit Capacities

Condition	Inlet Type	Blockage factor
Sag	Side entry	20%
Sag	Grated	50%
Sag	Combination	Side inlet capacity only Grate assumed completely blocked
Sag	"Letterbox"	50%
Continuous Grade	Side entry	20%
Continuous Grade	Grated	50%
Continuous Grade	Combination	90%
Field inlet	Flush	80%
Field inlet	Raised grate	50%

(6) Hydraulic losses

(a) Pressure change co-efficient "K" shall be determined from the appropriate charts given in QUDM Appendix 2.

(b) Allowable reduction in "K" due to benching is given in QUDM section 7.16.8.

(c) Computer program default pressure change co-efficient “K” shall not be acceptable unless they are consistent with those from the charts in QUDM. The chart used and relevant co-efficients for determining“K” value from that chart shall be noted on the hydraulic summary sheet provided for plan checking and included on the final design drawings.

(d) Bends may be permissible in certain circumstances and discussions with Council regarding their use isrequired prior to detailed design. Appropriate values of pit pressure change co-efficient at bends are givenin QUDM.

(e) The design must avoid clashes between services. However, where unavoidable clashes occur within the existing network, then the pressure change co-efficient “Kp” must be determined from the chart given in QUDM section 7.16.11.

(f) Requirements for private pipes entering Council’s system are given below:

(i) all pipe inlets, including subsoil pipes, must where possible, enter the main pipe system at junction pits. These must be finished off flush with and be grouted into the pit wall; and

(ii) if a junction has to be added then a junction pit shall be built at this location in accordance with this section.

(g) Construction of a junction without a structure should be avoided where possible. Permission to do this is required from Council prior to detailed design. Where this is unavoidable, the pressure-change coefficients Ku, for the upstream pipe and Kl, for the lateral pipe, must be determined from the chart given in QUDM.

(h) Going from larger upstream to smaller downstream conduits is not permitted without approval of Council prior to detailed design. In going from smaller to larger pipes benching must be provided in pits to enable a smooth flow transition. Losses in sudden expansions and contractions are given in QUDM.

(i) Underground drainage systems must be designed as an overall system, with due regard to the upstream and downstream system and not as individual pipe lengths. Drainage system designs must clearly show the hydraulic grade line (HGL), especially in systems operating under undue pressure.

(7) Major system – minimum freeboard criteria

(a) Where floor levels of adjacent buildings are above road level there must be a minimum freeboard of 300 mm to floor level of adjacent buildings.

(b) Where floor levels of existing adjacent buildings are below, or less than 300 mm above the top of kerb, and there is at least 100 mm fall on the footpath towards the kerb, the maximum flow depth is 50 mm above the top of kerb.

(c) Where floor levels of existing adjacent buildings are below, or less than 300 mm above the top of kerb, and there is less than 100 mm fall on the footpath towards the kerb, the maximum flow depth is at the topof kerb.

(d) Wave action wash that enters properties from passing vehicles must be considered.

(e) Road capacities and major system flood levels are to be determined adopting the roadway as an openchannel. Assessment of flood impacts on adjoining properties must consider any effects of backwater from the adjacent waterway using backwater analysis techniques.

(8) Minimum grades

(a) Unlined drains must have a minimum grade of 0.5% and lined drains must have a minimum grade of 0.3%. This includes table drains and kerb and channel.

(b) Pipe and box culverts must have a minimum grade of 0.2%.

(9) Open channels

(a) Generally, open channels and swales must be designed to have smooth transitions with adequate access provisions for maintenance and cleaning. Where Council permits the use of an open channel to convey flows from a development site to the receiving water body, such a channel must comply with therequirements of this section.

(b) Design of open channels must be in accordance with Chapter 9 of QUDM. Open channels must be designed to contain the major system flow.

(c) Friction losses in open channels must be determined using Manning's "n" values. Mannings "n" roughness co-efficients for open channels must generally be derived from information in Chapter 2, Book 6 of Australian Rainfall & Runoff (AR&R). Manning's "n" values applicable to specific channel types are given in the table SC6.4.9.4 below:

Table SC6.4.9.4 – Manning's "n" Values for Specific Channel Types.

Surface Type	Manning's "n"
Concrete Pipes or Box Sections	0.011
Concrete (trowel finish)	0.014
Concrete (formed without finishing)	0.016
Sprayed Concrete (gunite)	0.018
Bitumen Seal	0.018
Bricks or pavers	0.015
Pitchers or dressed stone on mortar	0.016
Rubble Masonry or Random stone in mortar	0.028
Rock Lining or Rip Rap	0.028
Corrugated Metal	0.027
Earth (clear of weeds and debris)	0.022
Earth (with weeds and gravel)	0.028
Rock Cut	0.038

Editor's Note - For Manning's n values of grass channels refer to the *Road Planning and Design Manual (Part 5B).*

(d) Where the product of average velocity and average flow depth for the design flow rate is greater than 0.4m²/s, the design must specifically provide for the safety of persons who may enter the channel in accordance with Chapter 12 of QUDM.

(e) Maximum side slopes on grassed lined open channels must be in accordance with section 9.5.4 of QUDM. Low flow provisions in open channels (man-made or altered channels) will require low flows to be contained within a pipe system or concrete lined channel section at the invert of the main channel. The width of the concrete lined channel section must be the width of the drain invert or at least sufficiently wide enough to accommodate the full width of a tractor with an absolute minimum width of 1.5 m.

(f) Open channels should be wide and shallow in preference to narrow and deep to maintain natural invert level to reduce the expression of groundwater.

(g) Designers should also ensure that longitudinal grades are sufficient to prevent the ponding of storm water for periods of more than 2 days after a rain event.

(h) Transition in channel slopes is to be designed to avoid or accommodate any hydraulic jumps due to the nature of the transition.

(i) Drop structures must be designed in open channels where the water velocity exceeds 2 m/s. The design must address the size and location of the structure as well as details of any stilling basins and revetment works surrounding the structure.

(j) Special consideration must be given to erosion control where sodic soils occur. Details of treatment proposals prepared by a competent person must be provided and approved by Council.

(10) Major structures

(a) All major structures in urban areas, including bridges and culverts, must be designed for the 1% AEP storm event with minimal afflux. Some afflux and upstream inundation may be permitted in certain rural and urban areas provided the increased upstream flooding does not inundate private property or critical infrastructure.

(b) A minimum clearance of 0.5 m between the 1% AEP flood level and the underside of any structure is required to allow for passage of debris without blockage except where Council permits structures to be overtopped.

(c) Certified structural design must be provided for bridges and other major culvert structures and may be required on some specialised structures. Structural design must be carried out in accordance with Section SC6.4.17 Structures.

(d) Culverts (either pipe or box section) must be designed in accordance with information and charts provided in QUDM.

(e) Safety limitations – overtopping of roadways. All floodwaters overtopping a major structure such as a culvert or bridge structures within a road are to be checked for safety and stability limitations for both pedestrians and vehicles. Assessment of the waterway crossing safety and stability is to be undertaken based on criteria outlined in QUDM – Tables 7.4.3 and 7.4.4.

(11) Detention basins

(a) For each AEP a range of storm events shall be run to determine the peak flood level and discharge from the retarding basin. Storm patterns to be used are outlined in Australian Rainfall & Runoff (AR&R) and can be obtained from the AR&R data hub website (www.data.arr-software.org). The critical storm duration with the retarding basin is likely to be longer than without the basin. A graph showing the range of peak flood levels in the basin and peak discharges from the basin shall be provided for the storms examined.

(b) Flood routing should be modelled by methods outlined in AR&R. Rational method approximations of flood hydrographs are unacceptable.

(c) The high-level outlet to any retarding basin shall have capacity to contain a minimum of the 1% AEP flood event. Additional spillway capacity may be required due to the hazard category of the structure. The hazard category should be determined by reference to ANCOLD.

(d) The spillway design shall generally be in accordance with the requirements for open channel design in Clause SC6.4.9.5(9) and QUDM (Chapter 5).

(e) The low flow pipe intake shall be designed in accordance with the requirements of QUDM, section 5.8.

(f) Freeboard - Minimum floor levels of dwelling shall be 0.3 m above the Defined 1% AEP flood level in the basin.

(g) Public safety issues

Basin design is to consider the following aspects relating to public safety:

(i) side slopes are to be a maximum of 1 in 6 to allow easy egress. Side slopes of greater than 1 in 4 may require handrails to assist in egress from the basin;

(ii) water depths shall be, where possible, less than 1.5 m in the defined AEP flood event. Where neither practical nor economic, greater depths may be acceptable. In that case the provision ofsafety refuge mounds should be considered;

(iii) the depth indicators should be provided indicating maximum depth in the basin;

(iv) signage of the spillway is necessary to indicate the additional hazard;

(v) basins shall be designed so that no ponding of water occurs on to private property or roads;

(vi) no planting of trees in basin embarkment walls is allowed;

(vii) no basin spillway is to be located directly upstream of urban areas;

(viii) submission of drawings to the "Dam Safety Committee" is required where any of these guidelines are not met or Council specifically requires such submission; and

(ix) stepped spillways are used in rare instances for energy dissipation and scour control. Guidance on hydraulic design and analysis of these structures is as per Chanson 1994.

(12) Tidal barriers

The use of tidal barriers on stormwater outlets are required in areas affected by tides. The device used should meet the following criteria:

(a) limited pressure head required to allow the discharge of stormwater from the system without any manual intervention. Specifications of the device proposed to be used should be supplied to Council prior to detailed design;

(b) barriers should not be able to be wedged open to an incoming tide by litter;

(c) Council will not accept hinged flap gates as a suitable solution; and

(d) minimal requirements for repairs and maintenance of the device. Any maintenance information for thedevice should be supplied to Council prior to detailed design.

(13) Barriers at inlets and outlets

Provision shall be made for the safety of the public including children relating to the inlet and outlet of the stormwater system and should be based on the following criteria:

(a) no opening into an underground system shall be wider than 150 mm except at head walls to pipes and box culverts;

(b) headwalls on the inlets and outlets to underground drains in which the drain is longer than 30 m and hasa cross sectional area greater than 0.5 m^2 must be protected with handrails, guard rails or fencing which restricts easy access to the entry structure;

(c) trash screens or other forms of grates are not favoured across the front of inlets and are unlikely to be approved by Council unless there is a tidal barrier on the outlet of the stormwater system – this may beconsidered by Council;

(d) any grates over field inlet pits shall be set above the top of the pit to provide a 50 mm gap between the top of the pit and the bottom of the grate. In areas of open space, marker posts must be used to identify each corner of the pit; and

(e) under no circumstances, should fixed barriers or grates be placed at the end of stormwater outlet.

SC6.4.9.6 Stormwater detention

(1) Installation of stormwater detention is required on all development sites where insufficient capacity in thedownstream drainage systems exist and a minimum amount of detention will be that required to ensure no worsening of the flooding situation occurs during the defined flood event.

(2) The requirements for stormwater detention design are outlined in QUDM.

(3) The development must limit any increase in discharge rate for all storm events up to and including the defined flood event.

(4) The developed site must not discharge more stormwater than the discharge calculated for pre-developmentflows.

(5) Combined sedimentation and detention ponds must be designed in accordance with Section SC6.4.8 Stormwater management and SC6.4.10 Stormwater quality so that remobilisation of sediment is minimised.

SC6.4.9.7 Inter-allotment drainage

(1) Inter-allotment drainage must be avoided wherever possible. Where inter-allotment drainage is proposed, the Developer must demonstrate that no other drainage alternative is possible. Inter-allotment drainage is not to collect road runoff.

(2) Where inter-allotment drainage is unavoidable, it should not cover more than 2 allotments and must be contained within an easement not less than 3 m wide. The easement must be provided over the entire length of the drainage structure in favour of lots benefiting from and affected by the pipe. All inter-allotment and allotment drainage, connector pipes, and surface water collection infrastructure, remains the responsibility of the lot owner.

(3) Where inter allotment drainage is unavoidable and serves more than 5 allotments, a minimum 375 mm diameter pipe must be provided to capture the flow and must be contained within an easement not less than 3 m wide. The easement must be provided over the entire length of the drainage structure in favour of Council over the collector pipe.

(4) Inter-allotment drainage shall not be provided in commercial and industrial developments. Commercial and industrial areas shall connect directly to the Council stormwater network.

(5) Where drainage is required over more than two allotments, a drainage easement is required in favour of Council.See Clause SC6.4.9.10 Drainage easements and drainage reserves.

(6) Inter-allotment drains must be designed to accept concentrated drainage from buildings and paved areas on each allotment for flow rates having a design AEP the same as the “minor system” per Table SC6.4.9.1.

(7) The design of inter allotment drainage must make allowance for major system flows, with appropriate freeboard.

(8) In lieu of a more detailed analysis, the fraction impervious for surfaces contributing runoff to the inter-allotment drain are as shown in Table SC6.4.9.2.

(9) Pipes must be designed to flow full at the design discharge without surcharging of inspection pits.

(10) Inter allotment drainage pits must be located at all changes of direction. Pits must be constructed from an industry approved material and accepted by Council for use.

(11) The inter allotment drainage must have a minimum longitudinal gradient of 0.5% for grassed lined open channels and 0.5% for pipes less than 300 mm or if agreed by Council achieve self-cleansing velocity.

(12) The inter allotment drainage must be constructed from either fibre reinforced concrete drainage pipe, reinforced concrete pipe, or uPVC pipe which must conform respectively to the requirements of AS4139, AS/NZS4058 and AS/NZS1254 respectively.

(13) Where inter allotment drainage and sewer mains are laid adjacent to each other they must be spaced with 1.5m between pipe centrelines (where the pipe inverts are approximately equal).

(14) Where there is a disparity in level between inverts the spacing must be submitted for approval.

(15) Where sewer mains are close to inter allotment drainage lines, they must be shown on the inter allotment drainage plan.

SC6.4.9.8 Detailed design

(1) Conduits

(a) Pipe bedding and cover requirements for reinforced and fibre reinforced concrete pipes shall be determined from the Concrete Pipe Association's *Hydraulics of Precast Concrete Conduits (Pipes and Box Culverts) 2012* or AS/NZS3725. For uPVCpipes, the requirements shall be to AS/NZS2032.

(b) Conduit jointing shall be in accordance with manufacturer's specifications.

(c) Drainage lines in road reserves shall generally be located behind the kerb line and parallel to the kerb.

(d) Drop structures shall be designed on drainage lines where the pipe gradient exceeds 5 per cent or water velocity exceeds 4 m/s. The design details shall address the size, and position in the trench as well as spacing along the line.

Editor's Note - Buried flexible drainage pipes.

Situations may be identified during the design of a development for the use of buried flexible pipes instead of the pipes specified in Clause SC6.4.9.13 Pipe drainage (construction).

In such cases, the design will be required to select the flexible pipe type appropriate for the application and prepare the relevant technical specification clauses for the supply and construction with reference to AS/NZS 2566.1, Buried flexible pipelines Part1: Structural design. The proposed additional clauses would then be submitted, as an addendum to the development consent, for review and approval by Council.

(2) Design of pits

Pits shall be designed in accordance with Section SC6.4.3 Standard drawings SD-200, SD-205, SD-210 and SD-215. Safety and safe access are important in pit design and grates shall be of "bicycle safe" design.

(3) Stormwater discharge

(a) Scour protection at culvert, pipe system or kerb and channel outlets shall be designed in accordancewith the guidelines outlined in QUDM, section 8.7. Council discourages the use of any outlet structure that proposes ponding at the outlet.

(b) Where a Developer proposes to concentrate stormwater onto an adjoining property, Council will require the Developer to provide written agreement from the adjoining owner(s) granting permission to the discharge of stormwater through their property and the creation of any necessary easements.

(c) Where it is proposed to discharge runoff to an area under the control of another statutory authority, thedesign requirements of that statutory authority are also to be met.

(d) Piped stormwater drainage discharging to recreation reserves is to be taken to a point of discharge nominated by Council and in the manner nominated by Council.

(4) Trench subsoil drainage

Subsoil drainage should be designed and installed as per Section SC6.4.3 Standard drawings SD-080.

SC6.4.9.9 Documentation

(1) Drawings

(a) Catchment area plans shall be drawn to scales of 1:500, 1:1000 or 1:5000, at A1 sheet size, unless alternative scales are specifically approved by Council and shall show contours, direction of grading of kerb and channel, general layout of the drainage system with pit locations, catchment limits and any other information necessary for the design of the drainage system.

(b) The drainage system layout plan shall be drawn to a scale of 1:500 at A1 for urban areas and 1:1000 rural areas and shall show drainage pipeline location, drainage pit location and number and road centreline chainage, size of opening and any other information necessary for the design and construction of the drainage system.

(c) The plan shall also show all drainage easements, reserves, and natural water courses. The plan may be combined with the road layout plan.

(d) The drainage system longitudinal section shall be drawn to a scale of 1:500 at A1 horizontally and 1:50 vertically and shall show pipe size, class and type, pipe support type in accordance with AS/NZS 3725 or AS/NZS 2032 as appropriate, pipeline and road chainages, pipeline grade, hydraulic grade line and any other information necessary for the design and construction of the drainage system.

(e) Open channel cross sections shall be drawn to a scale of 1:100 at A1 natural and shall show the direction in which the cross sections should be viewed. Reduced levels are to be to Australian height datum (AHD),unless otherwise approved by Council where AHD is not available.

(f) Details including standard and non-standard pits and structures, pit benching, open channel designs andtransitions shall be provided on the drawings to scales appropriate to the type and complexity of the detail being shown.

(g) As constructed drawings shall be submitted to Council upon completion of the drainage construction andprior to Council's acceptance of completed works. The detailed drawings may form the basis of this information; however, any changes must be noted on these drawings.

(h) The as constructed plans must clearly identify the sections of the drainage system that will be owned byprivate residents as agreed by Council.

(2) Easements and agreements

(a) Evidence of any Deed of Agreement necessary for the diversion of runoff through an adjoining property must be submitted prior to any approval of the engineering drawings required for an Operational Works application. Easements must be created concurrently with the issue of the plan of survey.

(b) Where an agreement is reached with the adjacent landowners to increase flood levels on their property or otherwise adversely affect their property, a letter signed by all the landowners outlining what they have agreed to and witnessed by an independent person shall be submitted prior to any approval of the application.

(3) Computer program files and program output

(a) Computer program output must be submitted to Council providing summary sheets for hydrological and hydraulic calculations in accordance with this section and together with the plans submitted for checking and with final drawings.

(b) Copies of final computer data files (electronic and hard copy), for both hydrological and hydraulic models shall be provided for Council's data base of flooding and drainage information in formats agreed with Council.

SC6.4.9.10 Drainage easements and drainage reserves

(1) Specifications for new easements and reserves

(a) Easements must be of a size to enable necessary works including, but not limited to, construction,maintenance, and inspection, to be carried out.

(b) Easement widths for drainage must be no less than the greater of the criteria below.

Criteria	Type	Easement/Reserve Width
Pipe/Culvert	Pipe diameter/box culvert width ≤900 mm	Minimum 3.0 m
	Pipe diameter/box culvert width >900 mm	Easement to extend to outside diameter/box culvert width + 1m each side of external edges of pipe/culvert
Channel/Drain	Base width ≤ 5 m	Full bank width of channel/drain + 4 m wide accesspath along one bank
	Base width > 5 m	Full bank width of channel/drain + 4 m wide accesspath along both sides of channel/drain

(c) All drainage easements must be appropriately sized and located to ensure that they are not affected by, and do not impact on, an existing building's footing zone of influence, and consider any future building footings on the subject or adjoining land.

(2) Residential, commercial, and industrial areas

All major drainage is to be located within a drainage reserve with the minimum widths of that reserve being capable of containing the 1% AEP design flows plus a 4 m strip on each side for maintenance accessand safety purposes.

(3) Rural residential areas

(a) Easements must be created over all drains and natural water courses through private property unless Council determines the land is to be set aside for public use and is to be handed to Council.

(b) In rural residential areas adjacent to a major watercourse, Council may require drainage reserves or easements to be extended to cover identified areas of riparian vegetation, which may be beyond the strip required for maintenance access and safety purposes.

(4) Rural areas

(a) Easements or reserves are not required over natural watercourses. However, easements must be provided over all drains where stormwater is diverted from the natural flow path and be wide enough to contain the flows from the defined flood event plus adequate width for maintenance and safety purposes.

(b) Where the land falls away from the road, easements for drainage are required through private property over formed drains from road culverts and table drains. The location of these easements shall be fixed during design and approval of operational works for the roadworks concerned.

(5) Maintenance of easements

(a) A drainage easement over a property restricts the use of the area of land contained within the easement for drainage purposes. Council's level of service for drainage easements is restricted to ensuring the drainage easement can perform its purpose of carrying stormwater flows through the property. If an owner desires a higher order of maintenance for other reasons, this will be at the owner's ongoing cost and must not compromise the drainage function of the easement. Altering

of the drain in the easement by the owner without the approval of Council may result in action being undertaken by Council to restore the drainage path at the expense of the owner.

(b) Where subdividers are required to provide drainage easements and reserves over approved drainage paths, then these are to be acquired over the entire land at the first stage of subdivision. Where surcharge paths are terminated at the end of stages then drainage easements are required over balance lands, with such easements being released progressively with future stages that provide the surcharge path down the future roads or drainage reserves.

(6) Instrument relating to the terms – easements upon private property

Standard wording for the instruments setting out the terms for the various types of easements that can be acquired for drainage are to be utilised, with each document being cognisant of Council's needs for future grading and on-going maintenance. The document is to also ensure that the responsibility and definition of maintenance within drains is clearly defined on the instruments that accompany the easement documents. This is particularly important in rural residential areas where some residents have an expectation that Council will maintain the land (easement) to a much higher standard than is needed for drainage purposes. In relation to inter allotment drains that are not a part of the public drainage system, provision is to be made in the easement document to state that all maintenance is the owner's responsibility but with provision being made to enable the Council to carry out necessary works at the cost of the defaulting owner.

(7) Townsville City Council standard drawings for drainage

Please refer to Table SC6.4.3.2 - Townsville City Council Standard Drawings for Stormwater Drainage or Click here to obtain a copy of the drawings.

SC6.4.9.11 Construction general

(1) Introduction

Drainage works shall form a complete system carrying water through and away from the works.

This is the general section common and applicable to all types of drainage lines, open drains, kerb and channel, and drainage structures and shall be read in conjunction with drainage requirements provided below for pipe drainage, precast box culverts, drainage structures, and open drains.

(2) General scope

The work to be executed under this section consists of:

(a) preparation for stormwater drainage construction;

(b) temporary drainage during construction;

(c) siting of pipes, pipe arches and box culverts;

(d) all activities and quality requirements associated with excavation and backfilling; and

(e) all concrete work associated with stormwater drainage.

Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in Section SC6.4.23 Construction management, quality management, inspection and testing.

(3) Extent of works

Details of the work are shown on the drawings. The extent of works under this section is summarised as follows:

(a) pipe culvert stormwater drainage;

(b) precast box culvert stormwater drainage;

(c) drainage pits, headwalls, wingwalls and aprons;

(d) open concrete dish drains;

(e) scour protection of open drains at outlets to drainage structures; and

(f) demolition and removal of existing redundant pipe culverts, headwalls, and pits.

(4) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(a) SC6.4 Development manual planning scheme policy sections:

Section SC6.4.7 Clearing, grubbing, and earthworks.
Section SC6.4.18 Concrete works.

(b) Australian Standards:

AS 1289.5.4.1	*Methods of testing soils for engineering purposes - Method 5.4.1: Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio*
AS 1289.5.7.1	*Methods of testing soils for engineering purposes - Method 5.7.1: Soil compaction and density tests - Compaction control test - Hilf density ratio and Hilf moisture variation (rapid method)*
AS 1597	*Precast reinforced concrete box culverts*
AS/NZS2566.2	*Buried flexible pipelines – Part 2: Installation*
AS/NZS3725	*Design for installation of buried concrete pipes*

(c) Other:

International Erosion Control Association (IECA) *Best Practice Erosion and Sediment Control*

(5) Temporary drainage during construction

(a) For each part of the drainage system, complete the erosion and sedimentation control measures before commencing the drainage works (except those parts of the drainage system forming part of the control measures). Measures for erosion and sedimentation control must be provided in accordance with the requirements of the accepted project erosion and sediment control plan and/or *Best Practice Erosion and Sediment Control* and make adequate provision for runoff flows at drainage works under constructionor at surrounding areas/structure.

(b) The Contractor shall make adequate provision for runoff flows at drainage works under construction to avoid damage or nuisance due to scour, sedimentation, soil erosion, flooding, diversion of flow, damming, undermining, seepage, slumping or other adverse effects to the Works or surrounding areas and structures because of the Contractor's activities.

(c) The Contractor shall not implement any proposals to dam up or divert existing watercourses (either temporarily or permanently) without the prior approval of Council by way of approved drawings or written instruction.

(d) The Contractor's material and equipment shall be located clear of all watercourses.

(6) Siting of culverts

(a) Before commencing construction of any culvert, the Contractor shall set out on site the culvert inlet and outlet positions to the location and levels shown on the drawings and shall present this set out for inspection by the Superintendent.

(b) The Superintendent may amend the inlet or outlet locations or designed levels or the culvert length to suit actual site conditions. Any such amendments must ensure no negative impacts on neighbouringland parcels and existing properties. Prior approval must be sought from Council.

(c) Should the Contractor propose changes to the culvert location, length, designed levels, culvert strength, conditions of installation or cover to suit the construction procedures, the Contractor shall present theproposed culvert set out in addition to the designed set out for consideration by the Superintendent and Council. No changes shall be made unless prior written approval from Council is obtained.

(7) Excavation

(a) Before undertaking stormwater drainage excavation, topsoil shall be removed in accordance with Section SC6.4.7 Clearing, grubbing and earthworks.

(b) In undertaking trench excavation, the Contractor shall provide any shoring, sheet piling or other stabilisation of the sides necessary to comply with statutory requirements.

(c) Where public utilities exist in the vicinity of stormwater drainage works the Contractor shall obtain the approval of the relevant authority/corporation to the method of excavation before commencing excavation.

(d) Excavation by blasting, if permitted by Council, shall be carried out to ensure that the peak particle velocity measured on the ground adjacent to any previously installed culvert or drainage structure does not exceed 25mm per second. The Contractor shall comply with other requirements concerning blasting operations in Section SC6.4.7 Clearing, grubbing and earthworks.

(e) Trench or foundation excavation for stormwater drainage works shall be undertaken to the planned levelfor the bottom of the specified bedding or foundation level. All loose material shall be removed by the Contractor.

(f) Any material at the bottom of the trench or at foundation level which the Superintendent deems to be unsuitable and inadequate to support the proposed drainage structure shall be removed and disposed in accordance with Section SC6.4.7 Clearing, grubbing and earthworks by the Contractor and replaced with backfill material in accordance with the requirements of this section and the sections for the culvert type. The bottom of the excavated trench or foundation, after any unsuitable material has been removed and replaced, shall be parallel with the specified level and slope of the culvert.

(g) The excavated material shall be used in the construction of embankments backfilling or spoiled in accordance with Section SC6.4.7 Clearing, grubbing and earthworks.

(8) Backfilling

Backfilling shall be carried out in accordance with the requirements of the relevant culverts or drainage structures sections and to the compaction requirements in Clause SC6.4.9.11 (9) Compaction below.

In situ concrete structures are to be backfilled in accordance with Section SC6.4.17 Structures, Clause SC6.4.17.6 (11).

The shape of the culvert must be checked by the Contractor during backfilling to ensure that on completion of backfilling the vertical and horizontal centreline dimensions of the pipe or structure do not vary from the manufacturer's specified dimensions by more than ± 2% for pipes and pipe arches.

(9) Compaction

Foundations, bedding (other than for pipe drainage) and backfilling shall be compacted to the following requirements when tested in accordance with AS 1289.5.4.1 or AS 1289.5.7.1 for standard compactive effort.

Refer to Table SC6.4.9.6 below for details of compaction and moisture tolerances.

Compaction requirements adjacent to pipe drainage for concrete, steel or UPVC pipes are set out in Clause SC6.4.9.13 (4)(d)(iv) below.

(10) Concrete work

For all concrete work, the Contractor shall comply with Section SC6.4.18 Concrete works in relation to the supply and placement of normal class concrete and steel reinforcement, formwork, tolerances, construction joints, curing and protection.

(11) Sprayed concrete

If sprayed concrete has been specified, shown on the drawings, or directed by the Superintendent, it shall comply with requirements in section SC6.4.18 Concrete works.

(12) Construction traffic

If proposing to move heavy construction plant or vehicles over pipe or box culverts structures, provide verification and certification of protective measures to the Superintendent for confirmation and approval.

(13) Limits and tolerances

The limits and tolerances applicable to the various clauses in this section are summarised in Table SC6.4.9.6 below:

Table SC6.4.9.6 - Summary of Limits and Tolerances

Item	Activity	Limits/Tolerances	Clause
(1)	**Excavation by Blasting** (a) Peak particle velocity	≤25mm/sec	Clause SC6.4.9.11(7)(d)
(2)	**Relative Compaction (Standard)** (a) Foundations or trench base to a depth of 150 mm below foundation level. (b) Material replacing unsuitable material. (c) Bedding material. (d) Selected backfill and ordinary backfill material: (i) Other than subgrade (sand 70% Density Index). (ii) Other than subgrade (other than sand). (iii) At subgrade level to 300 mm below. (iv) In a pavement zone. (e) Backfill material within the selected material zone.	95%	Clause SC6.4.9.11(9)
(3)	**Backfill** (a) Layers (b) Moisture Content	≤ 150mm >60%, <95%	Clause SC6.4.9.11(9) Clause SC6.4.9.11(9)

SC6.4.9.12 Drainage structures (construction)

(1) Scope

(a) This policy section provides standards, advice and guidelines for the construction of drainage structures.

(b) This section details the construction of headwalls, wingwalls, pits, gully pits, inspection pits, junction boxes/pits, drop structures, inlet and outlet structures, energy dissipators, batter drains and other supplementary structures.

(c) Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in Section SC6.4.23 Construction management, quality control, inspection and testing.

Editor's Note - A reference to drawings is a reference to construction drawings.

(2) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

Editor's note - Documents referenced in this section are listed in full below whilst being cited in the text in the abbreviated form or code indicated.

(a) SC6.4 Development manual planning scheme policy sections:

Section SC6.4.7 Clearing, grubbing, and earthworks
Section SC6.4.18 Concrete works

(b) Australian Standards:

AS 3996 *Access covers and grates*

(3) General

(a) Drainage structures shall be constructed in concrete and in accordance with Section SC6.4.18 Concrete works.

(b) All structures shall be constructed as soon as practicable and shall be completed not later than 28 days after the construction of the associated culverts, unless otherwise approved by the Superintendent.

(4) Alignment

(a) Unless otherwise shown on the drawings, headwalls and pits shall be constructed parallel to the road centreline and wingwalls at 120º to the headwall or as shown on the drawings.

(b) Where the culvert is laid skew to the road, the wingwalls and headwalls shall be splayed so that the front edge of the wing bisects the angle between the centreline of the culvert and the headwall.

(c) Energy dissipaters shall be constructed in accordance with the drawings and with centreline on the axis of the culvert.

(5) Headwalls and wingwalls

(a) The wingwalls shall be constructed to retain the batters effectively. Where the dimensioned drawings do not satisfy this requirement, the Superintendent shall be notified before the headwalls and wingwalls are constructed. The Superintendent shall direct the Contractor as to the action to be taken. Where rock is encountered at the bottom of excavations for wingwalls and headwalls, and after approval is given by theSuperintendent, the depth of cut-off walls in uniform rock over the full width of the foundations may be reduced to less than that shown in the drawings but must be not less than 150 mm into sound rock.

(6) Pits

(a) All new pits, including access covers, gully grates and frames complying with AS 3996, shall be constructed to the details shown on the drawings. Modification of existing pits is only to be carried out if shown on the drawings.

(b) Where the full depth of the excavation is in sound rock, and the Superintendent approves, part of the concrete lining of gully pits and sumps may be omitted, provided that a neatly formed pit of the required dimensions is constructed. In all such cases the wall of the pit adjacent to and parallel to the road shall be constructed of concrete.

(c) Inlet and outlet pipes shall be integrally cast into the pit at the time of pouring the concrete for the pit walls.

(d) Step irons are not required.

(e) A subsoil drain, where required shall be installed into the pit or headwall in accordance with the general requirements in Clause SC6.4.9.13 Pipe drainage construction.

(7) Precast units

(a) Where precast units including kerb inlet lintels, are provided in the design they shall be handled and installed in accordance with the manufacturer's instructions.

(b) If the Contractor proposes to use precast units, detailed drawings and complete details of installation procedures shall be submitted for the approval of the Superintendent.

(c) The Superintendent is required to adopt pre-cast units which are in accordance with Council's standard drawings and requirements unless otherwise agreed by Council.

(8) Jointing

Where drainage structures abut concrete paving, kerb and channel or other concrete structures, a 10 mm wide joint shall be provided between the structure and paving, or kerb and channel or other concrete structures. The joint shall consist of preformed jointing material of bituminous fibreboard.

(9) Mass concrete bedding

(a) Mass concrete bedding for reinforced concrete bases shall not be placed on earth or rock foundations until the foundations have been inspected and approved by the Superintendent. Following such approval, the surface of the foundation shall be dampened and a layer of concrete not less than 50 mm thick, shall be placed over the excavated surface and shall be finished to a smooth even surface.

(b) Unreinforced concrete bases may be cast on earth or rock foundations without the mass concrete bedding.

(10) Backfill

(a) Backfilling shall not commence until the compressive strength of concrete has reached at least 15 MPa unless otherwise approved by the Superintendent.

(b) Selected backfill shall be placed against the full height of the vertical faces of structures for a horizontal distance equal to one third the height of the structure.

(c) Selected backfill shall consist of a granular material in accordance with the requirements in Clause SC6.4.9.13 Pipe drainage construction below.

(d) Special care shall be exercised to prevent wedge action against vertical surfaces during the backfilling. Where the sides of the excavation are steeper than 4 horizontally to 1 vertically, they shall be cut in the form of successive horizontal terraces at least 600 mm in width, as the backfill is placed.

(e) Backfill on both sides of the structure shall be carried up to level alternately in layers to avoid wedge action or excessive horizontal forces. Backfilling and compaction shall commence at the wall. Compaction shall be in accordance with Clause SC6.4.9.11 (9) Compaction and SC6.4.9.13

Pipe drainage construction.

(11) Limits and tolerances

The limits and tolerances applicable to the various clauses in this section are summarised in Table SC6.4.9.7 below.

Table SC6.4.9.7 - Summary of Limits and Tolerances

Item	Activity	Limits/Tolerances	Clause
(1)	**Cut-off Walls** Depth into sound rock	>150 mm	Clause SC6.4.9.12(5)
(2)	**Mass Concrete Bedding**	>50 mm	Clause SC6.4.9.12(9)

SC6.4.9.13 Pipe drainage (Construction)

(1) Scope

(a) This section covers the supply and installation of pipe culverts and pipe arches for stormwater drainage.

(b) The work to be executed under this section consists of supply of pipes and pipe arches, bedding, installation, and backfilling.

(c) Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in Section SC6.4.23 Construction management, quality management, inspection and testing

(2) References and source documents

Reference and source documents that must be read in conjunction with this section are as follows:

Editor's note - Documents referenced in this section are listed in full below whilst being cited in the text in the abbreviated form or code indicated.

(a) SC6.4 Development manual planning scheme policy sections:

Section SC6.4.7 Clearing, grubbing, and earthworks
Section SC6.4.8 Stormwater management
Section SC6.4.10 Stormwater quality
Section SC6.4.17 Structures
Section SC6.4.18 Concrete works

(b) Australian Standards:

ISO202920-5	*Aggregates for concrete – Test methods for mechanical and physical properties*
AS 5101.4	*Methods for preparation and testing of stabilized materials – Part 4: Unconfined compressive strength of compacted materials.*
AS/NZS 1254	*PVC-U pipes and fittings for stormwater or surface water applications.*
AS 1289.3.3.1	*Methods of testing soils for engineering purposes – Method 3.3.1: Soil classification tests - Calculation of the plasticity index of a soil.*
AS 1289.5.4.1	*Methods of testing soils for engineering purposes - Method 5.4.1: Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio.*
AS 1289.4.3.1	*Methods of testing soils for engineering purposes - Method 4.3.1: Soil chemical tests - Determination of the pH value of a soil - Electrometric method.*
AS 1289.4.4.1	*Methods of testing soils for engineering purposes - Method 4.4.1: Soil chemical tests - Determination of the electrical resistivity of a soil – Method for sands and granular materials.*
AS 1289.5.6.1	*Methods of testing soils for engineering purposes - Method 5.6.1: Soil compaction and density tests - Compaction control test - Density index method for a cohesionless material.*
AS 1397	*Steel sheet and strip—Hot-dip zinccoated or aluminium/zinc-coated*
AS 1646	*Elastomeric seals for waterworks purposes.*
AS 1762	*Helical lock-seam corrugated steel pipes - Design and installation.*

AS/NZS 2032	*Installation of PVC pipe systems.*
AS/NZS 2041	*Buried corrugated metal structures.*
AS/NZS 2566.1	*Buried flexible pipelines - Part 1: Structural design*
AS/NZS 2566.2	*Buried flexible pipelines - Part 2: Installation*
AS/NZS 3725	*Design for installation of buried concrete pipes*
AS/NZS 3750.9	*Paints for steel structures - Part 9: Organic zinc-rich primer.*
AS/NZS 3750.15	*Paints for steel structures - Part 15: Inorganic zinc silicate paint.*
AS/NZS 4058	*Precast concrete pipes (pressure and non-pressure).*
AS/NZS 4131	*Polyethylene (PE) compounds for pressure pipes and fittings*.
AS 4139	*Fibre reinforced concrete pipes and fittings.*
AS/NZS 4680	*Hot-dip galvanised (zinc) coatings on fabricated ferrous articles.*
AS/NZS 5065	*Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications.*
AS/NZS ISO 9001 *(as amended)*	*Quality management systems - Requirements*.

(c) Department of Transport and Main Roads Technical Standards:

MRTS 25	*Steel Reinforced Precast Concrete Pipes*
MRTS 26	*Manufacture of fibre reinforced concrete drainage pipes*

(d) Other:

AASHTO Standard, M190 - *Asphalt-Coated Corrugated Metal Culvert Pipe and Pipe-Arches*

American Society for Testing and Materials (ASTM) - F2562/F2562M-08 *Specification for steel reinforced thermoplastic ribbed pipe and fittings for non-pressurised drainage and sewerage*

Safety in Design CWPHESS.

(3) Common requirements

(a) Pipes and/or pipe arches shall not be placed in position until the Contractor has produced documentary evidence to the Superintendent, that the manufacture of the products to be used in the works has complied with the Manufacturer's Quality Plan in accordance with ISO 9001.

(b) Documentation shall comprise a conformance certificate to AS 4058 or AS 4139 as appropriate for each batch of pipes or pipe arches to be included in the works, including manufacturer's installation recommendations. The above documentations certificates are to be supplied at least 24 hours in advance of dispatch to site.

Editor's Note - Table 3.6 of AS 4058 shall be replaced by Table 7A of MRTS 25 - *Asphalt-Coated Corrugated Metal Culvert Pipe and Pipe-Arches* in determining the acceptability of pipe wall and joint surface defects.

(c) Each unit shall be marked at time of manufacture with:

(i) class and size;

(ii) manufacturer's name; and

(iii) date of casting.

(d) Where a Contractor wishes to use drainage pipe other than the pipes described in Clause SC6.4.9.13, the Contractor shall submit, for agreement by the Superintendent, full details in accordance with AS/NZS 2566.1 of the characteristics of the pipe materials and embedment and design loads, together with certification from the manufacturer of its suitability and quality for use in each application. Certification of the suitability of any pipe will address the bedding requirements, deflection, strength, buckling and any other considerations appropriate to the application. Upon agreement, the Superintendent must submit an application for a variation to the development consent for approval by Council.

(e) The Contractor shall take all necessary steps to drain the excavation to allow the foundation, the bedding, and any backfilling to be compacted to the specified relative compaction.

(f) Culverts shall be installed within 10 mm of the grade line and within 50 mm of the horizontal alignment specified on the drawings. The Contractor shall relay any culvert which is not within these tolerances. Where longitudinal gradients are less than 0.5 per cent, culverts shall be installed within +/- 6 mm of the grade line.

(g) Where shown on the drawings at the discharge end of culverts terminating at pits and headwalls a 3 m length of 100 mm diameter subsurface drain shall be laid in the trench 100 mm above the invert level of the culvert and discharging through the wall of the pit or headwall at 100 mm above the invert level of the culvert or headwall. The subsurface drainage pipe shall be sealed at the upstream end and shall be enclosed in a seamless tubular filter fabric in accordance with Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.3 Sub surface drainage.

(h) Excavation and backfilling for pipe drainage shall be undertaken in a safe manner and in accordance with all statutory requirements. The Contractor must present to the Superintendent the installed pipe drainage upon completion of backfill to the top side of the side zone for inspection prior completion of backfill.

(i) Where the Contractor proposes to travel construction plant in excess of 5 tonnes gross mass over pipe drainage structures, the Contractor shall design and provide adequate protective measures for the crossings and shall submit the proposals to the Superintendent for prior approval.

(j) Upon completion of installation of pipe drainage, the Contractor shall submit relevant test results to demonstrate compliance to the requirements indicated on clauses.

(4) Precast reinforced concrete pipes

(a) Pipes

(i) Precast reinforced concrete pipes shall comply with AS 4058 and shall be of the class and size as shown on the drawings.

Editor's Note - Table 3.6 of AS 4058 shall be replaced by Table 7A of MRTS 25 - *Asphalt-Coated Corrugated Metal Culvert Pipe and Pipe-Arches* in determining the acceptability of pipe wall and joint surface defects.

(ii) Fibre reinforced concrete drainage pipes shall comply with AS 4139 and shall be of the class and size as shown on the drawings.

(iii) Unless specified otherwise, joints shall be flush type with external elastomeric bands complying with AS 1646 and as recommended by the manufacturer.

(iv) Where precast pipes are to be installed into a marine or saline environment, the Contractor is to ensure and provide documentation that the supplied pipes are "fit for purpose" and are suitable for the intended site application.

(b) Excavation

(i) Unless otherwise indicated on the drawings, or approved by the Superintendent, the formation shall be completed to subgrade level and the pipes then installed in the normal trench condition.

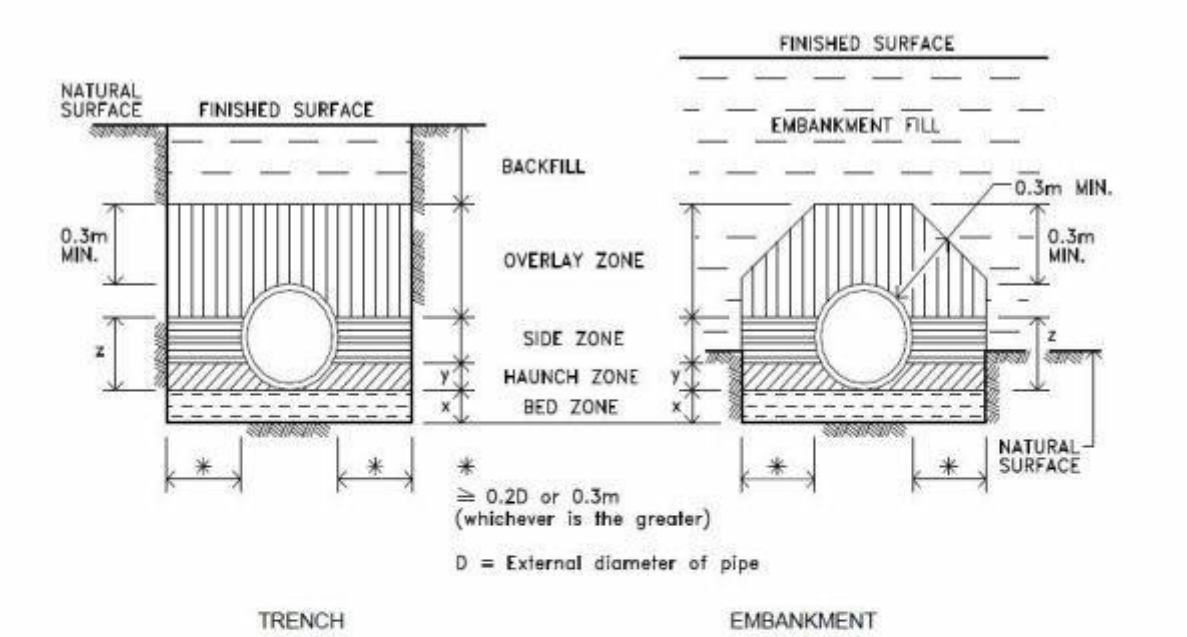
(ii) For normal trench conditions, the pipe shall be laid in an excavated trench with bedding as set out in Clause SC6.4.9.13(4)(c) below. The trench shall be excavated to a width as shown in Figure SC6.4.9.1.

(iii) Care is necessary to avoid laying pipe drainage in trenches excavated to excessive width. Pipes laid in wide trench conditions will be deemed to be in embankment conditions (positive projection). Wide trench conditions apply when, for a single pipe, the width of trench, $W \geq D + 0.6$ metre where D is the pipe diameter. For multi-cell pipes wide trench conditions apply when the width of trench, $W \geq \sum D + \sum S + 0.6$ metre where S is the square spacing between the pipelines. This definition of wide trench conditions as equivalent to embankment conditions relates to the size and geometry of the excavation utilised at construction. Pipes shown on the drawings to require trench conditions shall not be placed under embankment conditions without a design check for compliance of the pipe strength and trench support requirements in accordance with AS 3725.

(c) Bedding

(i) Bedding shall be in accordance with this sub-section, AS 3725 and AS 3725 Supplement 1 for the pipe support types as shown on the drawings. Where the pipe support type is not shown on the drawings, the support type shall be HS3 within road reserves (HS3 is recommended for high embankment fill) and H2 elsewhere.

(ii) Figure SC6.4.9.1 below and Table 5 – Bedding factors for Working Dead Loads (U, H and HS Supports) in AS/NZS 3725 indicate the dimensions of bedding and backfilling for pipes laid in trench conditions and embankment conditions for all AS 3725 pipe support types.



		Pipe Support Type						
		U	H1	H2	H3	HS1	HS2	HS3
Dimension (minimum)	x	75 on rock Nil on soil	100 for D ≤ 1500 150 for D > 1500		0.25 D but >100	100 for D ≤ 1500 150 for D > 1500		
	y	—	0.1D	0.3D	0.3D	0.1D	0.3D	0.3D
	z	—	—	—	—	≥ 0.7D		

D = External diameter of pipe

Figure SC6.4.9.1 - Pipe Installation Conditions

(iii) Bedding material for the bed and haunch zones shall consist of a granular material having a grading, determined by ISO202920-5, complying with Table SC6.4.9.8 Bedding Material Grading Limits, and a Plasticity Index, determined by AS 1289.3.3.1 of less than 6. Select fill material in the side zones, for pipe support type HS, shall also comply with Table SC6.4.9.8.

Table SC6.4.9.8 - Bedding Material Grading Limits

Sieve size mm	Weight passing %	
	Bed and Haunch Zones	Side Zones/Overlay Zones
75.0	-	100
19.0	100	-
9.5	-	50 - 100
2.36	50 -100	30 - 100
0.60	20 - 90	15 - 50
0.30	10 - 60	-
0.15	0 - 25	-
0.075	0 - 10	0 - 25

(iv) The Contractor shall advise the Superintendent of the source of bedding material.

(v) All material shall be compacted in layers not exceeding 150 mm compacted thickness except where explicitly approved by the Superintendent, for the first placed layer above the pipe crown in the overlay zone, to protect the pipe from construction damage. Each layer shall be compacted to the relative compaction specified before the next layer is commenced. Cohesionless materials can be compacted in one operation by saturation and vibration to achieve the minimum Density Index (DI) specified.

(vi) At the time of compaction, the moisture content of the material shall be adjusted so as to permit the specified compaction to be attained at a moisture content which, unless otherwise approved by the Superintendent, is neither less than 60 per cent nor more than 95 per cent of the apparent optimum moisture content, as determined by AS 1289.5.4.1 (standard compaction).

(vii) Compaction of select fill material in the bed and haunch zones shall be to the appropriate pipe support requirements shown in Table 5 – Bedding factors for Working Dead Loads (U, H and HS Supports) in AS/NZS 3725, when tested in accordance with AS 1289.5.6.1. H3 Pipe Support includes concrete bedding. Concrete shall be grade N20 to AS 3600. Pipe shall be suitably reinforced in accordance with AS 3725 as standard elliptically reinforced pipe may not be adequate for H3 Pipe Support. Unless specifically selected pipes are nominated for use with H3 bedding, a design check shall be required to confirm the suitability of the proposed pipes.

(viii) The top 0.100 mm of the bedding and haunch material directly under the pipe shall be placed and shaped accurately to house the pipe after compaction is achieved in the bedding and haunch zone external to the area of direct pipe support.

(ix) Where the impermeability of the natural ground and the slope of the drainage line is such that erosion of bedding material is considered by the Superintendent to be a likely problem, the Superintendent may specify cementitious stabilisation of the bedding material used in the bedding and haunch zones.

(d) Installation

(i) General

Pipes shall be laid with the socket (female) end placed upstream. Pipes which have marks indicating the crown or invert of the pipes shall be laid strictly in accordance with the markings. Unless specified, no individual length of pipe shall be shorter than 1.2m.

The Contractor is to ensure that all trenching is to conform to the requirements of *Work Health and Safety (WHS) Act* and regulations and *Excavation Work Code of Practice 2013*.

Pipes can be stiffened temporarily using timber struts, erected before filling is placed. Struts shall be of hardwood measuring at least 100 mm by 100 mm or 125 mm diameter. One strut shall be placed in a vertical position at each pipe joint, thence at a spacing not greater than 1,200 mm. Struts shall bear against a sill laid along the invert of the pipe and a cap bearing against the crown of the pipe. Both the sill and the cap shall be continuous throughout the length of the pipe. Struts shall be made to bear tightly against the pipe using wedges between the top of the struts and the cap. Struts, sills and caps shall be removed on completion of the embankment, unless removal is ordered earlier.

Lifting holes in all pipes shall be sealed with plastic preformed plugs approved by the Superintendent, or a 3:1 sand/cement mortar, before the commencement of backfilling.

Bulkheads shall be constructed on all lines where the pipe gradient exceeds 5 per cent.

The Contractor shall present the laid and jointed pipes for inspection by the Superintendent prior to commencement of trench backfilling.

(ii) Joints in reinforced concrete pipes

1. Rubber ring joints

Before making the joint, the spigot and socket and the rubber ring shall be clean and dry.

The rubber ring shall be stretched on to the spigot end of the pipe, square with the axis and as near as possible to the end, care being taken that it is not twisted. The spigot end of the pipe shall then be pushed up to contact the socket of the pipe with which it is to join and be concentric with it. The spigot end shall then be entered into the socket of the already laid pipe and forced home by means of a bar, lever and chain, or other method approved by the Superintendent.

The joint shall be tested to ensure that the rubber ring has rolled evenly into place. Where wedge shaped “skid” rubber rings are prescribed the Manufacturer’s instructions, which include the use of lubricants, shall be followed.

2. Flush or butt joints

The ends of the pipes shall be butted together to be as tight and as even as possible.

The joints shall be sealed externally with proprietary EB bands, supplied, and installed in accordance with the manufacturer’s recommendations, care being taken that the bands are not twisted.

(iii) Joints in fibre-reinforced cement pipes

1. New pipes

Joints shall be of a flexible type. Rubber rings shall be used to seal joints in both rebated and spigot and socket jointed pipes in the manner set out in Clause SC6.4.9.13 (4)(d) Installation above.

Alternatively, a jointing compound comprising plasticised butyl rubber and inert fillers may be used to seal such pipes in accordance with the manufacturer's instructions.

2. Direct side connections to other pipes

   Direct side connections to other pipes shall be as detailed on the drawings.

(iv) Backfill

1. Select fill material to the side zones shall be compacted to the requirements shown in Table 5 – Bedding factors for Working Dead Loads (U, H and HS Supports) of AS/NZS 3725 when tested in accordance with AS 1289.5.4.1 for standard compactive effort.

2. Ordinary fill to the side zones and overlay zones, for all pipe support types, except type HS shall consist of Selected Backfill as defined in Section SC6.4.7 Clearing, grubbing and earthworks or alternatively cohesionless material in accordance with Table SC6.4.9.8 Bedding material grading limits. It shall be placed around the pipe to the dimensions shown in Figure SC6.4.9.1 Pipe Installation Conditions.

3. All material shall be compacted in layers not exceeding 150 mm compacted thickness. Each layer shall be compacted to the relative compaction specified before the next layer is commenced or compacted in one operation by saturation and vibration to achieve a minimum Density Index as specified in Table 5 – Bedding factors for Working Dead Loads (U, H and HS Supports) of AS/NZS 3725.

4. At the time of compaction, the moisture content of the material shall be adjusted to permit the specified compaction to be attained at a moisture content which, unless otherwise approved by the Superintendent, is neither less than 60 per cent nor more than 95 per cent of the apparent optimum moisture content, as determined by AS 1289.5.4.1 (standard compaction).

5. The remainder of the trench to the underside of the subgrade, or selected material zone as specified in Section SC6.4.7 Clearing, grubbing and earthworks, shall be backfilled with material satisfying the requirements for embankment material as defined in Section SC6.4.7 Clearing, grubbing and earthworks. Where excavation is approved through the selected material zone, the section of trench within the select material zone shall be backfilled with selected material as defined in Section SC6.4.7 Clearing, grubbing and earthworks.

6. When compacted adjacent to culverts or drainage structures, the Contractor shall adopt compaction methods which will not cause damage or misalignment to any culvert or drainage structure. Any damage caused shall be rectified by the Contractor. Backfilling and compaction shall commence at the pipe or wall to confine remaining uncompacted material at commencement.

(5) Steel pipes and pipe arches

(a) Nestable steel pipe and drainage units

(i) Nestable steel pipes and drainage units shall be supplied in accordance with AS 2041 and shall be of the class and size as shown on the drawings.

(ii) The galvanised steel sheets used in manufacture shall comply with AS 1397 for steel base grade G250 and a minimum coating Class of Z600.

(iii) Where specified, the pipes and drainage units shall be given a protective coating over the steel, after assembly of a coal tar epoxy paint or equivalent as approved by the Superintendent, to a thickness of 400 microns.

(iv) Field cut ends shall be carefully wire brushed to remove any scale followed immediately by two coats of zinc rich organic primer complying with AS/NZS 3750.9 or two coats of inorganic zinc silicate paint complying with AS/NZS 3750.15.

(b) Helical lock seam corrugated steel pipe

(i) Helical lock seam corrugated steel pipe shall be supplied in accordance with AS 1761 and AS 1762 and shall be of the class and size as shown on the drawings.

(ii) The galvanised steel sheet used in manufacture shall comply with AS 1397 for steel-based grade G250 and a minimum coating Class of Z600.

(iii) Unless otherwise approved by the Superintendent, no part of the pipe shall incorporate steel strips which have been joined by welding. Field cut ends shall be carefully wire brushed to remove any scale followed immediately by two coats of organic zinc rich primer complying with AS/NZS 3750.9 or two coats of inorganic zinc silicate paint complying with AS/NZS 3750.15. Pipes and coupling bands shall be given a protective hot dip coating of bitumen on both sides to AASHTO standard M190 or equivalent as part of the process of manufacturing.

(c) Bolted steel pipes, pipe arches and special shapes

(i) Bolted steel pipes, pipe arches and special shapes shall be supplied in accordance with AS 2041 and shall be of the class and size as shown on the drawings. The corrugated pipe or plate shall be hot dip galvanised on both sides after fabrication in accordance with the requirements for coating thickness and mass for articles in AS/NZS 4680.

(ii) Also, after assembly, all bolted steel pipes, pipe arches and special shapes shall be given a protective coating on the outside of the steel plate, of a coal tar epoxy paint complying with AS 3887 or equivalent paint approved by the Superintendent. Invert plates shall be coated on the outside before they are placed on the pipe bed. The plate surface shall be cleaned and degreased with a cleaning solution recommended by the protective coating manufacturer. The protective coating shall be applied to give a uniform minimum dry thickness of 400 microns. Any coating damaged shall be recoated by first cleaning any grease, mud or other foreign matter from the affected area. The area shall then be recoated so that the minimum dry thickness of the coating is 400 microns.

(d) Materials and surface treatment of steel pipes and pipe arches

All steel pipes and pipe arches will require an engineer's certification that the pipe materials and surface treatments are adequate to provide for installation and in-service loading, as well as corrosion protection for a satisfactory design life of 100 years, unless indicated otherwise on the drawings. Such certification shall address the chemistry of the soil, groundwater, stream and backfill material as set out in Clause SC6.4.9.13 (5)(e) below.

(e) Materials against steel structures

(i) The severity of corrosive attack on steel structures will depend on the pH value and electrical resistivity of the soil surrounding the structure and the pH value of the water in the stream.

(ii) Besides meeting the normal requirements of the bedding, selected backfill materials and the materials used for embankment construction above the steel structures and within a horizontal distance from the structure equal to the height of the filling over the structure, the pH and resistivity limits as shown in Figure SC6.4.9.2 will determine the level of corrosion protection required.

(iii) Notwithstanding the height of fill, embankment material within 6 m of the structure shall conform to these requirements.

(iv) The pH and electrical resistivity of the material shall be determined in accordance with AS 1289.4.3.1and AS 1289.4.4.1.

(v) The Contractor shall nominate the sources of the various materials and submit documentary evidence from a NATA registered laboratory that the representative samples conform to the requirements of this clause and the protective treatment provided. The samples shall be pre-treated, if necessary, to represent the condition and grading when compacted and in service.

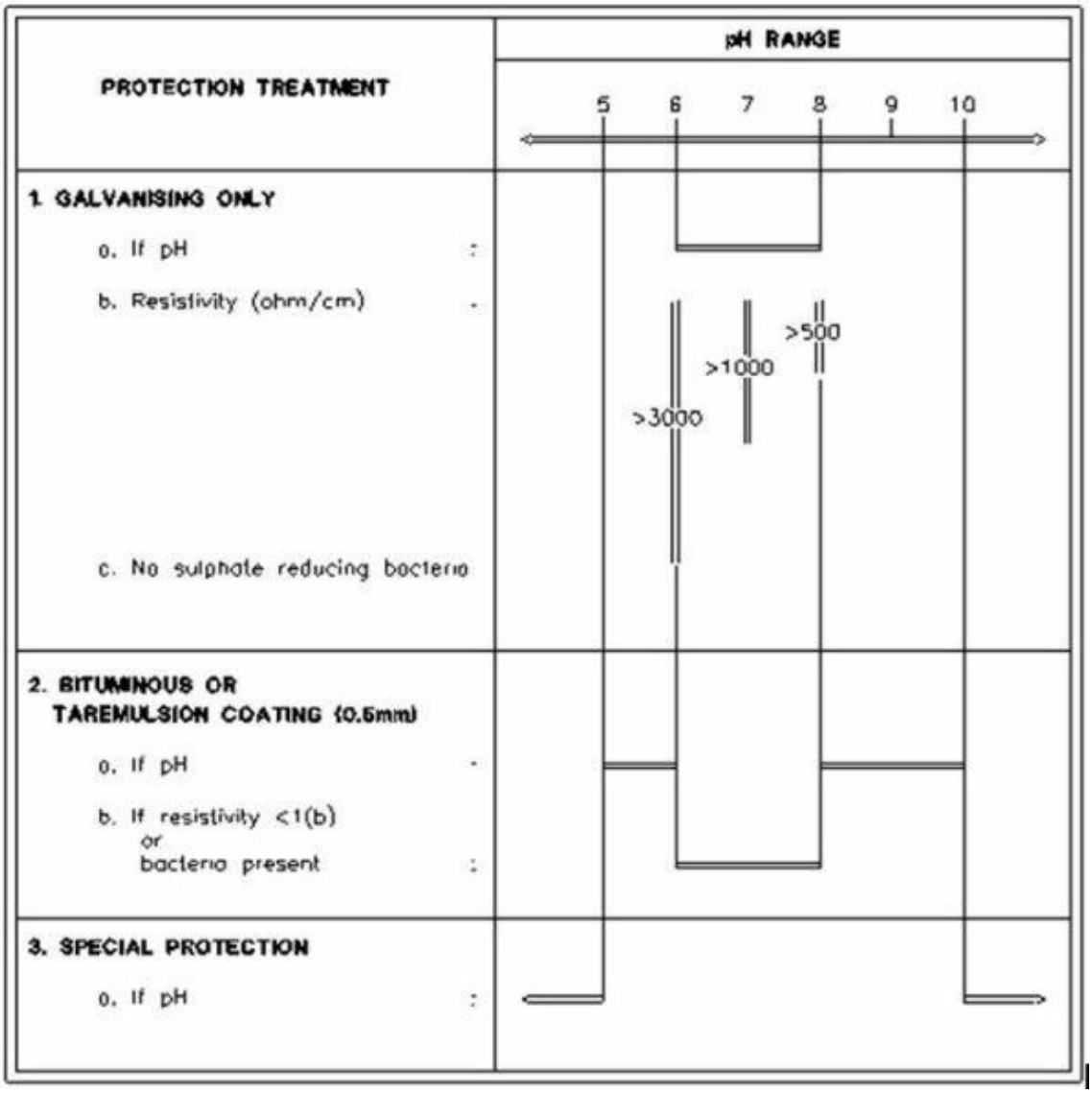


Figure SC6.4.9.2 - Corrosion Protection Requirements for Steel Structures

(f) Excavation and foundation preparation

(i) Unless otherwise indicated on the drawings or approved by the Superintendent, the formation shall be completed to subgrade level and the pipes then installed in the normal trench condition.

(ii) The trench shall be excavated to a level 75 mm below the design invert and for a minimum width of 600 mm on each side of the structure.

(iii) Where unsuitable material, as determined by the Superintendent, is encountered at the foundation level, it shall be removed to a depth approved by the Superintendent. The additional excavation shall be backfilled with material complying with, selected material as per Section SC6.4.7 Clearing, grubbing and earthworks.

(iv) Where rock is encountered at the foundation level, the foundation shall be excavated for an additional depth of 250 mm, or 0.25 times the structure width, whichever is the lesser and for a width equal to the width of the structure. The additional excavation shall be backfilled with material complying with, and compacted to, the requirements for HS3 pipe support as required in Clause SC6.4.9.13(4)(c) above.

(g) Bedding

Bedding shall meet the requirements of Clause SC6.4.9.13 (4)(c)(vii) above. The thickness of uncompacted bedding material between the foundation and the outer surface of corrugation shall not be less than 75 mm. The uniform blanket of loose material which provides the minimum 75 mm thick bedding, shall be placed on the shaped, compacted selected material foundation to allow the corrugations of the structure invert to bed in and become filled with the material.

(h) Installation

(i) General

The assembly of all corrugated steel pipes and pipe arches as well as helical lock seam corrugated steelpipes shall be carried out in accordance with the manufacturer's recommendations. These recommendations shall be submitted to the Superintendent before assembly or laying of the culverts iscommenced.

If deemed necessary after consultation with the manufacturer, temporary bracing of corrugated steel pipes or pipe arches shall be carried out in accordance with the manufacturer's recommendations.

(ii) Joints

Corrugated steel pipes or pipe arches shall be joined in accordance with the manufacturer's recommendations and AS 2041.

Where helical lock seam corrugated steel pipes are to be joined, both ends of the join shall be rerolled with four annular corrugations of pitch 68 mm. Coupling of the re-rolled ends shall be made in accordancewith AS 1761 by using semi corrugated bands. Rubber ring joint seals shall be used in conjunction with the coupling bands except where specifically indicated otherwise in the drawings.

All joints or lap joints in pipes or pipe arches (excluding rubber ring joint coupling bands) shall be covered with strips of non-woven geotextile material, of minimum 250 mm width and of minimum mass 270 grams per square metre in accordance with the requirements for geotextile in Section SC6.4.6 Roadworks and traffic control, Clause SC6.4.6.13(2)(d) Geotextile to prevent loss of sand backfill or bedding into the pipe.

(i) Backfill

(i) Compaction of the material in the side support and overlay zones shall comply with the requirements of Clause SC6.4.9.13(4)(c)(vii) above, except that the required relative compaction in the side support and overlay zones shall be 95 per cent (AS 1289.5.4.1 standard compaction). Backfill shall be placed around the steel pipe or structure, to a minimum dimension equal to the pipe width, on both sides.

(ii) All material shall be compacted in layers not exceeding 150 mm compacted thickness. Each layer shall be compacted to the relative compaction specified before the next layer is commenced.

(iii) At the time of compaction, the moisture content of the material shall be adjusted to permit the specified compaction to be attained at a moisture content which, unless otherwise approved by the Superintendent, is neither less than 60 per cent nor more than 95 per cent of the apparent optimum moisture content, as determined by AS 1289.5.4.1 (standard compaction).

(iv) The remainder of the trench to the underside of the subgrade, or selected material zone as specified in Section SC6.4.7 Clearing, grubbing and earthworks, shall be backfilled with material satisfying the requirements for embankment material as defined in Section SC6.4.7 Clearing, grubbing and earthworks. Where excavation is approved through the selected material zone, the section of trench within the select material zone shall be backfilled with selected material as defined in Section SC6.4.7 Clearing, grubbing, and earthworks.

(v) The Contractor shall check the shape of the culvert during backfilling to ensure that on completion of backfilling, the vertical and horizontal centreline dimensions of the pipe or structure shall not vary from the manufacturer's specified dimensions by more than plus or minus 2 per cent for pipes and pipe arches.

(j) Invert protection of corrugated steel pipes and pipe arches

(i) Where shown on the drawings, the invert of corrugated steel pipes and pipe arches shall be protected using sprayed concrete.

(ii) The sprayed concrete shall be placed to a thickness of not less than 100 mm over the crest of the corrugations and to a width such that the bottom third of the pipe circumference is covered symmetrically about the invert of the pipe.

(iii) All foreign material shall be removed from the surface to be protected. Where corrosion has occurred, all loose scale shall be removed.

(iv) The production, application and curing of sprayed concrete shall be in accordance with Section SC6.4.18 Concrete works.

(v) The sprayed concrete shall be reinforced with a fabric of hard drawn steel wire 4 mm diameter with 200 mm square mesh. The fabric shall be securely supported at a central location within the sprayed concrete by non-metallic supports.

(vi) Laps in fabric shall be 300 mm and a cover of 50 mm of sprayed concrete shall be provided to the fabric at all edges.

(vii) Immediately after placement of the sprayed concrete, all free water shall be removed, and the surface coated with cement slurry.

(viii) No water shall be allowed to flow over the surface of the sprayed concrete for twenty-four hours after the placement of sprayed concrete.

(6) UPVC pipes

(a) Materials

(i) Un-plasticised PVC (UPVC or similar material) pipes and fittings shall be manufactured in accordance with AS/NZS 1254 and shall be of the type and size as shown on the drawings. Where pipes with an external diameter equal to, or greater than, 450 mm (375 mm nominal internal diameter) are proposed, a separate approval from the Superintendent and Council is required.

(ii) Embedment material in the bedding, side support and overlay zones shall be in accordance with bed and haunch zone material in Clause SC6.4.9.13 (4)(c)(vii) above.

(iii) Trench backfill material shall satisfy the requirements for embankment material as defined in Section SC6.4.7 Clearing, grubbing and earthworks.

(b) Excavation and bedding

(i) Unless otherwise indicated on the drawings or approved by the Superintendent, the formation shall be completed to subgrade level and the pipes then installed in the normal trench condition.

(ii) Figure SC6.4.9.3 and Table SC6.4.9.9 indicate the dimensions of bedding and backfilling for pipes laid in trench conditions and embankment conditions, unless otherwise indicated on the drawings.

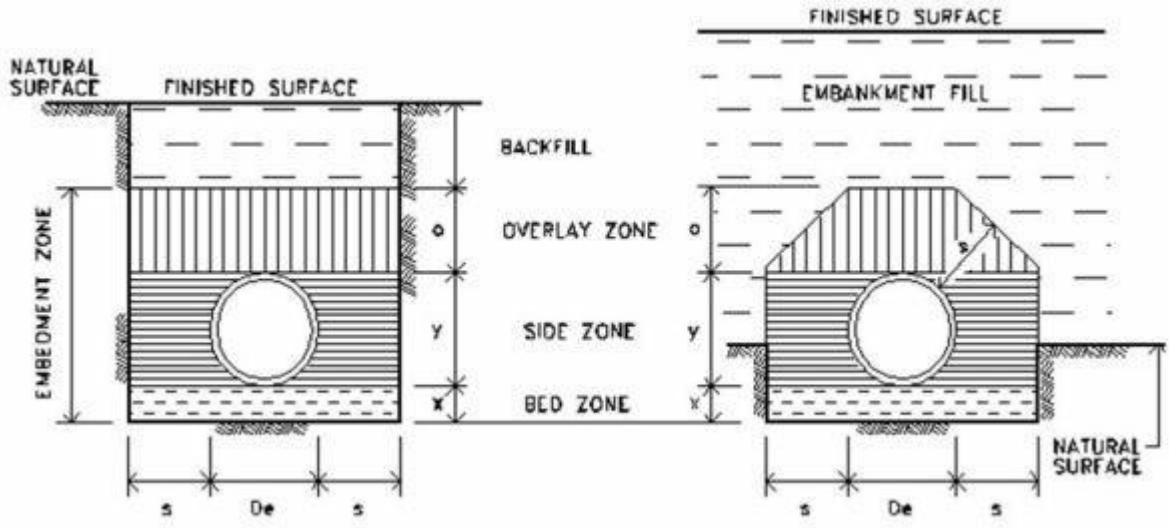


Figure SC6.4.9.3 - Pipe Installation Conditions

Table SC6.4.9.9 - Trench and Embedment Dimensions

Extreme External	Minimum Dimensions (mm)			
Dia (De)mm	x	S	o	y
³75≤150	75	100	100	Pipe dia.
>150≤300	100	150	150	Pipe dia.
>300≤450	100	200	150	Pipe dia.

Editor's Note - Where multiple pipes are laid side by side the minimum distance between the pipes shall be dimension "s" for the larger of adjacent pipes.

(c) Excavation and foundation reparation

(i) Bedding zone material shall be placed and compacted in accordance with the requirements in Table 5.5 of AS/NZS 2566.2.

(d) Installation

(i) Embedment of the UPVC pipe shall be in accordance with the requirements of AS/NZS 2566.2 and to the dimensions shown in Figure SC6.4.9.3 and Table SC6.4.9.9.

(ii) Pipe laying shall be in accordance with Part 7 of AS 2032 and solvent cement pipe jointing shall be in accordance with Part 3 of AS 2032. Jointing may be performed with the pipes either in the trench or at ground level. All pipes, or jointed pipelines, shall be lowered into the trench without being dropped. Pipelines shall be placed so that joints are not strained.

(e) Backfill

(i) Compaction of the material in the side support and overlay zones shall comply with the requirements of Clause SC6.4.9.13 (4)(d)(iv) above for HS3 support type.

(ii) All material shall be compacted in layers not exceeding 150 mm compacted thickness. Each layer shall be compacted to the relative compaction specified before the next layer is commenced or compacted in one operation by saturation and vibration to achieve a minimum Density Index as specified in Table 5.5 of AS/NZS 2566.2 – Buried Flexible Pipelines – Installation.

(iii) At the time of compaction, the moisture content of the material shall be adjusted to permit the specified compaction to be attained at a moisture content, which, unless otherwise approved by the Superintendent, is neither less than 60%, nor more than 95 per cent of the apparent optimum moisture content, as determined by AS 1289.5.4.1 (standard compaction).

(iv) The remainder of the trench to the underside of the subgrade, or selected material zone as specified in Section SC6.4.7 Clearing, grubbing and earthworks, shall be backfilled with material satisfying the requirements for embankment material as defined in Section SC6.4.7 Clearing, grubbing and earthworks. Where excavation is approved through the selected material zone, the section of trench within the select material zone shall be backfilled with selected material as defined in Section SC6.4.7 Clearing, grubbing and earthworks.

(7) Limits and tolerances

The limits and tolerances for materials and product performance related to the various clauses in this section aresummarised in Table SC6.4.9.10 Summary of Limits and Tolerances below:

Table SC6.4.9.10 - Summary of Limits and Tolerances

Item	Activity	Limits/Tolerances	Clause
(1)	**Culvert Position** (a) Grade Line (b) Grade line <0.5% (c) Horizontal Alignment	 ± 10 mm ± 6 mm ± 50 mm	Clause SC6.4.9.13 (3)(e)
(2)	**Bedding** (a) Bed and Haunch Zone Compaction	Table 5 – Bedding factors for Working Dead Loads (U, H and HS Supports) of AS/NZS 3725	Clause SC6.4.9.13 (4)(c)(vii)
(3)	**Backfill - Concrete Pipes** (a) Side and Overlay Zone Compaction	Table 5 – Bedding factors for Working Dead Loads (U, H and HS Supports) of AS/NZS 3725	Clause SC6.4.9.13 (4)(c)(ii)
(4)	**Backfill - Steel Pipes** (a) Side and Overlay Zone Compaction	Table 5 – Bedding factors for Working Dead Loads (U, H and HS Supports) of AS/NZS 3725	Clause SC6.4.9.13 (5)(i)
(5)	**Pipe/Structure** (a) Horizontal and Vertical Variation	< 2% of specified dimensions	Clause SC6.4.9.13 (5)(h)
(6)	**Sprayed Concrete** (a) Over crest of corrugations over bottom third of pipe circumference	> 100 mm	Clause SC6.4.9.13 (5)(j)
(7)	**Bedding Zone Compaction**	DI 70	Clause SC6.4.9.13 (6)(c)(i)
(8)	**Backfill - UPVC Pipes** (a) Side and Overlay Zone Compaction	[3]95%, DI 70	Clause SC6.4.9.13 (6)(e)(iii)

SC6.4.9.14 Precast box culverts

(1) Scope

(a) This section covers the installation of precast concrete box culverts.

(b) The work to be executed under this section consists of:

(i) preparation of foundations;

(ii) provision of bedding;

(iii) construction of base slabs;

(iv) installation of precast culvert units;

(v) headwalls and wingwalls;

(vi) backfilling against structures;

(vii) provision and removal of coffer dams; and

(viii) excavation of inlet and outlet channels.

(c) Requirements for quality control and testing, including maximum lot sizes and minimum testfrequencies, are cited in Section SC6.4.23 Construction management, quality management, inspection and testing.

(2) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

Editor's note - Documents referenced in this section are listed in full below whilst being cited in the text in the abbreviated form or code indicated.

(a) SC6.4 Development manual planning scheme policy sections:

Section SC6.4.6 Road works and traffic control
Section SC6.4.7 Clearing, grubbing and earthworks
Section SC6.4.18 Concrete works

(b) Australian Standards:

AS1597.1	*Precast reinforced concrete box culverts - Part 1: Small culverts (not exceeding 1200 mm width and 900 mm depth).*
AS1597.2	*Precast reinforced concrete box culverts - Part 2: Large culverts (from 1500 mm span and up to and including 4200 mm span and 4200 mm height)*
AS/NZS ISO 9001	*Quality management systems - Requirements.*

(c) Other:

Austroads *Guide to Pavement Technology - Part 4G: Geotextiles and Geogrids*

Department of Transport and Main Roads
MRTS05 *Unbound Pavements*
MRTS24 *Manufacture of precast concrete culverts*

(3) Materials

(a) Culvert units, link and base slabs

(i) The supply and testing of precast reinforced concrete box culvert units, link and base slabs shall be in accordance with AS 1597 with the following alterations or additional requirements:

1. proof load testing must be arranged by the Contractor in batches as specified in either AS 1597.1 or AS 1597.2 as appropriate;
2. proprietary lifting anchors must be provided in the culvert units, link, and base slabs;
3. delivery and unloading is the Contractor's responsibility; and
4. the supplier must implement and maintain a quality system in accordance with ISO 9001 to ensure materials, manufacture and proof load testing conform to the appropriate standards.

(ii) A conformance certificate, to AS 1597 must be submitted to the Superintendent at least 3 working days prior to dispatch.

(iii) Each unit must be marked at time of manufacture with:

1. type and size;
2. casting date;
3. manufacturer's name; and
4. inspection pass and date.

(b) Handling, delivery and storage

(i) Ensure adequate equipment and load shifting machineries are available for safe handling and unloading.

(ii) Upon delivery of precast units, ensure that the following criteria have been achieved:

1. 70% of the minimum concrete strength;
2. small culvert units: Cured to AS 1597.1 clause 2.6.3; and
3. large culvert units: Cured to AS 1597.2 clause 2.7.

(iii) Prior inspection of the stored precast box culvert units is to be undertaken for dimensional accuracy and defects following delivery. Results of the inspections must show that the units conform to the following:

1. small culvert unit: To AS 1597.1; and
2. large culvert unit: To AS 1597.2.

(c) Concrete

The concrete and reinforcement for cast-in-situ base slabs shall comply with Section SC6.4.18 Concrete works

(d) Selected backfill

The quality of selected backfill shall comply with the requirements in AS 1597.2, or alternatively comply with the requirements of side/overlay zone materials in Figure SC6.4.9.1 and Table SC6.4.9.8.

(e) Ordinary backfill

Ordinary backfill is material obtained from culvert excavations, cuttings and/or borrow areas which are in accordance with the requirements for the upper 0.3 m of embankment construction as detailed in Section C6.4.7 Clearing, grubbing and earthworks.

(4) Construction

(a) Coffer dams

(i) At some sites it may be expedient for the Contractor to construct a coffer dam. The construction of coffer dams shall be the responsibility of the Contractor.

(ii) Coffer dams shall be sufficiently watertight to prevent damage of the concrete by percolation or seepage through the sides and shall be taken sufficiently below the level of the foundations to prevent loosening of the foundation materials by water rising through the bottom of the excavation. Coffer dams shall be adequately braced and shall be so constructed that removal will not weaken or damage the structure.

(iii) A coffer dam may be constructed to the actual size of the reinforced concrete invert slab and used as side forms for the concrete. The details of the coffer dam and formwork, and the clearances proposed shall be subject to the approval of the Superintendent, but the Contractor shall be responsible for the successful construction of the work.

(iv) Coffer dams which have tilted or have moved laterally during sinking, shall be righted, or enlarged to provide the clearances specified. This work will be at the Contractor's expense.

No timber or bracing shall be left in the concrete or in the backfill of the finished structure. Coffer dams, including temporary piles, shall be removed at least to the level of the invert after completion of the structure. Upon completion of works, remove coffer dams, including temporary piles, at least to the level of the culvert invert after completion of the structure. Ensure that no material associated with the coffer dam or dewatering can enter the culvert.

(b) Excavation

Excavation shall be carried out in accordance with the provisions in. Clause SC6.4.9.11 (7).

(c) Foundations

(i) Rock foundations shall be neatly excavated to the underside of the mass concrete or selected fill bedding shown on the drawings. All minor fissures shall be thoroughly cleaned out and refilled with concrete, mortar, or grout. All loose material shall be removed.

(ii) Where rock is encountered over part of the foundation only or lies within 300 mm below the underside of the mass concrete or selected fill, all material shall be removed to a depth of 300 mm below the mass concrete or selected fill for the full width of the foundation over the length where the rock is encountered.This additional excavation shall be backfilled with ordinary backfill material.

(iii) Over excavation or uneven surfaces shall be corrected with mass concrete to provide a uniform surface at least 50 mm above the highest points of rock.

(iv) Earth foundations shall be finished to line and level to the underside of bedding shown on the drawings.Care shall be taken to avoid disturbing material below this level.

(v) All soft, yielding, or unsuitable material shall be removed and replaced with ordinary backfill material as directed by the Superintendent and backfilled in accordance with Clause SC6.4.9.11(8).

(d) Bedding

(i) Cast-in-situ base slabs

No bedding material shall be placed until the foundations have been inspected and approved by theSuperintendent.

Bedding shall be either mass concrete or lightly bound paving material which complies with the requirements of at least a Type 3, Subtype 3.3 material as defined in the Specification MRTS05,whichever is shown on the drawings.

Mass concrete bedding blinding layer shall be 20 mPa compressive strength and shall not be less than 50 mm thick over any point in the foundation. It shall be laid to the line and level of the underside of the base slab to a tolerance of ±10 mm in level and ±50 mm in line. The bedding shall be finished to a smooth surface. Where longitudinal gradients are less than 0.5 per cent, concrete blinding layers shall be installed with +/- 6 mm of the grade line.

(ii) Precast base slabs

Precast base slabs, U shaped culvert units and one-piece culvert units shall be supported on a bed zone of selected backfill of minimum compacted depth 150 mm in accordance with AS 1597.2.

If suitable compaction of the trench subgrade cannot be achieved, it will be the responsibility of the Developer to recommend an alternate solution to Council to achieve the desired bearing capacity for the structure prior to construction.

(e) Cast-in-situ slabs

(i) Cast-in-situ base slabs shall be constructed to the dimensions shown on the drawings and in accordance with the requirements of Section SC6.4.18 Concrete works. The invert levels shall be within -10 mm to +10 mm of the design level, grade 5 mm in 2.5m (1 in 500) and plan position ± 50 mm. Where longitudinal gradients are less than 0.5 per cent cast insitu base slabs shall be installedwithin +/- 6 mm of the grade line.

(ii) Recesses or nib walls to accommodate the walls of the precast crown units shall be formed in the base slab to the dimensions shown on the drawings.

(f) Installation of precast units

(i) Precast units shall not be installed until the base slab has attained a minimum compressive strength of 20 MPa.

(ii) Precast crown units shall be placed on a bed of mortar either on the slab or in the recesses in the base slab. Any gaps between the side walls and the sides of the recesses shall be packed with cement mortar. Lifting holes and butt joints between units shall be packed or sealed with cement mortar or grout or flexible joint filler.

(iii) Before placement of top slabs on U shaped units or link slabs on adjacent crown units, the bearing areas of the supports shall be thoroughly cleaned and covered with a bed of mortar of minimum thickness 5 mm after placement of precast unit.

(iv) Lifting anchor recesses shall be filled to the surface with cement mortar.

(v) In the case of multi-cell culverts, a nominal 50 mm gap shall be provided between adjacent cells. This gap shall be filled with cement mortar or grout.

(vi) All mortar joints shall be protected from the sun and cured in an approved manner for not less than 48 hours.

(vii) All external surfaces of vertical joints between precast crown units, shall be covered full length, a minimum 100 mm width with strips of Denso tape or similar as an

alternative to joint filling.

(g) Backfill

(i) All bracing and formwork shall be removed prior to backfilling. Prior to backfill placing, present to the Superintendent for inspection all seals, joints and levels.

(ii) Selected backfill shall be placed in the side zones of the box culverts and wingwalls, and to a depth of 300 mm in the overlay zone of the culverts, in layers with a maximum compacted thickness of 150 mm in accordance with the backfilling and compaction requirements of AS 1597.2. Alternatively, cohesionless materials can be compacted in one operation by saturation and vibration to achieve a minimum Density Index of 70. The remainder of the excavation shall be backfilled with ordinary embankment fill in accordance with Section SC6.4.7 Clearing, grubbing and earthworks.

(iii) Backfill shall be placed against wingwalls, headwalls and retaining walls in accordance with Section SC6.4.18 Concrete works.

(iv) Backfill layers shall be placed simultaneously on both sides of the culvert with a maximum 600 mm level difference to avoid differential loading. Backfilling and compaction shall commence at the wall and proceed away from it.

(v) Where the slopes bounding the excavation are steeper than 4:1, they shall be cut in the form of successive horizontal terraces of at least 1 m width before the backfill is placed.

(h) Excavation of inlet and outlet channels

Excavation of inlet and outlet channels shall be carried out as shown on the drawings and shall extend to join the existing stream bed in a regular manner as detailed in Clause SC6.4.9.16 below.

(i) Construction loadings on culverts

(i) Construction vehicles and plant shall not pass over the culvert until 28 days after the casting of the base slab or until the cylinder compressive strength of the base slab concrete has reached 32 MPa.

(ii) Construction vehicle loads on culverts for various design fill heights shall be in accordance with AS 1597.2.

(5) Limits and tolerances

The limits and tolerances applicable to the various clauses in this section are summarised in Table SC6.4.9.11 Summary of Limits and Tolerances below:

Table SC6.4.9.11 - Summary of Limits and Tolerances

Item	Activity	Limits/Tolerances	Clauses
(1)	**Mass Concrete Correction**		
	(a) Over highest points of rock	50 mm	Clause SC6.4.9.14(4)(c)(iii)
(2)	**Mass Concrete Bedding**		
	(a) Level	± 10 mm	Clause SC6.4.9.14(4)(d)(i)
	(b) Level where grade line <0.5%	+/- 6 mm	
	(c) Line	± 50 mm	)
(3)	**Culvert Location**		
	(a) Invert Level	±10 mm	Clause SC6.4.9.14(4)(d)(i)
	(b) Invert where grade line is <0.5%	+/- 6mm	
	(c) Grade	5 mm in 2.5 m (1 in 500)	
	(d) Plan Position	± 50 mm	

SC6.4.9.15 Drainage mats

(1) Scope

(a) The purpose of this policy section is to provide standards advice and guidelines for the use and installation of drainage mats.

(b) Drainage mats shall be constructed where and as shown on the drawings or as directed by the Superintendent.

(c) This section should be read in conjunction with Section SC6.4.6 Road works and traffic control Clause SC6.4.6.13.

(d) Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Section SC6.4.23 Construction management, quality management, inspection and testing.

(2) Terminology

Type A drainage mats	Refer to SC6.4.9.17
Type B drainage mats	Refer to SC6.4.9.17

(3) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

Editor's note - Documents referenced in this section are listed in full below whilst being cited in the text in the abbreviated form or code indicated.

(a) SC6.4 Development manual planning scheme policy sections:

Section SC6.4.6 Road works and traffic control, Clauses SC6.4.6.12 and SC6.4.6.13.

(b) Australian Standards:

AS 1289.5.4.1 *Methods of testing soils for engineering purposes - Method 5.4.1: Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio.*

(4) Order of construction

(a) Type A drainage mats shall be constructed after the site has been cleared and grubbed and before commencement of embankment construction.

(b) Type B drainage mats shall be constructed after completion of the subgrade construction and before construction of the pavement.

(5) Construction

(a) Type A Drainage Mats

(i) Type A drainage mats shall be constructed under embankments as and where shown on the drawings or as directed by the Superintendent.

(ii) After the embankment foundation has been trimmed and any necessary trench drains installed, a geotextile complying with the requirement of Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.13 Subsurface drainage, shall be laid on the embankment foundation. The area of geotextile laid shall be sufficient to cover the area of the Type A drainage mat and an additional amount for enclosing the sides of the drainage mat after the filter material has been placed. Laps of minimum width of 500 mm shall be provided at each join in the geotextile.

(iii) Type C filter material or Type D filter material, as shown on the drawings or as determined by the Superintendent, shall be placed on the geotextile, and compacted to the satisfaction of the Superintendent. The minimum thickness of the compacted filter material shall be 300 mm plus an allowance for the expected consolidation of the embankment foundation under the embankment load or 500 mm if the amount of the expected total consolidation of the embankment foundation is not known. The filter material shall be placed in two or more layers so that no layer, when compacted, has a thickness greater than 250 mm.

(iv) After completion of placement and compaction of the filter material, geotextile shall be placed on top of and around the sides of the filter material so that the filter material is completely enclosed by geotextile. The geotextile shall be secured in such a manner as to prevent movement of the geotextile by wind or by construction plant placing subsequent layers of filter material or earth filling over the drainage mat.

(v) An additional layer of geotextile shall be placed on the drainage mat under the base of any rock facing which may be placed as part of the embankment construction. The additional layer of geotextile shall extend beyond the outside and inside faces of the bottom layer of rock.

(vi) Care shall be taken not to damage the geotextile during the construction of the drainage mat or during placement of subsequent layers of filter material, earth filling or rock facing. Any geotextile so damaged shall be repaired or replaced by the Contractor to the satisfaction of the Superintendent. The cost of repairing or replacing such damaged geotextile shall be borne by the Contractor.

(vii) Type A drainage mats shall extend 2 m beyond the toes of embankments and such extensions shall be covered by a 300 mm thick layer of Type C filter material or Type D filter material, as determined by the Superintendent. This protective layer shall be placed immediately after completion of construction of each drainage mat.

(viii) Outlets from Type A drainage mats may be surface outlets at the toes of embankments or piped outlets connected to other drainage systems. Where piped outlets are constructed, they shall conform to the requirements of Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.3 Subsurface drainage.

(b) Type B Mats

(i) Type B drainage mats shall be constructed in cuttings as and where shown on the drawings or as directed by the Superintendent. Type B drainage mats shall be constructed for the full width of cuttings and for the pavement width in other locations.

(ii) After the subgrade material has been compacted and trimmed, a geotextile complying with the requirements of Section SC6.4.6 Road works and traffic control, Clause SC6.4.6 3 Subsurface drainage, shall be laid on the subgrade. Laps of minimum width of 500 mm shall be provided at each join in the geotextile.

(iii) Slotted thick-walled un-plasticised PVC pressure pipe complying with AS 1477, shall be laid on the geotextile 200 mm from and parallel to the longitudinal edges of the drainage blanket as shown in the drawings. Details of slot sizes and spacings are shown in Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.13.

(iv) Type A filter material shall be placed on the geotextile and compacted to achieve a relative compaction,determined by AS 1289.5.4.1, of at least 100 per cent (standard compaction). Alternatively, the Superintendent may approve the use of a coarser filter material having a maximum particle size of 75 mm and a maximum D90/D10 ratio of three.

(v) The thickness of the compacted filter material shall be as shown on the drawings or as directed by theSuperintendent. If the required thickness of compacted filter material is greater than 250 mm, the filter material shall be placed in two or more layers so that no layer, when compacted, has a thickness greater than 250 mm.

(vi) After completion of placement and compaction of the filter material, geotextile shall be placed on top of and around the sides of the filter material so that the filter material is completely enclosed by geotextile. The geotextile shall be secured in such a manner as to prevent movement of the geotextile by wind or by construction plant placing pavement layers over the drainage mat.

(vii) Outlets from Type B Drainage Mats shall conform to the requirements of Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.3 Subsurface drainage.

(6) Limits and tolerances

The limits and tolerances applicable to the various clauses in this section are summarised in Table SC6.4.9.12 Summary of Limits and Tolerances Drainage Mats below:

Table SC6.4.9.12 - Summary of Limits and Tolerances Drainage Mats

Item	Activity	Limits/Tolerances	Clause
(1)	**Filter Material**		
	(a) Layer thickness	250 mm max	Clause C6.4.9.15(5)(a)(iii)
	(b) Compaction (Relative)	100% Standard	Clause SC6.4.9.15(5)(b)(iv)
	Type A filter material		
(2)	**Type B Mats**		
	(a) Design level at top of mat	+0, -40 mm	Clause SC6.4.9.15(5)(b)(v)

SC6.4.9.16 Open drains

(1) Scope

(a) This policy section provides standards, advice, and guidelines for the construction, lining and protection of all types of open drains including the construction of rock filled wire mattresses and gabions associated with stormwater drainage infrastructure.

(b) Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in Section SC6.4.23 Construction management, quality management, inspection and testing.

Editor's Note - A reference to drawings is a reference to construction drawings.

(2) Terminology

Open Drains Refer to SC6.4.9.17

(3) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

Editor's Note - Documents referenced in this section are listed in full below whilst being cited in the text in the abbreviated form or code indicated.

(a) SC6.4 Development manual planning scheme policy sections:

SC6.4.6 Road works and traffic control

SC6.4.12 Landscaping and open space

SC6.4.17 Structures

SC6.4.18 Concrete works

(b) Australian Standards:

AS 1141.22	*Wet/dry strength variation*
AS 1289.5.4.1	*Methods of testing soils for engineering purposes - Method 5.4.1: Soil compaction and density tests – Compaction control test – Dry density ratio, moisture variation and moisture ratio*
AS 1289.5.7.1	*Methods of testing soils for engineering purposes - Method 5.7.1: Soil compaction and density Tests - Compaction control test Hilf density ratio and Hilf moisture variation (rapid method)*
AS 2758.4	*Aggregate for gabion baskets and wire mattresses*

	AS 2876	*Concrete kerbs and channels (gutters) – Manually or machine placed*
	AS/NZS 4534	*Zinc and zinc/aluminium alloy coatings on steel wire.*
	AS/NZS 4680	*Hot dip galvanized (zinc) coatings on fabricated ferrous articles*

(c) Other:

Austroads	*Guide to Pavement Technology, Part 4B – Asphalt (AGPT04B)*
Austroads	*Guide to Pavement Technology, Part 4G – Geotextiles and Geogrids (AGPT04G)*
ASTM International	ASTM A975 - *Standard specification for double twisted hexagonal mesh gabionsand revet mattresses (metallic coated steel wire or metallic coated steel wire with PVC coating)*
International Erosion Control Association (IECA),	*Best Practice Erosion and Sediment Control.*

(4) General

Open drains shall be designed and constructed in accordance with the relevant clauses in Chapter 9 of QUDM 2013. Locate and construct open drains to avoid recharging groundwater, a shallow water table and salinity degradation of adjacent land.

Any unsuitable material must not be used for the bed and banks of the drain and must be removed from the site. Where a tree is marked for preservation, any drain must be diverted around it with sufficient clearance to avoid damage to the tree's root system.

Where open drains pass through private property, drainage easements of sufficient width to contain the flow and vehicular access for maintenance must be provided and registered as an encumbrance on the title of the land through which the drain passes.

Prior to works commencing, temporary drainage measures must be implemented in accordance with the requirements of *Best Practice Erosion and Sediment Control*.

(5) Types of open drains

Catch drains shall be provided above the top and at the toe of embankments as part of the construction of the adjacent roadway. The edges of catch drains shall be positioned not less than 2 m from the tops of cuttings or the toes of embankments nor more than is necessary to maintain the fall of the drains unless otherwise approved.

Minor diversion and contour drains shall be constructed where shown on the construction drawings. Minor diversion drains shall have the same capacity as the nearest pipe culvert on the line of the drain unless otherwise approved by the Superintendent.

Table drains, swales and depressed medians shall be constructed to the line and level shown or calculated from the drawings. Their construction is deemed to be part of the earthworks.

(6) Inlet, outlet, and diversion drains

Inlet, outlet, and diversion drains shall extend to join the existing stream bed and be of sufficient size to accommodate the design flows from the upstream catchment. The drain shall be excavated to the full width of the structure and care must be taken to ensure the stream bed can accommodate the additional flow with only minimal disturbance.

(7) Excavated materials

Construction material excavated from drains shall be placed on the lower sides of the drains and formed as banks with slopes graded in accordance with QUDM Third edition 2013 – Provisional. This material shall be compacted in accordance with AS 1289.5.4.1 and shall be not less than 95 per cent for standard compactive effort.

The Contractor shall ensure that none of the activities associated with the work disturbs any watercourse outside the site. Any excavation below the level of the natural channel shall be backfilled with suitable material compacted to a density equal to and compatible with that existing naturally.

Any excess material shall be legally and responsibly disposed of by the Contractor.

Unlined drains and areas adjacent to open drains shall be treated and revegetated immediately after the drains are complete, in accordance with Section SC6.4.12 Landscaping and open space.

(8) Lined open drains

(a) Proprietary lining materials

The Contractor must only use proprietary products which are suited to the terrain and have been approved for use by Council. This would include the use of:

(i) organic fibre and vegetation mats installed in accordance with the manufacturer's instructions;

(ii) rock filled wire mattresses; or

(iii) concrete where there is insufficient width to accommodate the required water way area, or the flow velocity in the drain will exceed the non-scouring velocities or where the trail is likely to be used as a bikeway or footpath during dry periods. Lining shall conform to the profile of the drain and shall be provided as soon as possible after forming the drain.

Before placing any lining material, the foundation material shall be shaped and compacted to not be less than 95 per cent for standard compactive effort as determined by AS 1289.5.7.1 or AS 1289.5.4.1.

Unless shown on the drawings, proprietary products may only be used with the approval of the Superintendent. Where specified, they must be used strictly in accordance with the manufacturer's instructions.

This section does not include kerb and channel.

(b) Concrete lining

Concrete lining for open drains shall be cast-in-situ or sprayed concrete supplied and placed to a minimum thickness of 100 mm measured at right angles to the surface of the lining in accordance with Section SC6.4.18 Concrete works.

Poly-fibres must not be used in marine environments, or where there is risk of fibres escaping into the environment, without approved controls to capture loose poly-fibre strands.

Weepholes shall be provided in the concrete at intervals of 2 m spacing with non-horizontal elements or as determined by the Superintendent.

Contraction joints in concrete lining, consisting of narrow transverse and vertical grooves, 5-10 mm in width, 20 mm deep, shall be formed neatly in the surface of the freshly placed concrete at intervals of 3 m unless otherwise specified by the Superintendent.

Expansion joints shall be placed at intervals not more than 15 m with a minimum width of 15 mm and shall consist of preformed jointing material of bituminous fibreboard or alternate approved material and shall be of sufficient depth to fill the joint.

(c) Stone pitching

Stone pitching shall consist of sound durable rock not less than 100 mm thick, properly bedded on approved loam or sand and mortared to present a uniform surface. The exposed surface of each stone or block shall be generally flat and not less than 0.05 square metres in area. Spaces between adjacent stones or blocks shall not exceed 20 mm in width.

(d) Batter drains

Batter drains shall be constructed using either half round steel pipes or precast nestable concrete units as shown and detailed on the drawings.

The units shall be installed in carefully excavated and template-controlled trench to produce an even rim line of +0 mm to – 50 mm from the batter line at the underside of topsoil.

Any over excavation and undulations in the batter line shall be backfilled and both sides of the drain compacted over the full length to form a firm shoulder against the rim of the batter drain.

When topsoil is placed it shall be tapered over a width of 1 m to zero thickness at the rim of the drain. Both sides of the drain shall then be turfed for minimum width of 1 m and pinned down as provided in Section SC6.4.12 Landscaping and open space.

(9) Rock filled wire mattresses and gabions

(a) General

Prior to installation of rock filled wire mattress or gabion, excavate so the mattresses finish flush and level with the surrounding ground. Rock filled wire mattresses and gabions shall be placed at the locations shown on the drawings. Installation shall be in accordance with the manufacturer's instructions. A geotextile, as shown on the drawings, shall be placed between the wire cage and the material being protected.

Foundations of floors of gabions should ideally be within cut material, however if in fill areas or embankments then material must be compacted in layers not greater than 150 mm thick, to a relative compaction of 95 percent when tested in accordance with AS 1289.5.4.1, for standard compactive effort.

(b) Materials

For wire mattresses and gabions, the galvanising requirements for wire of circular cross section cited in this Clause as "heavily galvanised", shall comply with the coating mass requirements for round wire, Class W10, in AS/NZS 4534. The Contractor must submit for approval the type of mattress/gabion proposed along with confirmation of compliance to ASTM A975 and a schedule of installation locations.

(i) Gabions

The gabions shall be of the sizes shown on the drawings and fabricated of woven heavily galvanised wire mesh and PVC coated where specified on the drawings. Each gabion shall be divided by diaphragms into cells whose length shall not be greater than the width of the gabions plus 100 mm. Gabions shall have a nominal mesh size of 80 mm x 100 mm and body wire shall be a minimum diameter of 2.7 mm heavily galvanised with an additional thickness of 0.4 mm PVC coating where specified on the drawings. The minimum core diameters of heavily galvanised selvedge wire and lacing wire shall be 3.4 mm and 2.2 mm respectively.

(ii) Wire mattresses

Unless specified otherwise, the wire mattresses shall be supplied in units having dimensions of 6 m x 2 m x 230 mm and shall be cut to suit areas as shown on the drawings. The mattresses shall be divided by diaphragms into cells of length not exceeding 600 mm. Unless otherwise specified, they shall be fabricated of woven heavily galvanised wire and PVC coated where specified on the drawings.

Mattresses shall have a mesh size of 60 mm x 80 mm and body wire shall be a minimum diameter of 2.0 mm heavily galvanised with an additional minimum thickness of 0.4 mm PVC coating where specified on the drawings. The minimum core diameters of heavily galvanised selvedge wire and lacing wire shall be 2.7 mm and 2.2 mm respectively.

(iii) Geotextile

A chemically and biologically stable geotextile with a minimum strength rating (G) of 1350 and minimum mass of 180 grams per square metre, in accordance with Guide to Pavement Technology - Part 4G: Geotextiles and Geogrids, shall be used.

Samples, manufacturer's specification, and instructions on installation shall be submitted to the Superintendent seven days before the intended use of geotextile.

(iv) Rock fill material

The rock fill shall consist of clean hard rock complying with the requirements of AS 2758.4.

Rock fill for gabions shall have particle sizes between 100 mm and 250 mm. Rock fill material should be placed by hand and only when approved by the superintendent shall they be placed using a suitable mechanical device to ensure fill is tightly packed with a minimum of voids. Fill material shall be levelled off 25 mm to 50 mm above the top of the mesh to allow for settlement.

When the mattress is on a slope, rock fill material shall be placed into the units starting from the low end. Units shall be filled slightly overfull by 25 mm to 50 mm to allow for settlement and to provide an even tight and smooth surface of the required contour.

(c) Assembly and erection

Before laying out the gabions or wire mattresses, geotextile shall be placed on the founding material and against any surface that will be in contact with either drainage course or earth backfill.

Adjust the position of the diaphragms so that the sides hinge up on the thicker wire woven in the mesh. Lace the gabion boxes along all diaphragm points and edges at to all adjacent boxes. Internal bracing wires 4 per metres at 330 mm centres to prevent distortion. Face bracing wires 4 per metres of face.

Ensure star pickets are either driven or cut off level with the top of the mattress.

After tying diaphragms and adjacent units of mattresses/gabions on all three adjacent corners (rear, floor, and front face), leave top edge untied to allow for securing along with the lid section. The end corners of wire mattress/gabion tied sections shall be firmly tied after galvanised star pickets are driven and stretched in place a minimum of 900 mm into the surrounding ground in the final location at one end.

Carefully secure the opposite end of the gabions without damaging or distorting the dimensions of the units to a suitable mechanical device and apply a stretching force to the assembled mattress/gabion section to be filled.Whilst under tension, secure each corner of each unit using galvanised star pickets driven into foundation ensuring each unit is stretched tight in all directions.

(d) Filling

Fill whilst the gabion boxes are under tension. Place the rocks at the front face and other exposed faces byhand to produce a neat face free of excessive bulges, depressions, and voids.

Redistribute the filling materials by hand to ensure that all diaphragm compartments are fully filled to produce aneat and level top surface. Overfill by 25 to 50 mm to allow for subsequent settlement.

Mechanical filling equipment may be used with caution ensuring to protect any PVC or galvanized coatings from abrasion. Release the tension on the mattress/gabion boxes only when fully laced to prevent anyslackening.

The upstream edge of wire mattresses shall be folded down into a trench of minimum depth 300 mm and filled with rock fill. This edge shall be tied to star pickets.

Final lacing should be undertaken as soon as practicable after filling particularly if there is a storm or floodexpected. Stretch lids tightly over the filling and lace down securely. The works should be inspected uponcompletion of lacing.

(10) Limits and tolerances

The limits and tolerances applicable to the various clauses in this section are summarised in Table SC6.4.9.13 below.

Table SC6.4.9.13 - Summary of Limits and Tolerances Rock Filled Wire Mattresses and Gabions

Item	Activity	Limits/Tolerances	Clause
(1)	**Open Drains - General**		
	(a) Grading	Grade - QUDM 2013 Table 9.5.2	Clause SC6.4.9.16(4)
	(b) Depth	Based on hydraulic capacity of the channel	Clause SC6.4.9.16(4)
			Clause SC6.4.9.16(4)
	(c) Freeboard	QUDM 2013 table 9.3.1 & Fig 9.8	Clause SC6.4.9.16(4)
	(d) Channel Side Slopes	QUDM 2013 Section 9.5.3	
	(e) Compaction	> 95% (standard compaction)	Clause SC6.4.9.16(7)
(2)	**Open Drains – Lining**		
	(a) Compaction of Foundation	>95% (standard compaction)	Clause SC6.4.9.16(8) (a)
(3)	**Stone Pitching**		
	(a) Rock Dimensions	> 100 mm thickness	Clause SC6.4.9.16(8)(c)

	(b) Exposed surface area (c) Spaces between stones	> 0.05 sq m < 20 mm width	Clause SC6.4.9.16(8)(c) Clause SC6.4.9.16(8)(c)
(4)	**Batter Drains** (b) Rim line	 + 0, - 50 mm from batter line	 Clause SC6.4.9.16(8)(d)
(5)	**Kerb and Channel** (a) Compaction of foundation (b) Level of gutter surface (c) Alignment (d) Surface uniformity (e) Contraction joints (i) Area (ii) Groove width (f) Expansion joint interval (g) Backfill behind kerb (i) Layer thickness (ii) Compaction	 To AS 2876 Level ≤ ± 6 mm of design level Level ≤ ± 50 mm of design alignment Deviation of kerb and channel surface from 3 m straight edge ≤ 5 mm ≥ 50% of CS area ≥ 5 mm at all gully pits and associated structures ≤150 mm >95% (standard compaction)	
(6)	**Rock Fill for Gabions and Wire Mattresses** (a) Wet strength (b) Wet/dry strength variation (c) Particle size for gabions (d) Fill level (e) Particle size for wire mattresses	 > 100 kN < 35% >100 mm <250 mm and preferably not greater than 200 mm > 25 mm < 50 mm above top of mesh Between 75 mm and two thirds of the mattress thickness, or 250 mm, whichever is the lesser	 Clause SC6.4.9.16(9)(b) Clause SC6.4.9.16(9)(b) Clause SC6.4.9.16(9)(b) Clause SC6.4.9.16(9)(b)
(7)	**Erection of Gabions and Wire Mattresses** (a) Star pickets for ties (b) Trench depth from upstream edge	Depth in ground > 900 mm. Spacing < 1 m Depth >300 mm	Clause SC6.4.9.16(9)(d)

SC6.4.9.17 Terminology

AEP	Annual Exceedance Probability
IFD	Intensity-Frequency-Duration
QUDM	Queensland Urban Drainage Manual
MHWS	Mean High Water Springs
ANCOLD	The Australian National Committee on Large Dams
IECA	International Erosion Control Association
DI	Density Index
WHS	Work Health & Safety
AASHTO	American Association of State Highway and Transportation
NATA	National Association of Testing Authorities
Type A Drainage Mats	are intended to ensure continuity of a sheet flow of water under fills, to collect surface seepage from a wet seepage area or for protection of vegetation or habitat downstream of the road reserve where a fill would otherwise cut the flow of water. are intended to ensure continuity of a sheet flow of water under dfills, to collect surface seepage from a wet seepage area or for protection of vegetation or habitat downstream of the road reserve where a fill would otherwise cut the flow of water.
Type B Drainage Mats	are constructed to intercept water which would otherwise enter pavements by capillary action or by other means on fills and to intercept and control seepage water and springs in the floors of cuttings.
Open Drains	are all drains other than pipe and box culverts and include catch drains, contour drains, diversion drains, table drains, batter drains, swales, channels, gutters and kerb and channel.

Development manual planning scheme policy (PSP)
SC6.4.10 Stormwater quality

Index

SC6.4.10.1 Introduction

(1) Objectives of water sensitive urban design

SC6.4.10.2 Water sensitive urban design

(1) Introduction
(2) Design objectives for stormwater management – dry tropics
(3) Selection of appropriate stormwater management measures
(4) Safety and risk management

SC6.4.10.3 Construction standards

(1) Introduction
(2) Irrigation
(3) Vegetation establishment
(4) Weed management
(5) Dredge spoil dewatering areas
(6) Saltwater intrusion

SC6.4.10.4 Bioretention swales

(1) Introduction
(2) Design considerations for bioretention swales
(3) Bioretention swale design process
(4) Landscape design notes - bioretention swales
(5) Construction and establishment – bioretention swales
(6) Maintenance requirements – bioretention swales
(7) Checking tools – bioretention swales
(8) Engineering drawings – bioretention swales.
(9) References – bioretention swales

SC6.4.10.5 Bioretention basins

(1) Introduction
(2) Design considerations - bioretention basins
(3) Design process – bioretention basins
(4) Landscape design notes
(5) Construction and establishment – bioretention basins
(6) Maintenance requirements – bioretention basins
(7) Checking tools – bioretention basins
(8) Example engineering drawings – bioretention basins
(9) References and additional information – bioretention basins

SC6.4.10.6 Constructed stormwater wetlands

(1) Introduction
(2) Design considerations - constructed wetlands
(3) Technical note: saline/brackish constructed wetlands
(4) Wetland design process
(5) Landscape design notes – constructed wetlands
(6) Construction and establishment – constructed wetlands
(7) Maintenance requirements – constructed wetlands
(8) Checking tools – constructed wetlands
(9) References – constructed wetlands

SC6.4.10.7 Plant selection for WSUD systems in the coastal dry tropics

(1) Introduction
(2) Recommended plant species
(3) Plant Selection
(4) Wetlands and sedimentation basins -plant selection
(5) References – plant selection

SC6.4.10.8 Attachments and checklists

Checklist A - Bioretention Swales Design Calculation Summary

Checklist B - Bioretention Swale Design Assessment Checklist

Checklist C - Bioretention Swale Construction Inspection Checklist

Checklist D - Bioretention Swale Maintenance Checklist

Checklist E - Bioretention Swale Asset Transfer Checklist

Checklist F - Bioretention Basin Design Calculation Summary

Checklist G - Bioretention Basin Design Assessment Checklist

Checklist H - Bioretention Basin Construction Inspection Checklist

Checklist I - Bioretention Basin Maintenance Checklist

Checklist J - Bioretention Basin Asset Transfer Checklist

Checklist K - Constructed Wetlands Design Calculation Summary

Checklist L - Wetland Design Assessment Checklist

Checklist M - Wetland Construction Inspection Checklist

Checklist N - Wetland Maintenance Checklist

Checklist O - Asset Transfer Checklist

Attachment A1 - Groundcover Plant Species List for Swales (incorporating buffer strips), Bioretention Swales and Bioretention Basins

Attachment A2 - Shrub and Tree Plant Species List for Bioretention Basins

Attachment A3 - Macrophyte and Groundcover Plant Species List for Wetlands and Sedimentation Basins

Attachment A4 - Shrub and Tree Plant Species List for Wetlands and Sedimentation Basins

SC6.4.10.1 Introduction

(1) Objectives of water sensitive urban design

Water sensitive urban design (WSUD), water quality, is an internationally recognised concept that offers an alternative to traditional development practices. WSUD is a holistic approach to the planning and design of urban development that aims to minimise negative impacts on the natural water cycle and protect the health of aquatic ecosystems. It promotes the integration of stormwater, water supply and sewage management at the development scale.

The key principles of WSUD are to:

(a) protect existing natural features and ecological processes;

(b) maintain the natural hydrologic behaviour of catchments;

(c) protect water quality of surface and ground waters;

(d) minimise demand on the reticulated water supply system;

(e) minimise sewage discharges to the natural environment; and

(f) integrate water into the landscape to enhance visual, social, cultural, and ecological values.

These guidelines are not intended to limit innovation in design or construction of WSUD elements by restricting alternative approaches to those presented here. Alternative designs should be considered where potential improvements in performance, constructability or maintenance requirements can be demonstrated. However, the design procedures and recommendations given in these guidelines are based on contemporary best practice, incorporating lessons from local experience, and are regarded as appropriate for the coastal dry tropic's region.

SC6.4.10.2 Water sensitive urban design

(1) Introduction

(a) The following sections

Introducing water sensitive urban design, Bioretention swales, Bioretention basins, constructed stormwater wetlands, and Clause SC6.4.10.7 Plant selection for water sensitive urban design systems have been developed specifically for the coastal dry tropic conditions found in the Townsville area.

(b) References and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

Section SC6.4.2 Development application guidelines for advice and guidelines relating to development applications to assist applicants in achieving Council's design objectives.

Section SC6.4.8 Stormwater management

Section SC6.4.9 Stormwater quantity

Healthy Waterways Partnership's *Water Sensitive Urban Design Technical Design Guidelines for South-East Queensland (2006)*.

Editors Note - Chapter 3 Bioretention Swales, Chapter 5 Bioretention Basins, and Appendix A Plant Selection for WSUD Systems, which formed part of the original version of Healthy Waterways Partnership's *Water Sensitive Urban Design Technical Design Guidelines for South-East Queensland (2006)* have been superseded by Healthy Waters' *Bioretention Technical Design Guidelines (Version 1, October 2012)*.

The *Water by Design, Bioretention Technical Design Guidelines* are **not** being adopted.

(2) Design objectives for stormwater management – dry tropics

(a) Construction phase

The three critical elements of erosion and sediment control (ESC) on construction sites are:

(i) Drainage Control.

(ii) Erosion Control.

(iii) Sediment Control.

For further detail refer to SC6.4.8. Stormwater management.

(b) Post construction phase

The adopted design objectives for Townsville (coastal dry tropics) in mean annual pollutant load leaving a developmentsite, compared to traditional urban design where stormwater is not treated:

(i) >= 80% reduction in total suspended solids load.
(ii) >= 65% reduction in total phosphorus load.
(iii) >= 40% reduction on total nitrogen load.
(iv) >= 90% reduction in gross pollutant load.

Editor's Note - This section contains illustrations and photographs of stormwater treatment devices. These are intended as examples only and should not be regarded as acceptable solutions. Unless specifically indicated, all drawings are not to scale.

(3) Selection of appropriate stormwater management measures

(a) Not all stormwater management measures presented in this section are suitable for any given site. Appropriate measures should be selected by matching device characteristics to target pollutants and the physical constraints of the site.

(b) These guidelines are not intended to provide detailed advice on selection of stormwater treatment devices. However, the following tables provide an indication of:

(i) the scale at which various treatment measures are typically applied (Table SC6.4.10.1);

Table SC6.4.10.1 - Scale of WSUD application in urban catchments

WSUD Measure	Allotment Scale	Street Scale	Precinct or Regional Scale
Swales and buffer strips		✓	
Bioretention Swales		✓	✓
Sedimentation basins			✓
Bioretention basins	✓	✓	✓
Constructed wetlands		✓	✓
Infiltration measures	✓	✓	
Sand filters	✓	✓	
Aquifer storage and recovery			✓

(ii) the effectiveness of these treatment measures in removing pollutants, attenuating peak flow rates, and reducing runoff volume (Table SC6.4.10.2); and

Table SC6.4.10.2 - Effectiveness of WSUD Measures for Runoff Quality and Quantity Management

WSUD Measure Water	Quality Treatment			Peak Flow Attenuation*	Reduction in Runoff Volume*
	TSS	TP	TN		
Swales and buffer strips	H	M	L	L	L
Bioretention Swales	H	H	H	M	L
Sedimentation basins	H	M	L	M	L
Bioretention basins	H	H	H	M	L
Constructed wetlands	H	H	H	H	L
Infiltration measures**	-	-	-	H	H
Sand filters	H	M	L	L	L
Aquifer storage and recovery**	-	-	-	H	H

H – High; M – Medium; L – Low * Frequent events only ** Water quality treatment is not a primary function of these devices

(iii) site conditions that may affect the suitability of different treatment measures (Table SC6.4.10.3).

Table SC6.4.10.3 - Site Constraints for WSUD Measures

WSUD Measure	Steep site (>5%)	Shallow bedrock	Acid Sulphate Soils	Low permeability soil (E.g., Clay)	High permeability soil (E.g., sand)	High water table	High sediment input	Land availability
Swales and buffer strips	C	D	D	✓	✓	D	D	D
Bioretention Swales	C	C	C	✓	✓	C	D	D
Sedimentation basins	C	✓	✓	✓	✓	D	✓	D
Bioretention basins	D	D	D	✓	✓	C	C	D
Constructed wetlands	C	D	C	✓	D	D	D	D
Infiltration measures	C	C	C	C	✓	C	C	D
Sand filters	D	✓	✓	✓	✓	D	C	✓
Aquifer storage and recovery	C	C	C	C	✓	C	C	D

C – Constraint may preclude use; D – Constraint may be overcome through appropriate design; ✓ – Generally not a constraint

(4) Safety and risk management

(a) WSUD aims to protect the environmental assets of a site and enhance liveability through greater integration of built and natural features. This approach may introduce some risks to the urban environment that are greater than or different to those encountered in traditional land development practice. The more obvious of these risks relate to the presence of open water bodies and the introduction of street-scape elements that may alter lines of sight or other aspects of traffic safety.

(b) Whilst this section makes occasional comment on various aspects of safety, they are not intended to provide comprehensive advice on appropriate risk management strategies. Designers are responsible for providing an appropriate level of public safety in their designs and for ensuring that risk management procedures, in accordance with relevant standards and guidelines, are followed. Further information on risk management for water related urban infrastructure is provided in the *Queensland Urban Drainage Manual*.

SC6.4.10.3 Construction standards

(1) Introduction

This section is a supporting document to the Water by Design, 2010, *Construction and Establishment Requirements: Swales, Bioretention Systems and Wetlands* (Construction and Establishment Guidelines), South-East Queensland Healthy Waterways Partnership, Brisbane. The Construction and Establishment Guidelines are adopted in whole, with the exceptions and additions as noted in this Planning Scheme Policy.

Editors Note - The most up to date version of the *Construction and Establishment Guidelines* can be purchased from Water by Design.

(2) Irrigation

Supplementary irrigation may be required to maintain system functionality during prolonged periods of dry. Water supply to bioretention and wetland systems is greatly influenced by localised residential runoff; hence Council imposed water restrictions or prolonged periods of dry should be met with supplementary irrigation. Irrigation (temporary or permanent) may be requested by council during landscape installation. All irrigation plans are to beapproved for use by Council.

Editor's Note - Use Form D: Swales; Form G: Bioretention systems; Form H: Constructed Wetlands from the *Construction and Establishment Guidelines*.

(3) Vegetation establishment

Throughout the section, reference is made to building phase protection by temporary measures. Where 80-90% of the building phase is referred to in the text the developer should ensure upwards of 90% build out before removal of temporary measures and establishment of the approved vegetation.

(4) Weed management

Typha spp have shown an ability to dominate systems in Townsville and disable their functionality and maintainability. Although some Typha species are native they are considered an environmental weed whose control is recommended (Queensland Government Department of Primary Industries and Fisheries, October 2010). As such Typha spp should be removed from systems early to prevent spread and actively managed to ensure that the system is free of the weed at the point of handover. This will ensure that hydrological functioning is maintained, reduce snake habitat (both realand/or perceived), increase vector control, protect desirable, approved species; and reduce fuel loads when systems dry out.

The Developer is to ensure that all waterways are free of Typha spp at the end of the defects liability period.

(5) Dredge spoil dewatering areas

As Council, refuse facilities do not accept "wet waste", the developer will need to incorporate dredge spoil dewatering areas for sediment and aquatic weeds removal into their design. Any dewatering area proposed should be suitable for maintenance vehicle access. The area should be positioned as close as practical to the constructed wetland/drainage channel, be an adequate size and designed to contain the excavated material and associated runoff. The dredge spoil area will not only meet the needs of the developer during the construction and operational phases.

Dredge spoil areas must be identified and approved by Council prior to any excavation.

Dredge spoil areas are to be retained for the duration of the construction and operational phases of thewetland/drainage canal that is being maintained.

The Developer must determine dredge spoil area locations based on the following criteria:

(a) Estimated amount and frequency of dredge material to be dewatered;

(b) Proximity to existing residential and commercial properties;

(c) Proximity to proposed wetland/drainage channel; and

(d) Potential for dredge spoil to emit offensive odours (I.e., high clay/weed content).

Editor's Note - Use Form A: Swales; Form A: Bioretention Systems; Form C: Constructed Wetlands from the *Construction and Establishment Guidelines.*

(6) Saltwater intrusion

Section 4.9 of the Construction and Establishment Guidelines lists potential failures. Saltwater intrusion should be considered as an additional defect or failure.

Table SC6.4.10.4 - Potential Failure Scenarios for Swales and Rectification Actions.

Defect or Failure	Causes	Rectification
Saltwater Intrusion	Physical disturbance/excavation of clay liner during routine maintenance works.	Provide supplementary water to lower salinity of intruded water and/or leach accumulated salts from underlying soils.
	Drying/cracking of clay liner during routine maintenance and system resetting works.	Review construction designs such as spill weir heights and clay liners for deficiencies / inefficiencies.
	System overtopping during Highest Astronomical Tide (HAT): (1) System should be designed for highest expected tide over lifespan of asset; and (2) Overtopping in tidal areas during storm surge and heavy rainfall typically appears manageable due to stratification of fresh on salt during high tides. This should be taken into account.	Engage soil scientist and water sensitive urban design specialist to review soils/clay lining and species compositions if system fails.
	Poor design/construction. No liner present.	
	Low lying wetland encroaching water table.	

SC6.4.10.4 Bioretention swales

(1) Introduction

(a) Bioretention swales act to disconnect impervious areas from downstream waterways and provide protection to natural receiving waterways from frequent storm events by reducing flow velocities compared with piped systems. The bioretention component is typically located at the downstream end of the overlying swale “cell” (I.e., immediately upstream of the swale overflow pit(s) as shown in Figure SC6.4.10.1).

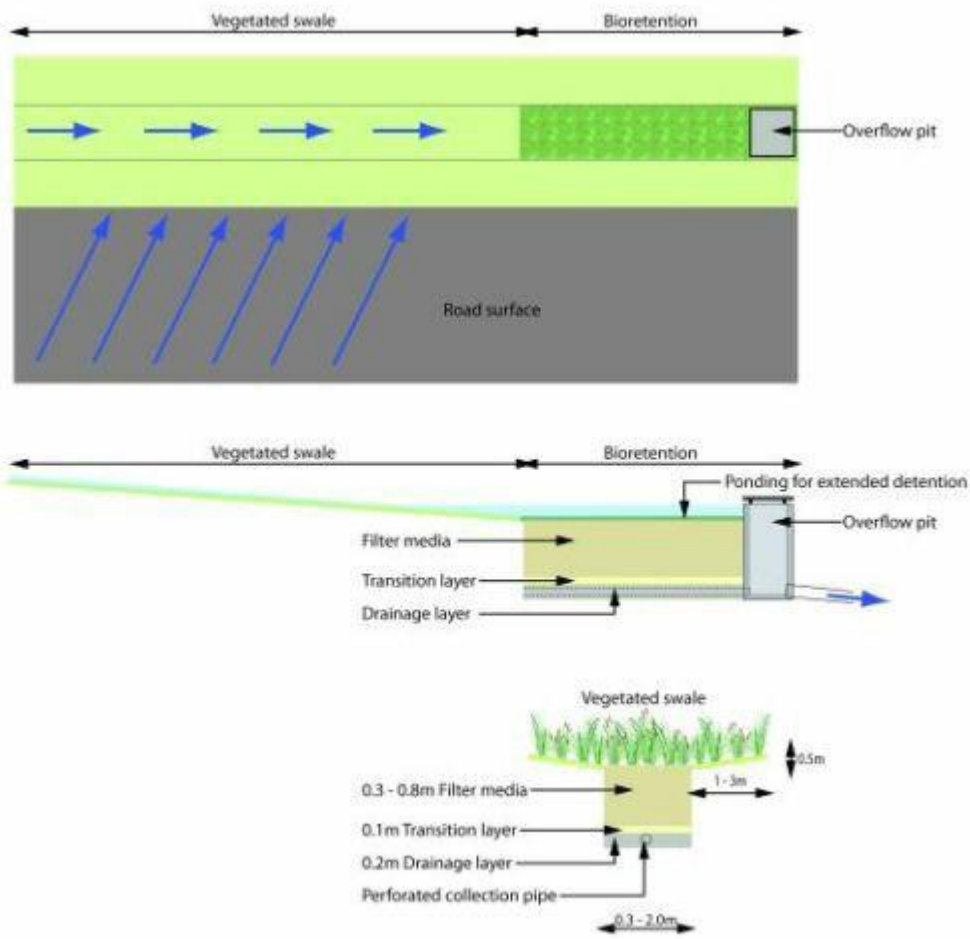


Figure SC6.4.10.1 - Bioretention Swale Conceptual Layout

The choice of bioretention location within the overlying swale will depend on a number of factors, including area available for the bioretention filter media and the maximum batter slopes for the overlying swale. Typically, when used as a continuous trench along the full length of a swale, the desirable maximum longitudinal grade of the swale is 4%. For other applications, the desirable grade of the bioretention zone is either horizontal or as close as possible to encourage uniform distribution of stormwater flows over the full surface area of bioretention filtermedia and allowing temporary storage of flows for treatment before bypass occurs.

(2) Design considerations for bioretention swales

(a) This section outlines some of the key design considerations for bioretention swales that the detailed designer should be familiar with before applying the design procedure presented later in this chapter.Standard design considerations for the swale component of bioretention swales are discussed in detail in Chapter 2 (Swales) and are not reproduced here. However, other swale design considerations that relate specifically to the interactions between the swale and bioretention components are presented in the following sections together with design considerations relating specifically to the bioretention component.

(i) Landscape design

Bioretention swales may be located within parkland areas, easements, car parks or along roadway corridors within footpaths (I.e., road verges) or centre medians. Landscape design of bioretention swales along the road edge can assist in defining the boundary of road or street corridors as well as providing landscape character and amenity. It is therefore important that the landscape design of bioretention swales addresses stormwater quality objectives whilst also being sensitive to these other

important landscape functions. It is also necessary to adequately address potential aesthetics issues such as weeds and sustaining perennial plants during the dryseason.

(ii) Hydraulic design

A key hydraulic design consideration for bioretention swales is the delivery of stormwater runoff from the swale onto the surface of a bioretention filter media. Flow must not scour the bioretentionsurface and needs to be uniformly distributed over the full surface area of the filter media. In steeper areas, check dams may be required along the swale to reduce flow velocities discharged onto the bioretention filter media.

It is important to ensure that velocities in the bioretention swale from both minor (2 to 10-year ARI) and major (50 to 100-year ARI) runoff events are kept sufficiently low (preferably below 0.5 m/s and not more than 2.0 m/s for major flood) to avoid scouring. This can be achieved by ensuring the slope and hydraulic roughness of the overlying swale reduce flow velocities by creating shallow temporary ponding (I.e., extended detention) over the surface of the bioretention filter media via theuse of a check dam and raised field inlet pits. This may also increase the overall volume of stormwater runoff that can be treated by the bioretention filter media.

(iii) Exfiltration to in-situ soils

Bioretention swales can be designed to either preclude or promote ex-filtration of treated stormwater to the surrounding in-situ soils depending on the overall stormwater management objectives established for the given project.

Where the concept design specifically aims to preclude ex-filtration of treated stormwater runoff it is necessary to consider if the bioretention swale needs to be provided with an impermeable liner.The amount of water lost from bioretention trenches to surrounding in-situ soils is largely dependent on the characteristics of the local soils and the saturated hydraulic conductivity of the bioretention filter media.

If the selected saturated hydraulic conductivity of the bioretention filter media is less than 10 timesthat of the native surrounding soils, it may be necessary to provide an impermeable liner. Flexible membranes or a concrete casting are commonly used to prevent excessive ex-filtration. This is particularly applicable for surrounding soils that are very sensitive to any ex-filtration (e.g., sodic soils and reactive clays in close proximity to significant structures such as roads).

The greatest pathway of ex-filtration is through the base of a bioretention trench, as gravity and the difference in hydraulic conductivity between the filter media and the surrounding native soil would typically act to minimise ex-filtration through the walls of the trench. If lining is required, it is likely that only the base and the sides of the drainage layer will need to be lined.

Where ex-filtration of treated stormwater to the surrounding in-situ soils is promoted by the bioretention swale concept design, it is necessary to ensure the saturated hydraulic conductivity ofthe in-situ soils is at least equivalent to that of the bioretention filter media, thus ensuring no impedance of the desired rate of flow through the bioretention filter media. Depending on the saturated hydraulic conductivity of the in-situ soils it may be necessary to provide an impermeable liner to the sides of the bioretention filter media to prevent horizontal ex-filtration and subsequent short circuiting of the treatment provided by the filter media. Bioretention trenches promoting ex- filtration do not require perforated under-drains at the base of the filter media or a drainage layer.

A subsurface pipe is often used to prevent water intrusion into a road sub-base. This practice is to continue as a precautionary measure to collect any water seepage from bioretention swales located along roadways.

(iv) Vegetation types

Bioretention swales can use a variety of vegetation types including turf (swale component only),sedges and tufted grasses. Vegetation is required to cover the whole width of the swale and bioretention filter media surface, be capable of withstanding design flows and be of sufficient density to prevent preferred flow paths and scour of deposited sediments.

Grassed (turf) bioretention swales can be used in residential areas where a continuous bioretention trench approach is used. The preferred vegetation for the bioretention component of bioretention swales is therefore sedges and tufted grasses (with potential occasional tree plantings) that do not require mowing.

The denser and taller the vegetation planted in the bioretention filter media, the better the treatmentprovided, especially during extended detention. Taller vegetation has better interaction with temporarily stored stormwater during ponding, which results in enhanced sedimentation of suspended sediments and associated pollutants. The vegetation that grows in the bioretention filtermedia also acts to continuously break up the surface of the media through plant root growth and wind induced agitation, which prevents surface clogging. Vegetation also provides a substrate for biofilm growth in the upper layer of the filter media which facilitates biological transformation of pollutants (particularly nitrogen).

To maintain aesthetics in highly visible areas supplemental irrigation may be required to sustain vegetation. The incorporation of saturated zones beneath the bioretention filter media can help to sustain soil moisture and is beneficial for nitrogen removal from stormwater. The ability to sustaindense perennial vegetation is important for long term weed management.

Clause SC6.4.10.7 Plant selection for WSUD systems in the coastal dry tropics provides more specific guidance on the selection of appropriate vegetation for bioretention swales.

(v) Bioretention filter media

Selection of an appropriate bioretention filter media is a key design step involving consideration of three inter-related factors:

1. saturated hydraulic conductivity required to optimise the treatment performance of the bioretention component given site constraints on available filter media area;
2. depth of extended detention provided above the filter media; and
3. suitability as a growing media to support vegetation growth (I.e., retaining sufficient soilmoisture and organic content).

The area available for bioretention swales in an urban layout is often constrained by factors such as the available area within the footpaths of standard road reserves. Selecting bioretention filter media for bioretention swale applications in the coastal dry tropics will often require careful consideration of saturated hydraulic conductivity and extended detention depth to ensure the desired minimum volume of stormwater runoff receives treatment. This must also be balanced with the requirement to also ensure the saturated hydraulic conductivity does not become too high such that it can no longer sustain healthy vegetation growth. The maximum saturated hydraulic conductivity should not exceed 500 mm/hr (and preferably be between 50 - 200 mm/hr) to sustain vegetation growth.

The concept design stage will have established the optimal combination of filter media saturated hydraulic conductivity and extended detention depth using a continuous simulation modelling approach (such as MUSIC). Any adjustment of either of these two design parameters during thedetailed design stage will require the continuous simulation modelling to be re-run to assess theimpact on the overall treatment performance of the bioretention system.

As shown in Figure SC6.4.10.2 below, bioretention media can consist of three or four layers. Inaddition to the filter media required for stormwater treatment, a saturated zone can also be added to enhance nitrogen removal and to provide a source of water for vegetation over the dry season. A drainage layer is also required to convey treated water from the base of the filter media or saturated zone into the perforated under-drains. The drainage layer surrounds the perforated under-drains and can be either coarse sand (1 mm) or fine gravel (2-5 mm). If fine gravel is used, atransition layer of sand must also be installed to prevent migration of the filter or saturated zonemedia into the drainage layer and subsequently into the perforated under-drains.

(vi) Saturated zone

The saturated zone design involves a relatively simple modification to a conventional bioretention system. An additional layer located below the filter media is designed to retain stormwater providing a saturated zone at the base of the bioretention system. A saturated zone can be formed by using a riser pipe with the outlet level higher than the drainage layer or by incorporating a weir within the outlet pit. The saturated zone holds water and therefore provides a source of water to maintain soil moisture for plant uptake during dry periods.

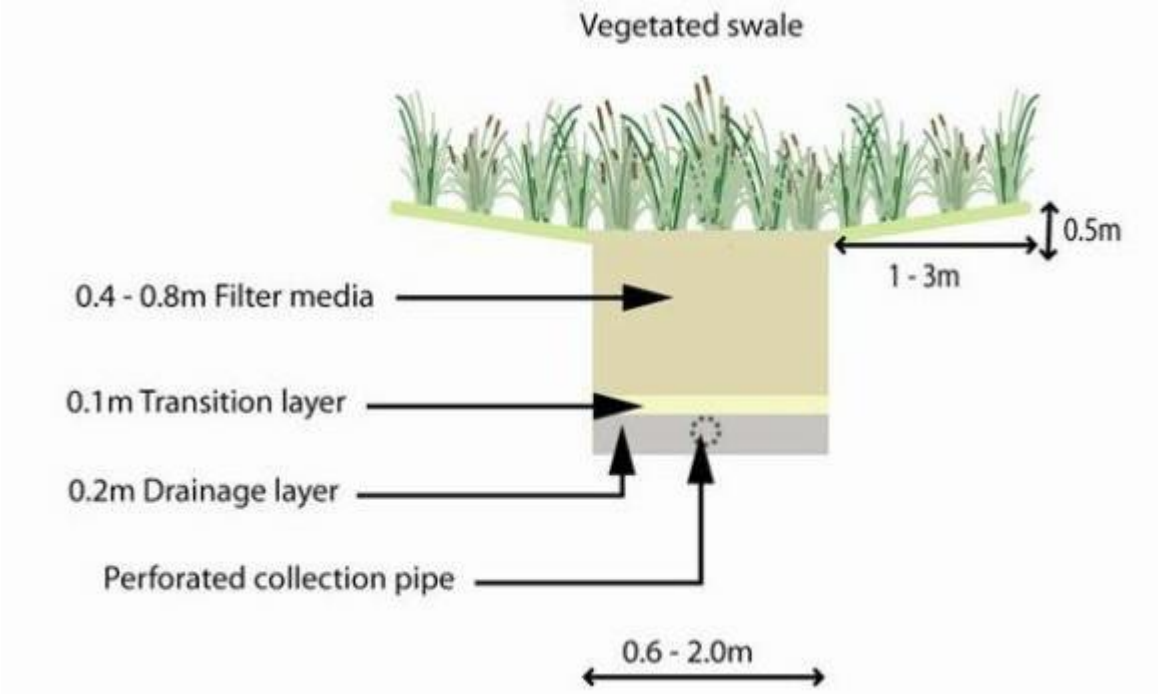


Figure SC6.4.10.2 Typical Section of a Bioretention Swale

(vii) Traffic controls

Another design consideration is keeping traffic and building material deliveries off swales, particularly during the building phase of a development.

A staged construction and establishment method Clause SC6.4.10.4 (5) Construction and establishment - bioretention swales) affords protection to the sub-surface elements of a bioretention swale from heavily sediment laden runoff during the subdivision construction and allotment building phases. However, to prevent vehicles driving on bioretention swales and inadvertent placement of building materials, it is necessary to consider appropriate traffic control solutions as part of the system design. These can include temporary fencing of the swale during the subdivision construction andallotment building phases with signage erected to alert builders and contractors of the purpose andfunction of the

swales. Kerb and channel should be used at all corners, intersections, cul-de-sac heads and at traffic calming devices to ensure correct driving path is taken. For all of these applications, the kerb and channel is to extend 5 m beyond tangent points.

(viii) Roof water discharge

Roof runoff can contain a range of stormwater pollutants including nitrogen washed from the atmosphere during rainfall events. Roof water should be discharged onto the surface of the swalefor subsequent conveyance and treatment by the swale (and downstream treatment measures) before being discharged to receiving aquatic environments. Depending on the depth of the roof water drainage system and the finished levels of the bioretention swale, this may require the use of a small surcharge pit located within the invert of the swale to allow the roof water to surcharge tothe swale. Any residual water left in the surcharge pit can be discharged to the underlying subsoil drainage by providing perforations in the base and sides of the surcharge pit. If a surcharge pit is used, then an inspection chamber along the roof water drainage line is to be provided within the property boundary.

(ix) Services

Bioretention swales located within footpaths (I.e., road verges) must consider the standard locationfor services within the verge and ensure access for maintenance of services. Typically, it is acceptable to have water and sewer services located beneath the batters of the swale with any sewers located beneath bioretention swales to be fully welded polyethylene pipes with rodding points.

(3) Bioretention swale design process

(a) Step 1: Confirm treatment performance of concept design

This design process assumes a conceptual design has been undertaken. Before commencing detailed design, the designer should first undertake a preliminary check to confirm the bioretention swale treatment area from the concept design is adequate to deliver the required level of stormwater qualityimprovement. This assessment should be undertaken by a WSUD specialist and can be achieved bymodelling expected treatment performance in an appropriate quantitative modelling program. This modelling must be based on local rainfall data, the proposed configuration of the system, and based onlocal stormwater treatment performance data.

(b) Step 2: Determine design flows for the swale component

(i) Design flows

Two design flows are required for the design of a swale:

1. Minor flood flow (2-year ARI) to allow minor floods to be safely conveyed. For commercialand industrial areas, the design flow requirement for minor flows is a 5-year ARI event.

2. Major flood flow (100-year ARI) to check flow velocities, velocity depth criteria, conveyance within road reserve, and freeboard to adjoining property.

(ii) Design flow estimation

A range of hydrologic methods can be applied to estimate design flows. As the typical catchment area should be relatively small (<50 ha) the Rational Method design procedure is considered to be a suitable method for estimating design peak flows.

(c) Step 3: Dimension the swale component with consideration to site constraints factors to consider are:

(i) allowable width given the proposed road reserve and/ or urban layout;

(ii) how flows are delivered into a swale (e.g., cover requirements for pipes or kerb details);

(iii) vegetation height;

(iv) longitudinal slope;

(v) maximum side slopes and base width;

(vi) provision of crossings (elevated or at grade); and

(vii) requirements of QUDM and Townsville City Plan.

Depending on which of the above factors are fixed, the other variables can be adjusted to derive the optimal swale dimensions for the given site conditions. The following sections outline some considerations in relation to dimensioning a swale.

(d) Swale width and side slopes

Where the swale width is not constrained by an urban layout (e.g., when located within a large parkland area) then the width of the swale can be selected based on consideration of landscape objectives, maximum side slopes for ease of maintenance and public safety, hydraulic capacity required to convey the desired design flow, and treatment performance requirements. The maximum swale width needs to be identified early in the design process as it dictates the remaining steps in the swale design process. Selection of appropriate side slopes for swales in parks, easements or median strips is heavily dependent on-site constraints, and swale side slopesare typically between 1 in 10 and 1 in 4.

For swales located adjacent to roads, the types of driveway crossing used will typically dictate batter slopes. Where there are no driveway crossings, the maximum swale side slopes will be established for ease of maintenance and public safety considerations. Generally, “at grade” crossings, are preferred which require the swale to have 1:9 side slopes with a nominal 0.5 m flat base to provide sufficient transitions to allow for traffic movement across the crossing. Flatter swale side slopes can be adopted but this will reduce the depth of the swale and its conveyance capacity. Where “elevated” crossings are used, swale side slopes would typically be between 1 in6 and 1 in 4. “Elevated” crossings will require provision for drainage under the crossings with a culvert or similar.

(e) Maximum length of a swale

The maximum length of a swale located within parkland areas and easements is calculated as thedistance along the swale to the point where the flow in the swale from the contributing catchment (for the specific design flood frequency) exceeds the bank full capacity of the swale. For example, if the swale is to convey the minor flood flow (1 to 5-year ARI) without overflowing, then the maximumswale length would be determined as the distance along the swale to the point where the 1-5 year ARI flow from the contributing catchment is equivalent to the bank full flow capacity of the swale(bank full flow capacity is determined using Manning’s equation).

(i) Swale capacity – Manning’s Equation and selection of Manning’s *n*

To calculate the flow capacity of a swale, use Manning’s equation. This allows the flow rate andflood levels to be determined for variations in swale dimensions, vegetation type and longitudinal grade.

$$Q = \frac{A \cdot R^{2/3} \cdot S^{1/2}}{n}$$

Where A = cross section area of swale (m^2)
R = hydraulic radius (m)
S = channel slope (m/m)
N = roughness factor (Manning’s *n*)

Figure SC6.4.10.3 shows a plot of Manning’s *n* versus flow depth for a grass swale with longitudinal grade of 5 %. It is reasonable to expect the shape of the Manning’s n relation with flowdepth to be consistent with other swale configurations, with the vegetation height

at the boundary between low flows and intermediate flows (Figure SC6.4.10.3) on the top axis of the diagram. The bottom axis of the plot has been modified from Barling and Moore (1993) to express flow depth as a percentage of vegetation height.

Further discussion on selecting an appropriate Manning's n for a swale is provided in Appendix Eof the MUSIC User Guide (CRCCH 2005).

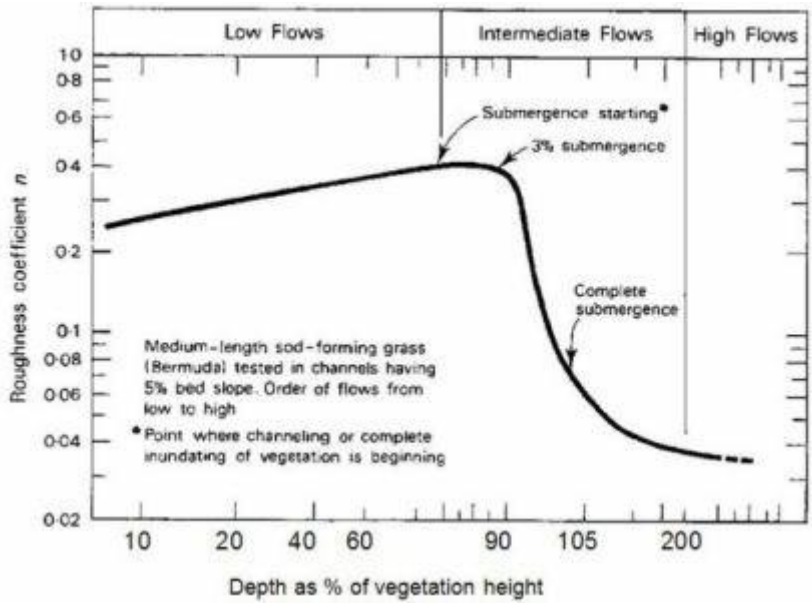


Figure SC6.4.10.3 - Impact of Flow Depth on Hydraulic Roughness (adapted from Barlingand Moore (1993))

(f) Step 4: Design inflow systems to swale and bioretention components

Inflows to bioretention swales can be via distributed runoff (e.g., from flush kerbs on a road) or point outlets such as pipe outfalls. Combinations of these inflow pathways can also be used.

(i) Distributed inflow

An advantage of flows entering a bioretention swale system in a distributed manner (I.e., entering perpendicular to the direction of the swale) is that flow depths are kept as shallow sheet flow, which maximises contact with the swale and bioretention vegetation, particularly on the batter receiving the distributed inflows. This swale and bioretention batter is often referred to as a buffer(see Figure SC6.4.10.4). The requirement of the buffer is to ensure there is dense vegetation growth, flow depths are shallow (below the vegetation height) and erosion is avoided. The buffer provides good pre-treatment, (I.e., significant coarse sediment removal) prior to flows being conveyed along the swale.

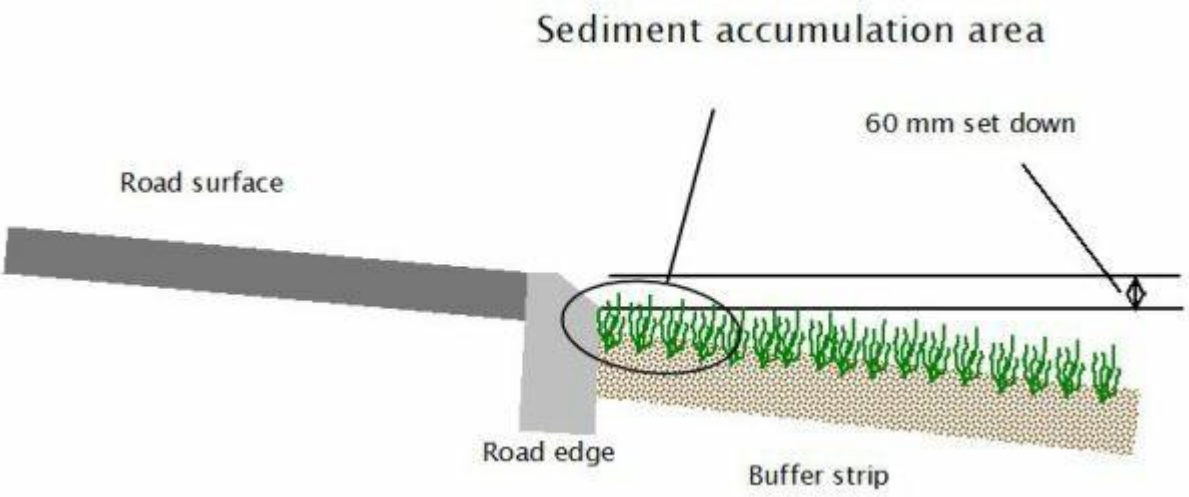


Figure SC6.4.10.4 - Flush kerb with 60 mm Set-down to Allow Sediment to Flow into Vegetated Area

Distributed inflows can be achieved either by having a flush kerb or by using kerbs with regularbreaks in them to allow for even flows across the buffer surface (Figure SC6.4.10.5).

Figure SC6.4.10.5 - Kerb Arrangements with Breaks and Flush Kerbs to Distribute Inflows onto Bioretention Swales and Prevent Vehicle Access

Key design parameters of buffer systems are:

1. providing distributed flows into a buffer (potentially spreading stormwater flows to achieve this);
2. avoiding riling or channelised flows;
3. maintaining flow heights lower than vegetation heights (this may require flow spreaders, or check dams); and
4. minimising the slope of buffer, best if slopes can be kept below 5%.

Maintenance of buffers is required to remove accumulated sediment and debris therefore access is important. It is important to ensure coarse sediments accumulate off the road surface at the start of the buffer. Figure SC6.4.10.6 shows sediment accumulating on a street surface where the vegetation is the same level as the road. To avoid this accumulation, a tapered flush kerb must be used that sets the top of the vegetation 60 mm which requires the top of the ground surface (beforeturf is placed) to be approximately 100 mm below the road surface. This allows sediments to accumulate off any trafficable surface.

FigureSC6.4.10.6 - Flush Kerb Without Set Down, Showing Sediment Accumulation on Road

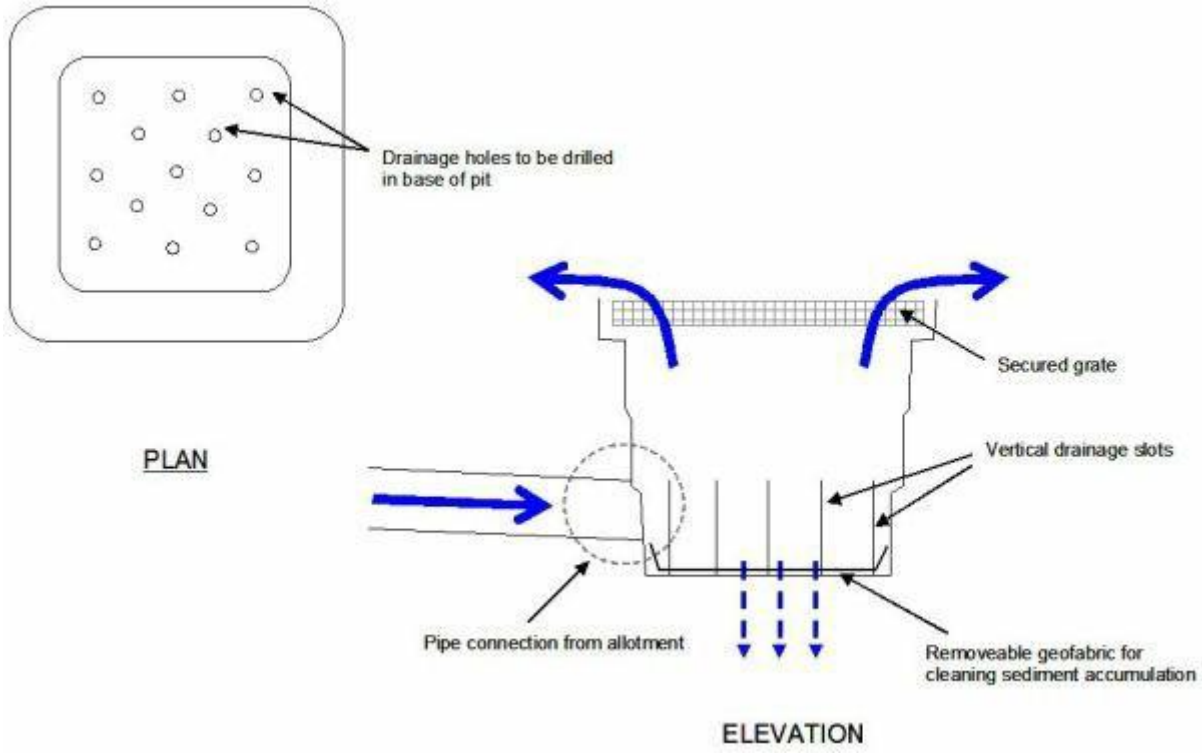
(ii) Concentrated inflow

Concentrated inflows to a bioretention swale can be in the form of a concentrated overland flow or adischarge from a piped drainage system (e.g., allotment drainage line). For all concentrated inflows,energy dissipation at the inflow location is required to minimise any erosion potential. This can usually be achieved with rock benching and/ or dense vegetation.

The most common constraint on pipe systems discharging to bioretention swales is bringing thepipe flows to the surface of a swale. In situations where the swale geometry does not allow the pipe to achieve “free” discharge to the surface of the swale, a “surcharge” pit may be used butshould be avoided where possible.

Surcharge pit systems are most frequently used when allotment runoff is required to cross a roadinto a swale on the opposite side of the road or for allotment runoff discharging into shallow profileswales. Where allotment runoff needs to cross under a road to discharge to a swale, it is preferable to combine the runoff from more than one allotment to reduce the number of crossings required under the road pavement. Figure SC6.4.10.7 illustrates a typical surcharge pit discharging into a swale.

Another important form of concentrated inflow in a bioretention swale is the discharge from the swale component into the bioretention component, particularly where the bioretention component is located at the downstream end of the overlying swale and receives flows concentrated within the swale. Depending on the grade, its top width and batter slopes, the resultant flow velocities at the transition from the swale to the bioretention filter media may require the use of energy dissipation to prevent scour of the filter media (if flow velocities > 0.5 m/sec). For most cases, this can be achieved by placing several large rocks in the flow path to reduce velocities and spread flows. Energy dissipaters located within footpaths must be designed to ensure pedestrian safety.



FigureSC6.4.10.7 Example of Surcharge Pit for Discharging Allotment Runoff into a Swale

(g) Step 5: Design bioretention component

(i) Select Filter media saturated hydraulic conductivity and extended detention

Where design Steps 2 and 3 reveal that the swale geometry derived during the concept design stage does not comply with the relevant local road drainage design standards and/or the standards established in QUDM for minor flood and majorflood flows on adjoining road pavements and minimum freeboard requirements to adjoining properties, it is necessary to revise the swale geometry. As such, an alternative dimension for the surface area of the bioretention component may result and this may require further quantitative modelling to determine the “new” optimal combination of filter media saturated hydraulic conductivity and extended detention depth to maximise the water quality treatment function of the bioretention component.

(ii) Specify the bioretention filter media characteristics

Three to four types of media can be required in the bioretention component of bioretention swales.

Filter Media

The filter media layer provides the majority of the pollutant treatment function, through fine filtration and by supporting vegetation. The vegetation enhances filtration, keeps the filter media porous, provides substrate for biofilm formation and provides some uptake of nutrients and otherstormwater pollutants. As a minimum, the filter media is required to have sufficient depth to support vegetation. Typical depths are between 600-1000 mm with a minimum depth of 300 mmaccepted in depth constrained situations. It is important to note that if deep rooted plants such astrees are to be planted in bioretention swales, the filter media must have a minimum depth of 800 mm to avoid roots interfering with the perforated under-drain system.

The saturated hydraulic conductivity of the filter media is established by optimising the treatment performance of the bioretention system given site constraints of the site (using a continuous simulation model). Saturated hydraulic conductivity should remain between

50-200 mm/hr (saturated hydraulic conductivity of greater than 500 mm/hr would not be accepted by mostcouncils). Once the saturated hydraulic conductivity of the filter media has been determined for a particular bioretention swale, the following process can then be applied to derive a suitable filter media soil to match the design saturated hydraulic conductivity:

1. identify available sources of a suitable base soil (I.e., topsoil) capable of supporting vegetation growth such as a sandy loam or sandy clay loam. In-situ topsoil should be considered first before importing a suitable base soil. Any base soil found to contain high levels of salt (see last bullet point), extremely low levels of organic carbon (< 5%), or otherextremes considered retardant to plant growth and denitrification should be rejected. The base soil must also be structurally sound and not prone to structural collapse as this can result in a significant reduction in saturated hydraulic conductivity. The risk of structural collapse can be reduced by ensuring the soil has a well graded particle size distribution with a combined clay and silt fraction of < 12%;
2. using laboratory analysis, determine the saturated hydraulic conductivity of the base soil using standard testing procedures (AS 4419-2003 Appendix H Soil Permeability). A minimum of five samples of the base soil should be tested. Any occurrence of structural collapse during laboratory testing must be noted and an alternative base soil sourced;
3. the required content of sand or clay (by weight) to be mixed to the base soil will need to be established in the laboratory by incrementally increasing the content of sand or clay until the desired saturated hydraulic conductivity is achieved. The sand or clay content (by weight) that achieves the desired saturated hydraulic conductivity should then be adopted on-site. A minimum of five samples of the selected base soil and sand (or clay) content mixmust be tested in the laboratory to ensure saturated hydraulic conductivity is consistent across all samples. If the average saturated hydraulic conductivity of the final filter media mix is within ± 20% of the design saturated hydraulic conductivity, then the filter media can be adopted and installed in the bioretention system. Otherwise, further amendment of thefilter media must occur through the addition of sand (or clay) and retested until the designsaturated hydraulic conductivity is achieved;
4. the base soil must have sufficient organic content to establish vegetation on the surface of the bioretention system. If the proportion of base soil in the final mix is less than 50%, it may be necessary to add organic material. This should not result in more than 10% organiccontent (measured in accordance with AS 1289.4.1.1-1997) and should not alter the saturated hydraulic conductivity of the final filter media mix;
5. the pH of the final filter media is to be amended (if required) to between 6 and 7. If the filter media mix is being prepared off-site, this amendment should be undertaken before delivery to the site; and
6. the salt content of the final filter media (as measured by EC1:5) must be less than 0.63dS/m for low clay content soils like sandy loam. (EC1:5 is the electrical conductivity ofa 1:5 soil/ water suspension).

Transition layer (if required)

The purpose of the transition layer is to prevent the filter media from migrating down into the drainage layer (or saturated layer). It also acts as a buffer between the permanently saturated zone and the filter media. This buffer is necessary to ensure the filter media is not saturated for prolonged periods during rainfall events due to increases in water levels in the saturated zone. Toachieve this, the transition layer depth must be greater than the head created by flows over the saturated zone outlet weir.

It is required if the particle size difference between the filter media and the drainage layer (or saturated layer) is more than one order of magnitude. If a transition layer is required then the material must be a clean, well graded sand/coarse sand material containing little or no fines.

The transition layer is recommended to be 100 mm thick and have a minimum saturated hydraulicconductivity of 1000 mm/hr.

A recent particle size distribution for the transition layer sand will need to be obtained to ensure that it meets the required grading and bridging criteria outlined below. The "bridging" criteria is based on the engineering principles that rely on the largest 15% of the filter media particles "bridging" withthe smallest 15% of the sand particles. This results in smaller voids, which prevent the migration of the filter media particles into the sand particles. The following equation is taken from the United States Golf Association's recommendations for golf course construction:

Bridging Factor: **D15 (Transitional Layer Sand) ≤ 8 x D85 (Filter Media)**

The addition of a transition layer increases the overall depth of the bioretention system and may bean important consideration for some sites where total depth of the bioretention system may be constrained. In such cases, the use of a sand drainage layer and/ or perforated pipes with smaller slot sizes may need to be considered Clause SC6.4.10.4 (3)(g)(iii) Step 5: Design Under-drain and Undertake Capacity Checks (if required)).

Saturated layer (if required)

The saturated layer should be about 400 mm deep (but may deeper depending on the specific application) and composed of clean (I.e., free from fines) medium coarse washed sand, gravel, or small rock (50 mm diameter maximum) together with a long-term carbon source. Hardwood wood chips, 5 mm to 40 mm in size, are recommended as the carbon source because they breakdown slowly to provide a long-term carbon source yet have a decomposition rate that should not limit thedenitrification process.

The total mass of carbon/electron donor that is required for denitrification must be calculated based on the expected stormwater influent TN mass over the desired life span of the system (e.g.,25 years). The calculation is based on the stoichiometry of the denitrification reaction (shown below).

Denitrification Reaction:

$NO_3^- + 1.25\ (CH_2O) + H^+\ (10^7 M) \rightarrow 0.5N_2\ (g) + 1.75H_2O + 1.25CO_2\ (g)$

Based on a 400 mm deep saturated zone and the modelled annual TN runoff mass (for Townsville)for a bioretention system that is 2% of the contributing 1ha catchment, the saturated zone media would have the following composition:

76.7 m^3 washed coarse sand, gravel, or small rock; and

3.3 m^3 hardwood wood chips, well graded 5 mm-40 mm.

This is equivalent to an organic carbon content of approximately 4-5% by volume. If the saturatedzone depth changed, or the bioretention system to catchment area ratio changed, the hardwood proportion would need to be recalculated using the denitrification stoichiometry.

Calculating Carbon Source for Saturated Zone with safety factor

Stoichiometry:
N:C ratio = 1:1.25 (mol), which equates to 14:15(g) [Mw: N = 14g/mol, C = 12g/mol]Average total carbon content of hardwood woodchips is 50%, therefore
N:C (woodchip) = 14:30 (g)

Woodchips (312.5 x	656
Safety Factor (x	1313kg/carbo
Density of wood	400 kg/m^3
Hardwood Wood Chips	**3.3 m^3** **76.7**

The saturated media must have a hydraulic conductivity of >1000 mm/hr (the ASTM F1815-06 test method is to be used to measure hydraulic conductivity).

The saturated zone should be lightly compacted (e.g., with one pass of a smooth drum lawn roller)during installation to stabilise the structure. Under no circumstances should heavy compaction or multiple passes be made.

Drainage layer (if required)
The drainage layer is used to convey treated flows from the base of the filter media layer (or saturated zone) into the perforated under-drainage system. The composition of the drainage layer is to be considered in conjunction with the selection and design of the perforated under-drainage system as the slot sizes in the perforated pipes may determine the minimum drainage layer particle size to avoid washout of the drainage layer into the perforated pipe system. Coarser material (e.g., fine gravel) is to be used for the drainage layer if the slot sizes in the perforated pipes are too large for use of a sand-based drainage layer. Otherwise, sand is thepreferred drainage layer media as it is likely to avoid having to provide a transition layer betweenthe filter media and the drainage layer (if there is no saturated zone). The drainage layer is to be a minimum of 200 mm thick.

Bridging Factor:

D15 (drainage gravel/sand) ≤ 8 x D85 (Filter Media/Saturated Zone/Transition Layer)

Ensure drainage media is washed prior to placement in bioretention system to remove any fines.

(iii) Under-drain design and capacity checks

The maximum spacing of the perforated pipes in wide bioretention trenches is 1.5 m (centre to centre) so that the distance water needs to travel (horizontally) through the drainage layer does nothinder drainage of the filtration media.

By installing parallel pipes, the capacity of the perforated pipe under-drain system can be increased. The recommended maximum size for the perforated pipes 100 mm to minimise therequired thickness of the drainage layer. Either flexible perforated pipe (e.g., “ag pipe”) or slotted PVC pipes can be used; however, care needs to be taken to ensure that the slots in the pipes arenot so large that sediment would freely flow into the pipes from the drainage layer. This is also a consideration when specifying the drainage layer media.

1. to ensure the slotted pipes are of adequate size, several checks are required:ensure perforations are adequate to pass the maximum infiltration rate;

2. ensure the pipe itself has capacity to convey the design flow/ infiltration rate; and
3. ensure that the material in the drainage layer will not be washed into the perforated pipes(consider a transition layer).

The maximum infiltration rate represents the maximum rate of flow through the bioretention filter media and is calculated by applying Darcy's equation (Equation 3.2) as follows:

$$Q_{max} = K_{sat} \cdot L \cdot W_{base} \cdot \frac{h_{max} + d}{d}$$

Where Q_{max} = maximum infiltration rate (m^3/s)
K_{sat} = hydraulic conductivity of the soil filter (m/s)
W_{base} = base width of the ponded cross section above the soil filter (m)
L = length of the bioretention zone (m)
h_{max} = depth of pondage above the soil filter (m)
d = depth of filter media (m)

The capacity of the perforated under-drains need to be greater than the maximum infiltration rate toensure the filter media drains freely and the pipe(s) do not become the hydraulic "control" in the bioretention system (I.e., to ensure the filter media sets the travel time for flows percolating through the bioretention system rather than the perforated under-drainage system).

To ensure the perforated under-drainage system has sufficient capacity to collect and convey the maximum infiltration rate, it is necessary to determine the capacity for flows to enter the under- drainage system via perforations in the pipes. To do this, orifice flow can be assumed, and the sharp-edged orifice equation can be used. Firstly, the number and size of perforations needs to be determined (typically from manufacturer's specifications) and used to estimate the flow rate into the pipes using the maximum driving head (being the depth of the filtration media if no extended detention is provided or if extended detention is provided in the design, then to the top of extended detention). It is conservative but reasonable to use a blockage factor to account for partial blockage of the perforations by the drainage layer media. A 50% blockage of the perforation is recommended.

$$Q_{perf} = B \cdot C_d \cdot A\sqrt{2 \cdot g \cdot h}$$

Where Q_{perf} = flow through perforations (m^3/s)
B = blockage factor (0.5)
C_d = orifice discharge coefficient (assume 0.61 for sharp edge orifice)
A = total area of the orifice (m^2)
g = gravity (9.79 m/s^2)
h = head above the perforated pipe (m)

If the capacity of the drainage system is unable to collect the maximum infiltration rate, then additional under- drains will be required.

After confirming the capacity of the under-drainage system to collect the maximum infiltration rate is it then necessary to confirm the conveyance capacity of the underdrainage system is sufficient to convey the collected runoff. To do this, Manning's equation (Equation 3.1) can be used (which assumes pipe full flow (in place of channel flow) but not under pressure). The Manning's roughness used will be dependent on the type of pipe used. When a saturated zone is incorporated into the design, the

underdrainage pipes are laid flat however the conveyance capacity can be calculated using the Manning's equation with an assumed friction slope of 0.5%.

The under-drains should be extended vertically to the surface of the bioretention system to allow inspection and maintenance when required. The vertical section of the under-drain should be unperforated and capped to avoid short circuiting of flows directly to the drain.

In bioretention systems with a saturated zone, the capacity of the weir or up-turned pipe (maintaining the water level within the saturated zone) must also be checked to ensure it does notbecome the hydraulic "control" in the bioretention system (I.e., to ensure the filter media sets the travel time for flows percolating through the bioretention system). A broad crested weir equation can be used to determine the length of weir required (assuming free flowing conditions) to convey the maximum flow/filtration rate. The maximum depth of flow over the weir is to be 100 mm. This is important to limit increase in the saturated zone depth and avoid prolonged saturation of the filtermedia.

(iv) Check requirement for impermeable lining

The saturated hydraulic conductivity of the natural soil profile surrounding the bioretention system should be tested together with depth to groundwater, chemical composition and proximity to structures and other infrastructure. This is to establish if an impermeable liner is required at the base (only for systems designed to preclude ex-filtration to in-situ soils) and/or sides of the bioretention system (refer also to discussion in Clause SC6.4.10.4 (2)(a)(iii) Ex-filtration to in-situ soils). If the saturated hydraulic conductivity of the filter media in the bioretention system is more than oneorder of magnitude (10 times) greater than that of the surrounding in-situ soil profile, no impermeable lining is required.

(h) Step 6: Verify design

(i) Vegetation scour velocity check

Potential scour velocities are checked by applying Manning's equation (Equation 3.1) to thebioretention swale design to ensure the following criteria are met:

1. less than 0.5 m/s for minor flood (2 to10-year ARI) discharge; and
2. less than 2.0 m/s for major flood (50 to 100-year ARI) discharge.

(ii) Velocity and depth check – safety

As bioretention swales are generally accessible by the public, it is important to check that depth xvelocity within the bioretention swale, at any crossings and adjacent pedestrian and bicycle pathways, satisfies the following public safety criteria:

1. depth x velocity < 0.6 m^2/s for low-risk locations and 0.4 m^2/s for high-risk locations asdefined in QUDM; and
2. maximum depth of flow over crossing = 0.3 m.

(iii) Confirm treatment performance

If the previous two checks are satisfactory then the bioretention swale design is satisfactory from aconveyance function perspective and it is now necessary to confirm the treatment performance of the bioretention swale by reference to the performance information presented in Clause SC6.4.10.4 (3)(a).

(i) Step 7: Size overflow pit (field inlet pits)

In a bioretention swale system, an overflow pit can be provided flush with the invert of the swale and/ orbioretention system filter media (I.e., when no extended detention is provided in the design) or it can beprovided with the pit crest raised above the level of the bioretention filter media to establish the design extended detention depth (if extended detention is provided for in the design).

Grated pits are typically used and the allowable head for discharges into the pits is the difference in levelbetween the pit crest and the maximum permissible water level to satisfy the local council's minimum freeboard requirements. Depending on the location of the bioretention swale, the design flow to be used to size the overflow pit could be the maximum capacity of the swale, the minor flood flow (2 to 5-year ARI) or the major flood flow (50-year ARI). There should be a minimum of 100 mm head over the overflow pitcrest to facilitate discharge of the design flow into the overflow pit.

To size an overflow pit, two checks should be made to test for either drowned or free flowing conditions. A broad crested weir equation can be used to determine the length of weir required (assuming free overflowing conditions) and an orifice equation used to estimate the area between openings required in the grate cover (assuming drowned outlet conditions). The larger of the two pit configurations should be adopted (as per Section 7.05 QUDM). In addition, a blockage factor is to be used, that assumes the grate is 50% blocked.

For free overfall conditions (weir equation):

$$Q_{weir} = B \cdot C_w \cdot L \cdot h^{3/2}$$

Where	Q_{weir}	=	Flow into pit (weir) under free overfall conditions (m^3/s)
	B	=	Blockage factor (= 0.5)
	C_w	=	Weir coefficient (= 1.66)
	L	=	Length of weir (perimeter of pit) (m)
	h	=	Flow depth above the weir (pit) (m)

Once the length of weir is calculated, a standard sized pit can be selected with a perimeter at least the same length of the required weir length.

For drowned outlet conditions (orifice equation):

$$Q_{orifice} = B \cdot C_d \cdot A\sqrt{2 \cdot g \cdot h}$$

Where B, g and h have the same meaning as in Equation 3.4

$Q_{orifice}$	=	flow rate into pit under drowned conditions (m^3/s)
C_d	=	discharge coefficient (drowned conditions = 0.6)
A	=	area of orifice (perforations in inlet grate) (m^2)

When designing grated field inlet pits, reference is also to be made to the procedure described in QUDMSection 7.05.4 (DNRW, IPWEA and BCC, 1998).

When a saturated zone is included in the design of a bioretention system, additional components must be incorporated into the outlet design. A saturated zone can be formed at the base of a bioretention system by using a riser pipe with the outlet level set at the top of the desired saturation depth (I.e., top of the saturated zone) or by incorporating a weir/overflow structure within the outlet pit (Refer to Figure SC6.4.10.18). The saturated zone would hold water rather than draining freely and would therefore provide a source of water to the plants during dry periods.

(j) Step 8: Make allowances to preclude traffic on swales

Refer to Clause SC6.4.10.4 (2)(a)(vii) for discussion on traffic control options.

(k) Step 9: Specify plant species and planting densities

Refer to Clause SC6.4.10.5 (4) Landscape design notes - bioretention swales and Section SC6.4.12 Landscape and open space policy.

For advice on selecting suitable plant species for bioretention swales in the coastal dry

tropics. Consultation with landscape architects is recommended when selecting vegetation to ensure thetreatment system compliments the landscape design of the area.

(l) Step 10: Consider maintenance requirements

Consider how maintenance is to be performed on the bioretention swale (e.g., how, and where is access available, where is litter likely to collect etc.). A specific maintenance plan and schedule should be developed for the bioretention swale in accordance with Clause SC6.4.10.4 (6) Maintenance requirements - bioretention swales.

(m) Design calculation summary

The design calculation checklist can be used to summarise the design data and calculation results from the design process (Refer to Clause SC6.4.10.8 Checklist A - Bioretention Swales Design Calculation Summary or click here to view the document).

(l) Typical design parameters

Table SC6.4.10.5 shows typical values for a number of key bioretention swale design parameters.

Table SC6.4.10.5 - Bioretention Swale Design Parameters

Design Parameter	Typical Values
Swale longitudinal slope	1% to 4%
Swale side slope for trafficability (with “at grade” crossover)	Maximum 1 in 9
Swale side slope (with elevated driveway crossover)	1 in 4 to 1 in 10
Manning’s *n* (with flow depth lower than vegetation height)	0.15 to 0.3
Manning’s *n* (with flow depth greater than vegetation height)	0.03 to 0.05
Maximum velocity for scour in minor event (E.g., 2 to 10-yr ARI)	0.5 m/s
Maximum velocity for 50-100yr ARI	2.0 m/s
Perforated pipe size	100 mm (maximum)
Drainage layer average material diameter (typically fine gravel or coarse sand)	1-5 mm diameter
Transition layer average material diameter typically sand to coarse sand	0.7 – 1.0 mm diameter

(4) Landscape design notes bioretention swales

Bioretention swales are a combined solution that involves integrating a swale with the filtration function of a bioretention basin/trench. These can involve an extended detention treatment and some biological uptake through the planted bioretention component. The landscaping for both the swale and bioretention parts are essentially similar to the treatments for the stand-alone components however consideration of the interfacelandscape between the vegetated swale and bioretention is important.

(a) Objectives

(i) Landscape design for bioretention swales has four key objectives:

1. ensure surface treatments and planting designs address stormwater quality objectives by incorporating appropriate plant species for stormwater treatment (biologically active root zone) whilst enhancing the overall natural landscape. This includes requirements for maintaining dense perennial vegetation throughout the dry

season to maintain aesthetics and to minimise weed growth;

2. integrated planning and design of bioretention swales within the built and landscape environments; and

3. incorporating crime prevention through environmental design (CPTED) principles and road, driveway, and footpath visibility safety standards.

(b) Streetscape bioretention systems

When using bioretention swales in road reserves it is important to understand how the swale landscape can be used to define the visual road space. Creative landscape treatments may be possible given that the bioretention swale element will typically be a minimum of 4 m in width. Design responses may range from informal “natural” planting layouts to regimented avenues of trees along each external and internal edge of the bioretention swale element. Bioretention swales can be incorporated into a typical streetscape landscape using either a central splitter median or using one side of the road reserve.

Bioretention swale surface treatments are generally a vegetated swale that integrates into a densely planted bioretention component. The use of turf for the bioretention parts of the system is discouraged asmowing and public use of these areas will compact the upper filter media and limit the amount of filtration.

Vegetated bioretention swales can provide a relatively maintenance free finish if the planting and invert treatment are designed well. Key considerations when detailing are density and types of plantings, locations of trees and shrubs, type of garden (mowing) edges to turf areas that allows unimpeded movement of stormwater flow and overall alignment of swale invert within the streetscape.

(i) Centre median

Generally, the central median swale will provide a greater landscaped amenity, allowing planting and shade trees to enhance the streetscape more effectively, whilst verges remain constraint free. This swale configuration is however confined to roads requiring larger corridors for increased traffic.

This can be seen in Figure SC6.4.10.8 and Figure SC6.4.10.9.

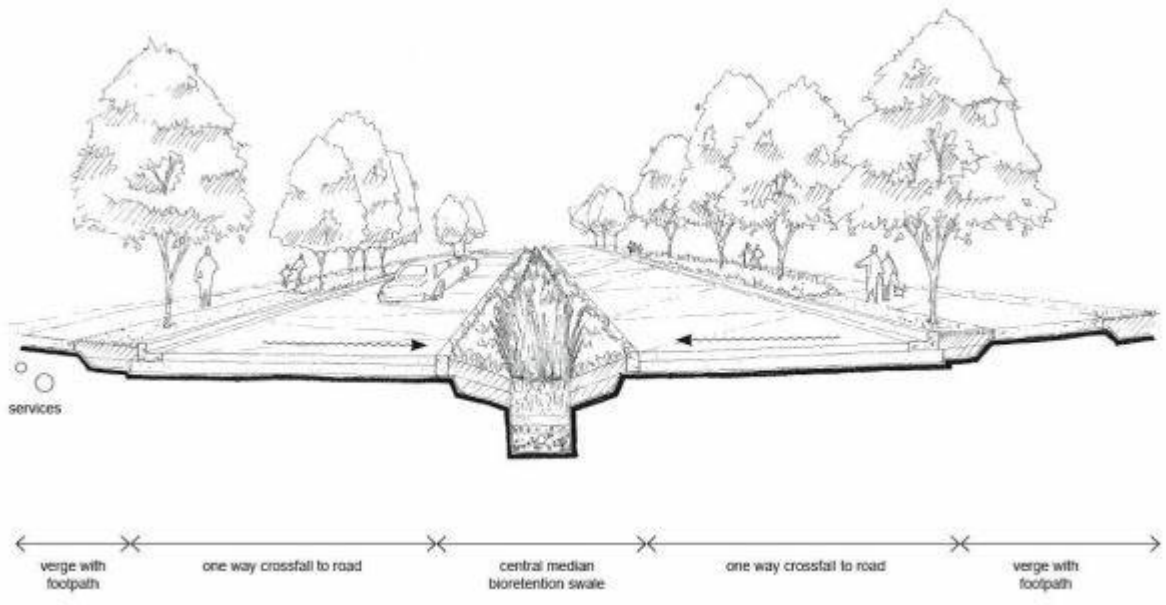


Figure SC.6.4.10.8 - Bioretention Swale in Centre Median

Figure SC6.4.10.9 - Median Strip Bioretention Applications

(ii) Side of road

In smaller minor roads, one side of the road can have a swale landscape to capture stormwaterrunoff from road pavements and house lots. To enhance the visual road space, creative landscapetreatments to driveway cross-overs, general planting and invert treatments should be used. It is important in this swale arrangement that services and footpaths that are standard for road verges have been planned and located to avoid clashes of function. This can be seen in Figure SC6.4.10.10.

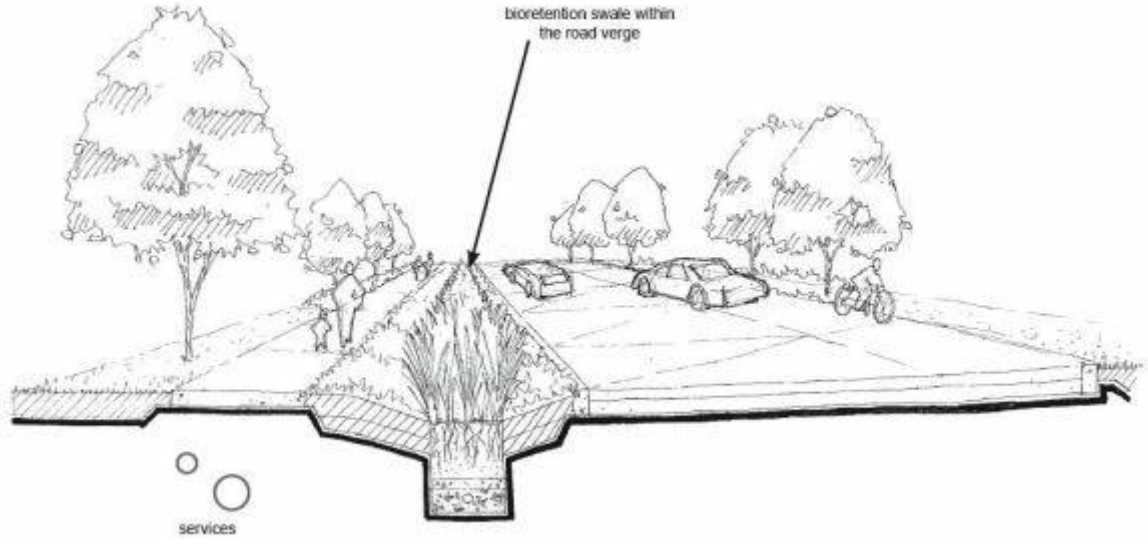


Figure SC6.4.10.10 Bioretention Swale Within Road Verge

(c) Civic and urban spaces

With increasing population growth in the coastal dry tropics, gentrification of urban areas is required tocreate more robust spaces that meet current environmental and social needs. Often constrained by existing infrastructure, landscape treatments of swales can have a dual role of providing functional stormwater quality objectives whilst creating landscapes that enhance the communities' perception of water sensitive design.

By creating hard useable edges to swales and using complimentary planting strategies, civic spaces can provide an aesthetic landscape that meets recreational uses and promotes water sensitive design to the community. Refer to Figure SC6.4.10.11 for an illustrative example.

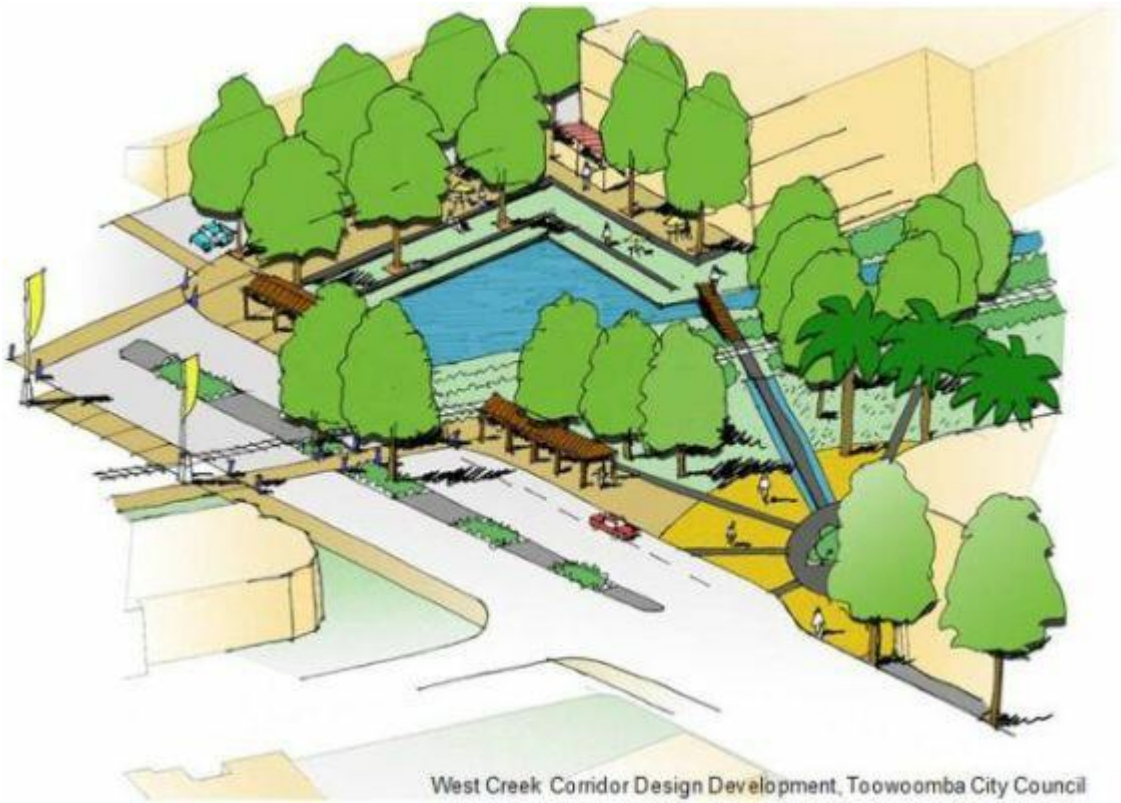


Figure SC6.4.10.11 - Swale Treatment in Civic Space

(d) Appropriate plant species

Planting for bioretention swale elements may consist of up to four vegetation types:

(i) groundcovers for stormwater treatment and erosion protection (required element);

(ii) shrubbery for screening, glare reduction, character, and other values;

(iii) street trees for shading, character, and other landscape values;

(iv) existing vegetation;

It is important to note that deep rooted plants such as trees are to be planted towards the top of the swale bank rather than near the bioretention trench, to avoid roots interfering with the underdrain system.

Where the landscape design includes canopy layers, more shade tolerant species should be selected forthe groundcover layer. Trees and shrubbery should be managed so that the groundcover layer is not out- competed. If this does occur, replacement planting and possible thinning of the upper vegetation layersmay be required.

(v) groundcovers, shrubs, and street trees; and

Refer to Clause SC6.4.10.7 Plant selection for WSUD systems in the coastal dry tropics for guidance on selecting suitable plant (including turf) species and cultivars that meet the functional requirements of bioretention swales to deliver the desired stormwater quality objectives.

(vi) existing vegetation

Existing vegetation, such as remnant native trees, within the bioretention swale alignment may be nominated for retention. In this case, the swale will need to be diverted or piped to avoid the vegetation's critical root zone (equivalent to 0.5 m beyond the vegetation's drip line).

(e) Safety issues

Bioretention swales within streetscapes and parks need to be generally consistent with public safety requirements for new developments. These include reasonable batter profiles for edges, providing adequate barriers to median swales for vehicle/pedestrian safety and safe vertical heights from drivewaysto intersecting swale inverts.

(i) Crime Prevention Through Environmental Design (CPTED)

Landscape design of bioretention swales need to accommodate the standard principles of informal surveillance, exclusion of places of concealment and open visible areas. Regular clear sightlinesshould be provided between the roadway and footpaths/ property. Where planting may create places of concealment or hinder informal surveillance, groundcovers and shrubs should not generally exceed 1 m in height.

(ii) Traffic sightlines

The standard rules of sightline geometry apply – planting designs should allow for visibility at pedestrian crossings, intersections, rest areas, medians, driveways, and roundabouts. Refer to the *Road Landscape Manual* (DTMR) for further guidance.

(5) Construction and establishment – bioretention swales

This section provides general advice for the construction and establishment of bioretention swales and key issues to be considered to ensure their successful establishment and operation.

(a) Staged construction and establishment method

(i) Construction and establishment challenges

There exist challenges that must be appropriately considered to ensure successful construction and establishment of bioretention swales. These challenges are best described in the context of the typical phases in the development of a greenfield or infill development, namely thesubdivision construction phase and the building phase (see Figure SC6.4.10.13).

1. Subdivision construction - the risks to successful construction and establishment of the WSUD systems during this phase of work have generally related to the following:

    a) Construction activities which can generate large sediment loads in runoff which cansmother vegetation and clog bioretention filter media.

    b) Construction traffic and other works can result in damage to the bioretention swales.Importantly, all works undertaken during Subdivision Construction are normally “controlled” through the principal contractor and site manager. This means the risks described above can be readily managed through appropriate guidance and supervision.

    c) Building phase - the allotment building phase (see Figure SC6.4.10.12) represents thegreatest risk to the successful establishment of bioretention swales.

Figure SC6.4.10.12 - Example of Building Phase

(ii) Staged construction and establishment method

To overcome the challenges associated within delivering bioretention swales a staged construction and establishment method should be adopted (see Figure SC6.4.10.13).

1. Stage 1: Functional installation

Construction of the functional elements of the bioretention system at the end of subdivision construction (I.e., during landscape works) and the installation of temporary protective measures.

2. Stage 2: Sediment and erosion control

   During the building phase the temporary protective measures preserve the functional infrastructure of the bioretention swales against damage whilst also providing a temporary erosion and sediment control facility throughout the building phase to protect downstream aquatic ecosystems.

3. Stage 3: Operational establishment

   At the completion of the building phase, the temporarymeasures protecting the functional elements of the bioretention swales can be removed along with all accumulated sediment and the system planted in accordance with the design planting schedule.

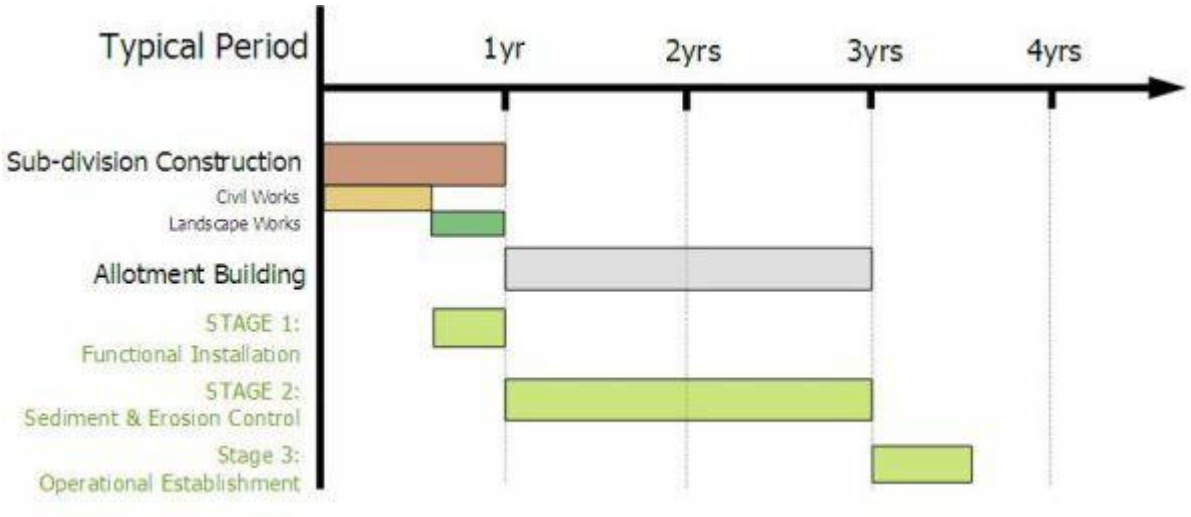


Figure SC6.4.10.13 - Staged Construction and Establishment Method

(iii) Functional installation

Functional installation of bioretention swales (see Figure SC6.4.10.14) occurs at the end of subdivision construction as part of landscape works and involves:

1. bulking out and trimming;
2. installation of the outlet structures;
3. placement of liner and installation of drainage layer (I.e., under-drains and drainage layer);
4. placement of filter media;
5. placement of a temporary protective layer - covering the surface of filtration media with geofabric and placement of 25 mm topsoil and turf over geofabric. This temporary geofabric and turf layer will protect the bioretention system during construction (subdivision and building phases) ensuring sediment/litter laden waters do not enter the filter media causingclogging; and
6. place silt fences around the boundary of the bioretention swale to exclude silt and restrict access.

Figure SC6.4.10.14 - Bioretention Swale Functional Installation

(iv) Sediment and erosion control

The temporary protective layers are left in place through the allotment building phase to ensure sediment laden waters do not clog the filtration media and allotment building traffic does not enter the bioretention swale (see Figure SC6.4.10.15). Importantly the configuration of the bioretention swale and the turf vegetation allow the system to function effectively as a shallow sedimentation basin reducing the load of coarse sediment discharging to the receiving environment. Using this approach, WSUD systems can operate effectively to protect downstream ecosystems immediately after construction.

Figure SC6.4.10.15 - Bioretention Swale Sediment and Erosion Control

(v) Operational establishment

1. At the completion of the allotment building phase the temporary measures are removed with allaccumulated sediment and the bioretention swale re-profiled and planted in accordance with theproposed landscape design. Establishment of the vegetation to design condition can require more than two growing seasons, depending on the vegetation types, during which regular watering and removal of weeds will be

required.

2. Sourcing bioretention vegetation

   The minimum recommended lead time for ordering is 3-6 months. This usually allows enough time for plants to be grown to the required size. The following pot sizes are recommended as the minimum:

   a) “Viro” tubes 50 mm wide x 85 mm deep;

   b) 50 mm tubes 50 mm wide x 75 mm deep; and

   c) native tubes 50 mm wide x 125 mm deep.

3. Vegetation establishment

   The following weed control measures and watering schedule are recommended to ensure successful plant establishment. Regular general maintenance as outlined in Clause SC6.4.10.4 (6) Maintenance requirements - bioretention swales will also be required.

4. Weed control

   Conventional surface mulching of bioretention swales with organic material like tanbark, should not be undertaken. Most organic mulch floats and runoff typically causes this material to be washed away with the risk of blockage of drains occurring. Weed management will need to be done manually until such time that the design vegetation is established with sufficient density to effectively prevent weed propagation.

5. Watering

   Regular watering of bioretention swale vegetation is essential for successful establishment and healthy growth and weed reduction. The frequency of watering to achieve successful plant establishment is dependent upon rainfall, maturity of planting stock and the water holding capacity of the soil. The following watering program is generally adequate but should be adjusted (increased) to suit the site conditions:

   a) Week 1-2 3 visits/ week;

   b) Week 3-6 2 visits/ week; and

   c) Week 7-12 1 visit/ week.

   After this initial three-month period, temporary, supplementary irrigation will be required in bioretention swales without submerged zones and may be required in bioretention swales with submerged zones (particularly during the 2-year plant establishment period). Watering requirements to sustain healthy vegetation should be determined during ongoing maintenance site visits.

(6) Maintenance requirements – bioretention swales

Bioretention swales have a flood conveyance role that needs to be maintained to ensure adequate flood protection for local properties. Vegetation plays a key role in maintaining the porosity of the soil media of thebioretention system and a strong healthy growth of vegetation is critical to its performance.

(a) Typical maintenance of bioretention swale elements will involve:

(i) routine inspection of the swale profile to identify any areas of obvious increased sediment deposition, scouring of the swale invert from storm flows, rill erosion of the swale batters from lateral inflows, damage to the swale profile from vehicles and clogging of the bioretention trench(evident by a “boggy” swale invert);

(ii) routine inspection of inlet points (if the swale does not have distributed inflows), surcharge pits andfield inlet pits to identify any areas of scour, litter build up and blockages;

(iii) removal of sediment where it is impeding the conveyance of the swale and/ or smothering theswale vegetation, and if necessary, reprofiling of the swale and revegetating to original design specification;

(iv) repairing any damage to the swale profile resulting from scour, rill erosion or vehicle damage;

(v) tilling of the bioretention trench surface if there is evidence of clogging;(vi) clearing of blockages to inlet or outlets;

(vi) regular watering/ irrigation of vegetation until plants are established and actively growing (see Clause SC6.4.10.4 (5)(a)(v)3 Vegetation establishment);

(vii) mowing of turf or slashing of vegetation (if required) to preserve the optimal design height for thevegetation;

(viii) removal and management of invasive weeds;

(ix) removal of plants that have died and replacement with plants of equivalent size and species asdetailed in the plant schedule;

(x) pruning to remove dead or diseased vegetation material and to stimulate new growth;

(xi) litter and debris removal; and

(xii) vegetation pest monitoring and control.

(b) Additional maintenance required if a saturated zone is included in the design:

(i) check weir/up-turned pipe is clear of debris; and

(ii) check water level in the saturated zone is at the design level.

(c) Resetting (I.e., complete reconstruction) of bioretention elements will be required if the available flow area of the overlying swale is reduced by 25% (due to accumulation of sediment) or if the bioretention trench fails to drain adequately after tilling of the surface. Inspections are also recommended following large storm events to check for scour.

(d) All maintenance activities must be specified in a maintenance plan (and associated maintenance inspection forms) to be developed as part of the design procedure. Maintenance personnel and asset managers will use this plan to ensure the bioretention swales continue to function as designed. The maintenance plans and forms must address the following:

(i) inspection frequency;

(ii) maintenance frequency;

(iii) data collection/ storage requirements (I.e., during inspections);

(iv) detailed cleanout procedures (main element of the plans) including:

1. equipment needs;
2. maintenance techniques;
3. occupational health and safety;
4. public safety;
5. environmental management considerations;
6. disposal requirements (of material removed);
7. access issues;

8. stakeholder notification requirements; and

9. data collection requirements (if any); and

(v) design details.

An example operation and maintenance inspection form is included in the checking tools provided in Clause SC6.4.10.5 (7).

(7) Checking tools – bioretention swales

A number of checking aids have been developed for designers and council development assessment officers. Inaddition, advice on construction techniques and lessons learnt from building bioretention swale systems are provided.

(a) Design assessment

Clause SC6.4.10.8 Checklist B - Bioretention Swale Design Assessment Checklist (Click here to view) presents the key design features to be reviewed when assessing design of a bioretention swale. These considerations include configuration, safety, maintenance, and operational issues that need to be addressed during the design phase. Where an item results in an "N"when reviewing the design, referral is to be made back to the design procedure to determine the impactof the omission or error.

In addition to the checklist, a proposed design is to have all necessary permits for its installations. Council development assessment officers need to ensure that all relevant permits are in place. These can include permits to clear vegetation, to dredge, create a waterbody, divert flows, or disturb fish or platypus habitat.

(b) Construction (during and post)

Clause SC6.4.10.8 Checklist C - Bioretention Swale Construction Inspection Checklist (Click here to view) presents the key items to be reviewed when inspecting the bioretention swale during and at the completion of construction. The checklist is to be used by construction site supervisors and compliance inspectors to ensure all the elements of the bioretention system have been constructed in accordance with the design. If an item receives an "N" in Satisfactory criteria, then appropriate actions must be specified and delivered to rectify the construction issue beforefinal inspection sign-off is given.

(c) Operation and maintenance inspection

Clause SC6.4.10.8 Checklist D - Bioretention Swale Maintenance Checklist (Click here to view) is to be used whenever an inspection is conducted and kept as a recordon the asset condition and quantity of removed pollutants over time.

(d) Asset transfer (following defects period)

Land ownership and asset ownership are key considerations prior to construction of a stormwater treatment device. A proposed design is to clearly identify the ultimate asset owner and who is responsible for its maintenance. Local authorities will use Clause SC6.4.10.8 Checklist E - Bioretention Swale Asset Transfer Checklist (Click here to view) when the asset is to be transferred to the local authority.

(8) Engineering drawings – bioretention swales.

The relevant local authority should be consulted to source standard drawings applicable to bioretention swales. These drawings may provide example dimensions for a number of different road reserve configurations. Standard drawings are not intended to be prescriptive drawings which must be adhered to, rather they are intended to provide detailed examples of swales which can be incorporated into commonly used urban subdivision layouts. Designers are encouraged to develop alternative bioretention swale designs to suit site specific conditions.

In the absence of locally specific guidelines, Brisbane City Council (BCC) standard drawings applicable to swales and bioretention systems are UMS 151-158. These may also be used as reference standards for swaledesign. BCC Standard drawings are available online.

(9) References – bioretention swales

Barling RD & Moore ID 1993, 'The Role of Buffer Strips in the Management of Waterway Pollution', in Woodfull Jet al. (eds), *The Role of Buffer Strips in the Management of Waterway Pollution from Diffuse Urban and Rural Sources*, LWRRDC Occasional Paper No. 01/93, Canberra

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DMR (Queensland Department of Main Roads) 1997, *Road Landscape Manual*, prepared by EDAW (Aust) PtyLtd for DMR, Brisbane

Duncan HP 1995, *A Review of Urban Storm Water Quality Processes*, Cooperative Research Centre forCatchment Hydrology, Report 95/9, Melbourne, Australia

Engineers Australia 2006, *Australian Runoff Quality*, Engineers Australia, ACT, http://www.arq.org.au/

Leinster, S 2006, *Delivering the Final Product – Establishing Water Sensitive Urban Design Systems*, 7th International Conference on Urban Drainage Modelling and 4th International Conference on Water Sensitive Urban Design Book of Proceedings, Volume 2, A Deletic and T Fletcher (eds), Melbourne.

LHCCREMS (Lower Hunter and Central Coast Regional Environmental Management Strategy) 2002, *Water Sensitive Urban Design in the Sydney Region: 'Practice Note 2 – Site Planning'*, LHCCREMS, NSW.

DNRW, IPWEA and BCC (Department of Natural Resources and Water, Institute of Public Works Engineering Australia – Qld Division & Brisbane City Council) 1998, *Queensland Urban Drainage Manual (QUDM) Second Edition*, prepared by Neville Jones & Associates and Australian Water Engineering for DNRW, IPWEA & BCC,Brisbane.

Standards Australia 1997, AS 1289.4.1.1-1997: *Methods of testing soils for engineering purposes - Soil chemical tests - Determination of the organic matter content of a soil - Normal method,* Standards Australia

Standards Australia 2003, AS 4419-2003: *Soils for landscaping and garden use*, Standards Australia

Townsville City Council, *Water sensitive urban design for the coastal dry tropics (Townsville): Technical design guidelines for stormwater management*, 2011

Weibel SR, Weidner RB, Cohen JM & Christianson AG, 1996, "Pesticides and Other Contaminants in Rainfalland Runoff", *Journal American Water Works Association*, vol. 58, no. 8, August 1966, pp. 1075-1084

SC6.4.10.5 Bioretention basins

(1) Introduction

Bioretention basins are vegetated areas where runoff is filtered through a filter media layer (e.g. sandy loam) as it percolates downwards. It is then collected via perforated under-drains and flows to downstream waterways or to storages for reuse. Bioretention basins often use temporary ponding above the filter media surface to increase the volume of runoff treated through the filter media. They treat stormwater in the same way as bioretention swales; however, "above design" flows are conveyed through overflow pits or bypass paths rather than over the filter media. This has the advantage of protecting the filter media surface from high velocities that can dislodge collected pollutants or scour vegetation.

Bioretention basins are generally not intended to be "infiltration" systems that discharge from the filter media to surrounding in-situ soils. Rather, the typical design intent is to recover stormwater at the base of the filter mediain perforated under-drains and discharge to receiving waterways or to

storages for potential reuse.

Figure SC6.4.10.16 shows examples of a basin integrated into a local streetscape and into a car park. FigureSC6.4.6.10.16 also illustrates the key elements of bioretention basins, namely surface vegetation, extended detention, filter media, drainage layer and overflow pit.

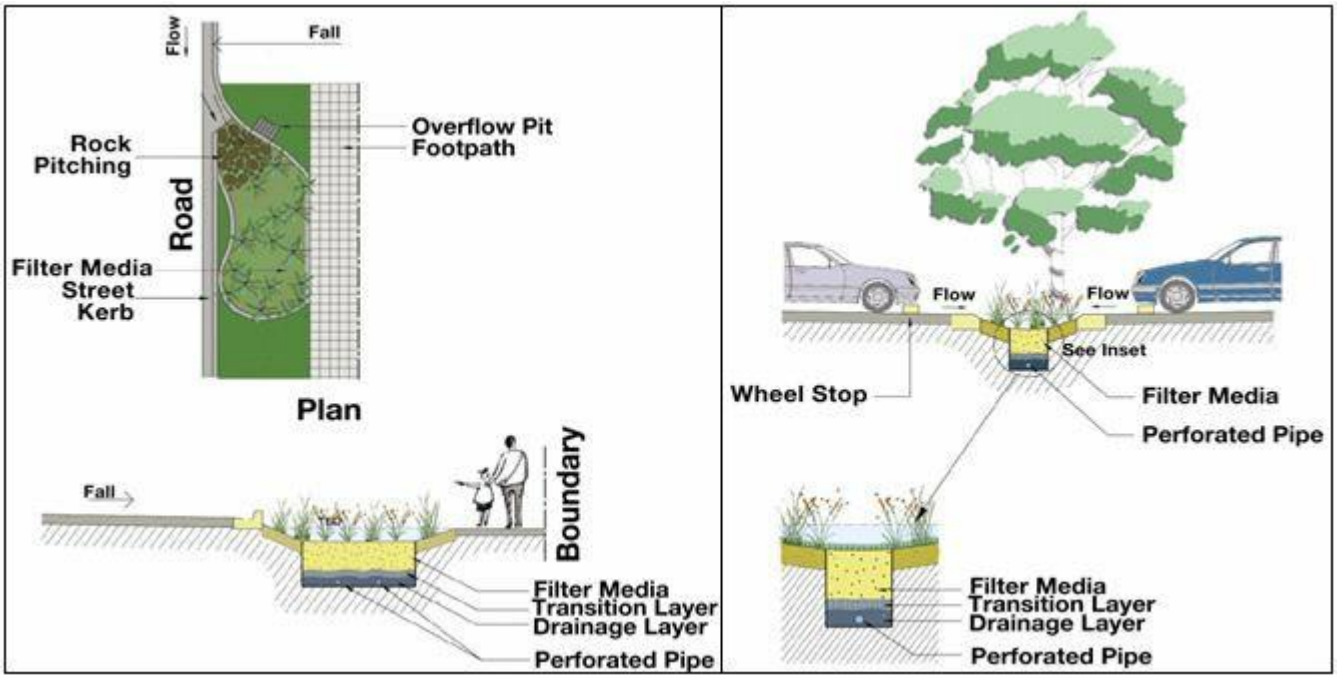

Figure SC6.4.6.10.16 - Bioretention Basin Integrated into a Local Streetscape (Left) and a Carpark (Right).

(2) Design considerations - bioretention basins

This section outlines some of the key design considerations for bioretention basins that the detailed designer should be familiar with before applying the design procedure presented later in this chapter.

Rain patterns in the dry tropics mean that bioretention systems will receive large volumes of consistent rainfall during the wet season and are likely to remain dry for extended periods during the dry season. Therefore, bioretention basin design will need to be adapted to incorporate the following elements:

(a) controls to ensure the bioretention basin is not compromised by sediment smothering; or

(b) a saturated zone beneath the filter media to increase soil moisture and help sustain vegetation during dryperiods; or

(c) supplemental temporary irrigation to sustain vegetation and maintain aesthetics in highly visible areas (e.g., bioretention pods within road verges).

(d) Landscape design

Bioretention basins are predominantly located within public areas, such as open space or within streets,which provide a primary setting for people to experience their local community and environment. It is therefore necessary for bioretention basins to be given an appropriate level of landscape design consideration to compliment the surrounding landscape character and to adequately address potential aesthetics issues such as weeds and sustaining perennial plants during the dry season. The landscape design of bioretention basins must address stormwater quality objectives whilst also being sensitive toother important landscape objectives such as road visibility, public safety and community character and habitat. To achieve this, the design process requires close collaboration between landscape architects,

urban designers, ecologists and WSUD engineers (see example at Figure SC6.4.10.17.

Figure SC6.4.10.17 - Bioretention Basin Within Roundabout at Kalynda Chase Development, Bohle Plains

(e) Hydraulic design

The correct hydraulic design of bioretention basins is essential to ensure effective stormwater treatment performance, minimise damage by storm flows, and to protect the hydraulic integrity and function of associated minor and major drainage systems. The following aspects are of key importance:

(i) the finished surface of the bioretention filter media must be horizontal (I.e., flat) to ensure even flowdispersion across the filter media surface (I.e., full engagement of the filter media by stormwaterflows) and to prevent concentration of stormwater flows within depressions and ruts resulting in potential scour and damage to the filter media;

(ii) temporary ponding (I.e., extended detention) of up to 0.3 m depth over the surface of the bioretention filter media created through the use of raised field inlet pits (overflow pits) can assistin managing flow velocities over the surface of the filter media as well as increase the overall volume of stormwater runoff that can be treated by the bioretention filter media;

(iii) where possible, the overflow pit or bypass channel should be located near the inflow zone (refer to Figure SC6.4.10.16 (left)) to prevent high flows passing over the surface of the filter media. If this is not possible, then velocities during the minor (2 to 10-year ARI) and major (50 to100-year ARI) floodsshould be maintained sufficiently low (preferably below values of 0.5 m/s and not more than 1.5 m/s for major flood) to avoid scouring of the filter media and vegetation;

(iv) where the field inlets in a bioretention system is required to convey the minor storm flow (I.e., is part of the minor drainage system), the inlet must be designed to avoid blockage, flow conveyanceand public safety issues; and

(v) for streetscape applications, the design of the inflow to the bioretention basin must ensure the kerb and channel flow requirements are preserved as specified in the Queensland Urban DrainageManual (QUDM) (DNRW, IPWEA and BCC 1998).

(f) Ex-filtration to in-situ soils

Bioretention basins can be designed to either preclude or promote ex-filtration of treated stormwater to the surrounding in-situ soils depending on the overall stormwater management objectives established for the given project. When considering ex-filtration to surrounding soils, the designer must consider site terrain, hydraulic conductivity of the in-situ soil, groundwater and building setback. Where the concept design specifically aims to preclude ex-filtration of

treated stormwater runoff it is necessary to consider if the bioretention basin needs to be provided with an impermeable liner. If the selected saturated hydraulic conductivity of the bioretention filter media is less than 10 times that of the native surrounding soils, it may be necessary to provide an impermeable liner. Flexible membranes or a concrete casting are commonly used to prevent excessive ex-filtration. This is particularly applicable for surrounding soils that are very sensitive to any ex-filtration (e.g., shallow groundwater or close proximity to significant structures).

Bioretention systems constructed in sodic soils without an impermeable lining are not at risk of exporting salt from in-situ soil into local streams or groundwater. Even after six months of intensive flushing under controlled, laboratory conditions, bioretention systems (constructed in sodic soils) did not leach salt fromthe surrounding soils (Deletic and Mudd, 2006).

The greatest pathway of ex-filtration is through the base of a bioretention basin, as gravity and the difference in hydraulic conductivity between the filter media and the surrounding native soil would typically act to minimise ex-filtration through the walls of the trench. If lining is required, it is likely that only the base and the sides of the drainage layer will need to be lined.

(g) Vegetation types

Vegetation is required to cover the whole bioretention filter media surface, be capable of withstandingminor and major design flows, and be of sufficient density to prevent preferred flow paths, scour and re-suspension of deposited sediments. Additionally, vegetation that grows in the bioretention filter media functions to continuously break up the surface of the filter media through root growth and wind induced agitation, which prevents surface clogging. The vegetation also provides a substrate for biofilm growth within the upper layer of the filter media, which facilitates biological transformation of pollutants (particularly nitrogen).

Ground cover vegetation (e.g., sedges and tufted grasses) is an essential component of bioretention basin function. Generally, the greater the density and height of vegetation planted in bioretention filter media, the better the treatment provided especially when extended detention is provided for in the design.

Contact between stormwater and vegetation results in enhanced sedimentation of suspended sediments and adsorption of associated pollutants.

Plant species selected for bioretention systems must be able to tolerate free draining sandy soils and be capable of withstanding long dry periods as well as periods of inundation. To maintain aesthetics in highly visible areas (e.g., bioretention pods within road verges) temporary supplemental irrigation may be required to sustain vegetation. The incorporation of saturated zones beneath the filter media can help to sustain soil moisture and is beneficial for nitrogen removal from stormwater. The ability to sustain dense perennial vegetation is important for long term weed management.

Clause SC6.4.10.7 Plant selection for WSUD systems in the coastal dry tropics provides more specific guidance on the selection of appropriate vegetation for bioretention basins. It should be noted that turf is not considered to be suitable vegetation for bioretention basins. The stem and root structure of turf is notsuitably robust and rapid growing to ensure the surface of the bioretention filter media is continuously broken up to prevent clogging.

(h) Bioretention filter media

Selection of an appropriate bioretention filter media is a key design step that involves consideration of the following four inter-related factors:

(i) saturated hydraulic conductivity required to optimise the treatment performance of the bioretention basin given site constraints and available filter media area;

(ii) depth of extended detention provided above the filter media;

(iii) surface area of the filter media; and

(iv) suitability as a growing media to support vegetation (I.e., retains sufficient soil moisture andorganic content).

The concept design stage will have established the optimal combination of filter media saturated hydraulic conductivity and extended detention depth using a continuous simulation modelling approach (i.e. MUSIC). Any adjustment of either of these two design parameters during the detailed design stage will require the continuous simulation modelling to be re-run to assess the impact on the overall treatment performance of the bioretention basin.

As shown in Figure SC6.4.10.18 below, bioretention media can consist of three or four layers. In additionto the filter media required for stormwater treatment, a saturated zone can also be added to enhance nitrogen removal and to provide a source of water for vegetation over the dry season. A drainage layer is also required to convey treated water from the base of the filter media or saturated zone into the perforated under-drains. The drainage layer surrounds the perforated under-drains and can be either coarse sand (1 mm) or fine gravel (2-5 mm). If fine gravel is used, a transition layer of sand must also be installed to prevent migration of the filter or saturated zone media into the drainage layer and subsequently into the perforated under-drains.

(i) Saturated zone

The incorporation of a saturated zone into bioretention design has evolved from research demonstrating improved nitrate removal through denitrification processes (Kim et al. 2003 and Zinger et al. 2007b).

The saturated zone design involves a relatively simple modification to a conventional bioretention system. An additional layer located below the filter media is designed to retain stormwater providing a saturated zone at the base of the bioretention system. A saturated zone can be formed by using a riser pipe with the outlet level higher than the drainage layer or by incorporating a weir within the outlet pit (see FigureSC6.4.10.18 below). The saturated zone holds water and therefore provides a source of water to maintain soil moisture for plant uptake during dry periods.

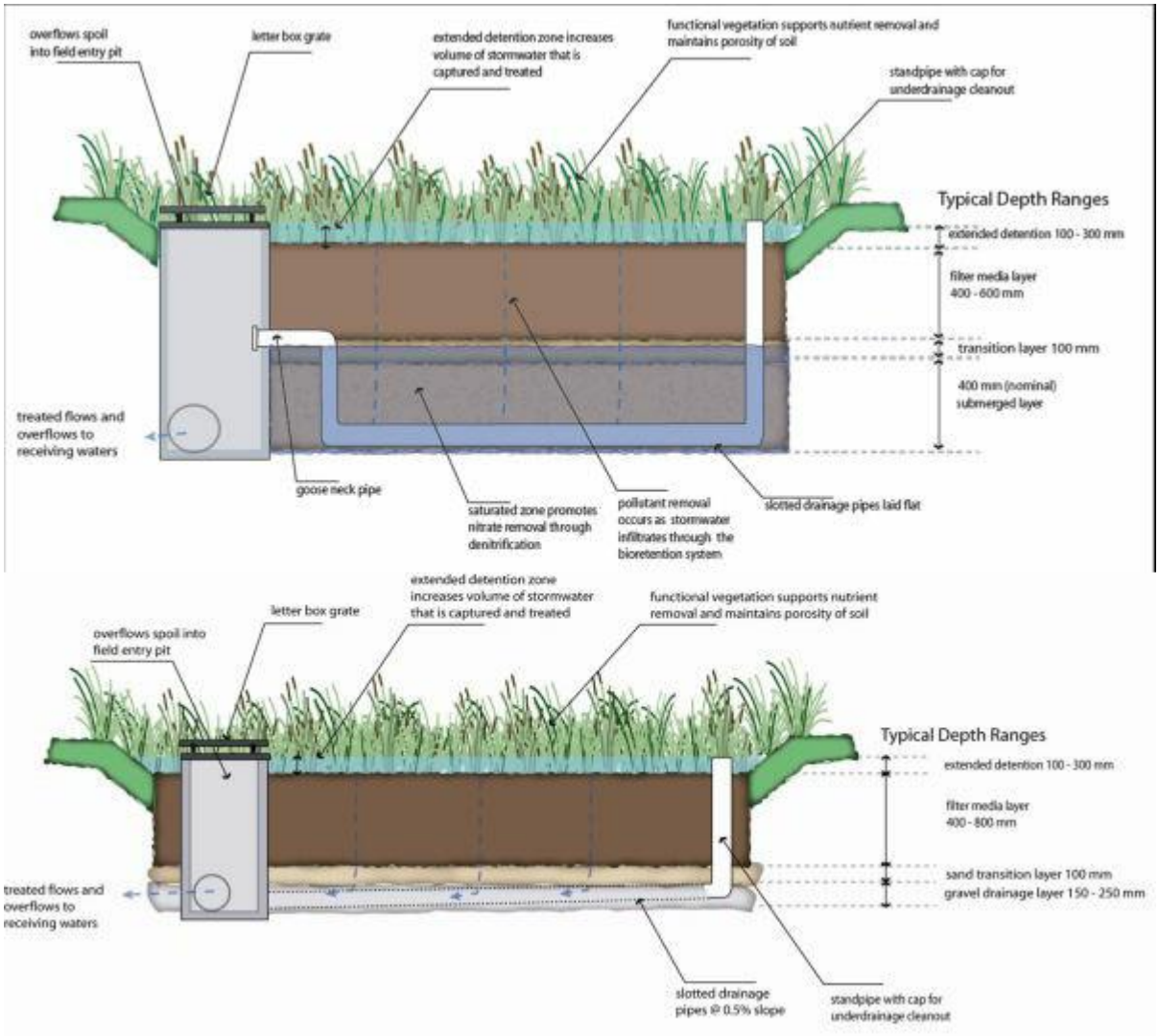

Figure SC6.4.10.18 - Cross Section of Bioretention Basins (Top- With a Saturated Zone;Below- Without a Saturated Zone)

(j) Traffic controls

Another design consideration is keeping traffic and building material deliveries off bioretention basins (particularly during the construction phase of a development). If bioretention basins are driven over or used for parking, the filter media will become compacted and the vegetation damaged.

Streetscape bioretention systems must be designed to satisfy local authority requirements with respect to traffic calming devices within particular street, or road reserve widths. Where bioretention is incorporated into traffic calming or control devices, or directly adjacent to mountable kerbs, considerationshould be given to protection of the area immediately behind the kerb where vehicles are likely to mount the kerb.

(k) Services

Bioretention basins or cells located within road verges or within footpaths must consider the standard location for services within the verge and ensure access for maintenance of services without regular disruption or damage to the bioretention system.

(3) Design process – bioretention basins

The following sections detail the design steps required for bioretention basins. Key design steps are:

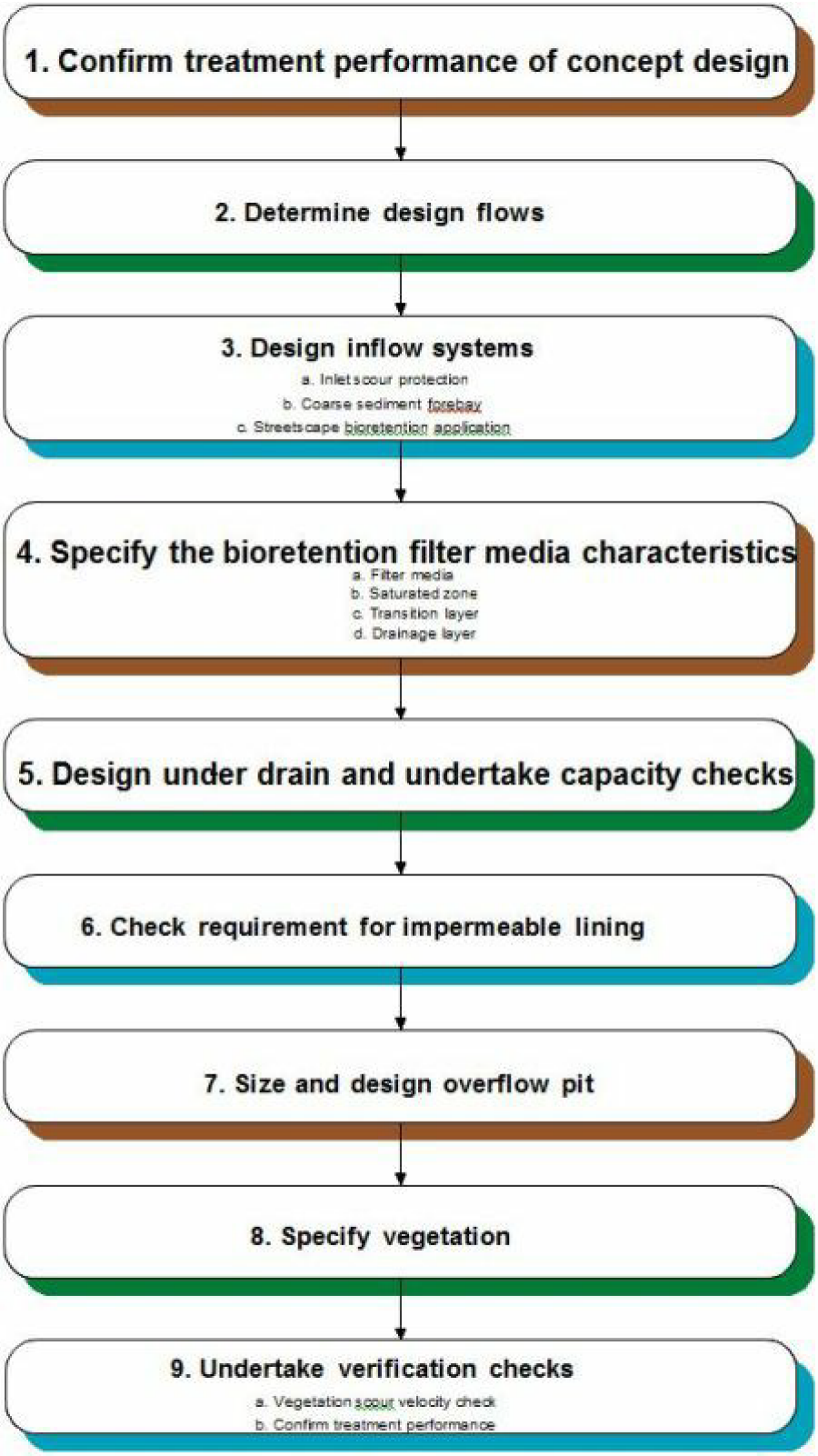

Figure SC6.4.10.19 - Key Design Steps Required for Bioretention Basins

(a) Step 1: Check treatment performance of concept design

Before commencing detailed design, the designer should first undertake a preliminary check to confirm the bioretention basin treatment area (I.e., the surface area of the filter media) from the concept design is adequate to deliver the required level of stormwater quality improvement. This design process assumes a conceptual design has been undertaken.

This assessment should be undertaken by a WSUD specialist and can be achieved by modelling expected treatment performance in an appropriate quantitative modelling program.

Where possible, this modelling should be based on local rainfall data, the proposed configuration of the system, and based onlocal stormwater treatment performance data.

(b) Step 2: Determine design flows

(i) Design flows

The hydraulic design of the bioretention basin should be based on the following design flows:

1. minor flood flow (2-year ARI) to allow minor floods to be safely conveyed. For commercial and industrial areas, the design flow requirement for minor flows is a 5-year ARI event; and
2. major flood flow (100-year ARI) to check flow velocities, velocity depth criteria, conveyance within road reserve, and freeboard to adjoining property.

(ii) Design flow estimation

A range of hydrologic methods can be applied to estimate design flows. If the typical catchment areas are relatively small, the Rational Method design procedure is considered to be a suitable method for estimating design flows. However, if the bioretention system is to form part of a retention basin or if the catchment area to the bioretention system is large, then a full flood routing computation method needs to be used to estimate design flows.

(c) Step 3: Design inflow systems

(i) The design of the inflow systems to bioretention basins needs to consider a number of functions:

1. scour protection – In most bioretention applications stormwater flows will enter the bioretention basin as concentrated flow (piped, channel or open channel) and as such is itimportant to slow and spread flows using appropriate scour (rock) protection;
2. coarse sediment forebay – Where stormwater runoff from the catchment is delivered directly to the bioretention basin without any coarse sediment management (through vegetated swale or buffer treatment) a coarse sediment forebay is to be included in the design. The forebay is to remove coarse sediment (1 mm +) from stormwater to minimise the risk of vegetation in the bioretention basin being smothered;
3. constant low base flows have to be taken into account and dealt with as they can blind the filter material and promote weed growth within permanently saturated areas; and
4. street hydraulics (streetscape applications only) – In streetscape applications, where stormwater is delivered directly from the kerb and channel to the bioretention basin, it isimportant to ensure the location and width of the kerb opening is designed such that flows enter the bioretention basin without adversely affecting trafficability of the road (QUDM, Table 7.04.1).

(ii) Each of these functions and the appropriate design responses are described in the following sections.

(iii) Inlet scour protection

Erosion protection should be provided for concentrated inflows to a bioretention basin. Typically, flows will enter the bioretention basin from either a surface flow system (I.e., roadside kerb, open channel) or a piped drainage system. Rock beaching is a simple method for dissipating the energy of concentrated inflow, as depicted in Figure SC6.4.10.20 (with the “D” representing the pipe diameter dimension). The rocks can form part of the landscape design of the bioretention component.

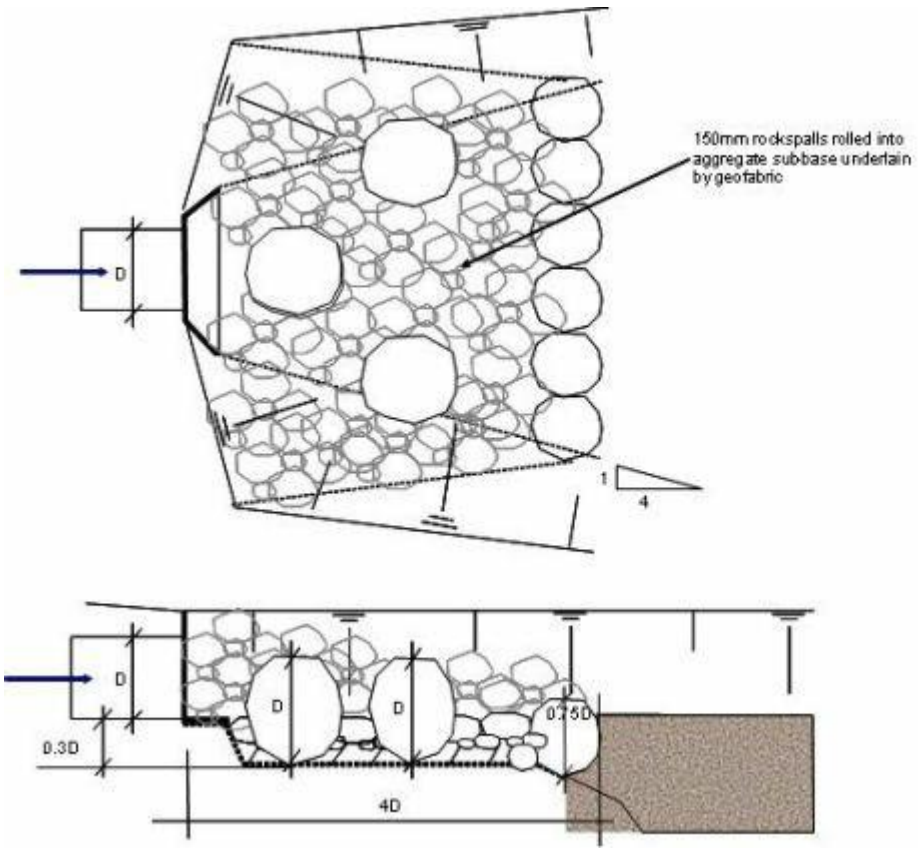

Figure SC6.4.10.20 - Typical Inlet Scour Protection Detail for Bioretention Basins Receiving Piped Flows

(iv) Coarse sediment control

Where stormwater runoff from the catchment is delivered directly to the bioretention basin without pre-treatment (through vegetated swale or buffer treatment), coarse sediment may accumulate near the basin inflow. This sediment may smother vegetation and reduce infiltration to the filter media. To mitigate these effects, either a sedimentation basin (Refer to *Water sensitive urban design for the coastal dry tropics (Townsville): Technical design guidelines for stormwater management*, Chapter 4) is to be located upstream or the bioretention basin inflow system I - to incorporate a coarse sediment forebay. Thefore bay should be designed to:

1. remove particles that are 1 mm or greater in diameter from the 3-month ARI storm event; and
2. provide appropriate storage for coarse sediment to ensure desilting is required no more thanonce per year.

The size of the sediment forebay is established using the following equation:

$$V_s = A_c \cdot R \cdot L_o \cdot F_c$$

Where
- V_s = volume of forebay sediment storage required (m^3)
- A_c = contributing catchment area (ha)
- R = capture efficiency (assume 80%)
- L_o = sediment loading rate (m^3/ha/year)
- F_c = desired cleanout frequency (years)

A catchment loading rate (L_o) of 1.6 m^3/ha/year for developed catchments can be used to

estimatethe sediment loads entering the basin. The area of the forebay is established by dividing the volume by the depth. The depth of the forebay should not be greater than 0.3 m below the surface of the filter media.

$$A_s = \frac{V_s}{D_s}$$

Where D = depth of sediment forebay (max 0.3 m below filter media surface).

The sediment forebay area should be checked to ensure it captures the 1 mm and greater particles using the following expression (modified version of Fair and Geyer (1954).

$$R = 1 - \left[1 + \frac{1}{n} \cdot \frac{v_s}{Q/A}\right]^{-n}$$

Where:

R	=	fraction of target sediment removed (80%)
v_s	=	settling velocity of target sediment (100 mm/s or 0.1 m/s for 1 mm particle)
Q/A	=	applied flow rate divided by forebay surface area ($m^3/s/m^2$)
n	=	turbulence or short-circuiting parameter (adopt 0.5)

The coarse sediment forebays will contain large rocks for energy dissipation and be underlain by filter material to promote drainage following storm events.

(v) Kerb opening configuration (streetscape applications)

In streetscape applications where stormwater is delivered directly from a kerb and channel to a bioretention basin, the following design issues must be considered:

1. the location of the kerb opening must be designed to ensure flows in the channel do not exceed the maximum allowance widths as defined by QUDM Table 7.04.1 (DNRW, IPWEA& BCC 1998); and
2. the width of the kerb opening is designed to allow the design flow to enter the bioretention basin.

(vi) Channel flow width at kerb opening

The width of channel flow at the kerb opening during a minor storm event (2 to 10-year ARI) needs tobe checked to ensure it does not exceed the maximum allowable channel flow widths defined by QUDM Table 7.04.1 (DNRW, IPWEA & BCC 1998) and the local authority requirements. This check can be undertaken by applying Manning's equation or Izzard's equation and ensuring the flow depth does not exceed either the crest of the road or the top of kerb (whichever is lowest).

(vii) Design kerb opening width (where kerb and channel is used)

To determine the width of the opening in the kerb to allow flows to enter the bioretention basin,Manning's equation, or Izzard's equation (QUDM Section 7.04.2) can be used with the kerb, channel, and road profile to estimate the flow depth in the kerb and channel at the entry point. Once the flow depth for the minor storm (e.g., 2 to10-year ARI) is known, this can then be used to calculate the required width of the opening in the kerb by applying a broad crested weir equation.The opening width is estimated by applying the flow depth in the channel (as h) and solving for L (opening width).

$$Q = C_w \cdot L \cdot h^{3/2}$$

Where	Q	= flow (m^3/s)
	Cw	= weir coefficient (= 1.66)
	L	= length of opening (m)
	h	= depth of flow (m)

This method ensures the kerb opening does not result in an increase in the upstream channel flow depth, which in turn ensures the bioretention basin does not impact on the trafficability of the adjoining road pavement as required by the QUDM. To ensure the kerb opening width is adequate, additional width factors may be required to account for slope of the kerb and channel, and the angle at which flow meets the kerb opening. This will depend on the location and position of the bioretention system in relation to the kerb and channel. Design of the inflow system within the kerband channel will need to consider maximising flow into the bioretention system. The kerb opening can be made more effective by lowering the kerb opening below the channel, increasing the crossfall at the kerb opening or by providing deflectors at the kerb opening.

(d) Step 4: Specify the bioretention filter media characteristics

Up to four types of media are required in bioretention basins (Refer Figure SC6.4.10.18 Cross section of bioretention basins (top—with a saturated zone; below—without a saturated zone)).

(i) Filter media

As a minimum, the filter media is required to have sufficient depth to support vegetation, typically between 400-600 mm (or as specified in the engineering design). It is important to note that if deeprooted plants such as trees are to be planted in bioretention basins, the filter media must have aminimum depth of 800 mm to avoid roots interfering with the perforated under-drain system.

In general, the media should be a loamy sand with an appropriately high permeability under compaction and should be free of rubbish, deleterious material, weed seeds, toxicants, and should not be hydrophobic. The filter media should contain some organic matter for increased water holding capacity but be low in nutrient content. To ensure a proposed soil is suitable as filter media, a testing regime is required. The *Guidelines for Soil Filter Media in Bioretention Systems*:Version 2.01 (FAWB, March 2008) (refer to http://www.monash.edu.au/fawb/products/index.html) provides best practice guidance on filter media selection and testing. It is recommended that soils used for bioretention filter media fulfil the requirements outlined in the FAWB Guideline. In summary, these requirements include:

1. organic carbon levels < 5%;
2. pH between 5.5 and 7.5;
3. electrical conductivity < 1.2 dS/m;
4. saturated hydraulic conductivity between 100-500 mm/hr. The saturated hydraulic conductivity of the filter media is established by optimising the treatment performance of the bioretention system given site constraints of the particular site (using a continuous simulation model such as MUSIC); and

5. the filter media must also be structurally sound and not prone to structural collapse as this can result in a significant reduction in saturated hydraulic conductivity. The risk of structural collapse can be reduced by ensuring the soil has a well graded particle size distribution with a combined clay and silt fraction of < 3%.

(ii) Transition layer (if required)

The purpose of the transition layer is to prevent the filter media from migrating down into the drainage layer (or the saturated zone). It also acts as a buffer between the permanently saturated zone (if required) and the filter media. This buffer is necessary to ensure the filter media is not saturated for prolonged periods during rainfall events due to increases in water levels in the saturated zone. To achieve this, the transition layer depth must be greater than the head created by flows over the saturated zone outlet weir.

It is required if the particle size difference between the filter media and the drainage layer (or the saturated zone) is more than one order of magnitude. If a transition layer is required then the material must be a clean, well graded sand/coarse sand material containing little or no fines.

The transition layer is recommended to be 100 mm thick and have a minimum saturated hydraulic conductivity of 1000 mm/hr.

A recent particle size distribution for the transition layer sand will need to be obtained to ensure that it meets the required grading and bridging criteria outlined below. The "bridging" criteria is based on the engineering principles that rely on the largest 15% of the filter media particles (or saturated zone particles) "bridging" with the smallest 15% of the sand particles. This results in smaller voids,which prevent the migration of the filter media particles into the sand particles. The following equation is taken from the United States Golf Association's recommendations for golf course construction:

Bridging Factor:
D15 (transitional layer sand) ≤ 8 x D85 (filter media)

The addition of a transition layer increases the overall depth of the bioretention system and may bean important consideration for some sites where total depth of the bioretention system may be constrained. In such cases, the use of a sand drainage layer and/ or perforated pipes with smaller slot sizes may need to be considered.

(iii) Saturated layer (if required)

The saturated layer should be about 400 mm deep (but may deeper depending on the specific application) and composed of clean (I.e., free from fines) medium coarse washed sand, gravel, or small rock (50 mm diameter maximum) together with a long-term carbon source. Hardwood wood chips, 5 mm to 40 mm in size, are recommended as the carbon source because they breakdown slowly to provide a long-term carbon source yet have a decomposition rate that should not limit thedenitrification process.

The total mass of carbon/electron donor that is required for denitrification must be calculated based on the expected stormwater influent TN mass over the desired life span of the system (e.g.,25 years). The calculation is based on the stoichiometry of the denitrification reaction (shown below).

Denitrification reaction:

$NO^{3-} + 1.25\ (CH^{2}O) + H+\ (10^{-7}\ M) \rightarrow 0.5N^{2}\ (g) + 1.75H^{2}O + 1.25CO^{2}\ (g)$

Based on a 400 mm deep saturated zone and the modelled annual TN runoff mass (for Townsville) for a bioretention system that is 2% of the contributing 1 ha catchment, the saturated zone media would have the following composition:

1. 76.7 m^3 washed coarse sand, gravel, or small rock; and
2. 3.3 m^3 hardwood wood chips, well graded 5 mm-40 mm.

This is equivalent to an organic carbon content of approximately 4-5% by volume. If the saturated zone depth changed, or the bioretention system to catchment area ratio changed, the hardwood proportion would need to be recalculated using the denitrification stoichiometry.

Calculating carbon source for saturated zone with safety factor

Catchment Area Treatment	1 ha
Area Required Bioretention	2%
Surface Area Saturated Zone	200 m^2
Depth Total volume of Saturated Zone	400 mm
TN load 1 year	12.5 kg/yr
TN load 25 years	312.5 kg/25

Stoichiometry:
N:C ratio = 1:1.25 (mol), which equates to 14:15 (g) [Mw: N = 14g/mol, C = 12g/mol]Average total carbon content of hardwood woodchips is 50%, therefore
N:C (woodchip) = 14:30 (g)
N:C (woodchip) = 1:2.1

Woodchips (312.5 x 2.1)	656kg/carbon
Safety Factor (x 2)	1313kg/carbon
Density of wood chips	400kg/m^3 (approx.)

Hardwood Wood Chips	3.3 m^3
Clean Coarse Sand	76.7 m^3

The saturated media must have a hydraulic conductivity of >1000 mm/hr (the ASTM F1815-06 test method is to be used to measure hydraulic conductivity).

The saturated zone should be lightly compacted (e.g., with one pass of a smooth drum lawn roller)during installation to stabilise the structure. Under no circumstances should heavy compaction or multiple passes be made.

(iv) Drainage layer (if required)

The drainage layer is used to convey treated flows from the base of the filter media layer (or thesaturated zone) into the perforated under-drainage system. The composition of the drainage layer is to be considered in conjunction with the selection and design of the perforated under-drainagepipes as the slot sizes in the perforated pipes may determine the minimum drainage layer particle size to avoid washout of the drainage layer into the perforated pipe system. Coarser material (e.g., fine gravel aggregate) is to be used for the drainage layer if the slot sizes in the perforated pipes are too large for use of a sand-based drainage layer. The drainage layer is to provide a minimum of 50 mm cover above the perforated under-drainage pipes and have a minimum saturated hydraulic conductivity of 1000 mm/hr.

A particle size distribution for the gravel will need to be obtained to ensure that it meets the“bridging” criteria outlined below:

Bridging Factor:

D15 (drainage gravel/sand) ≤ 8 x D85 (filter media/saturated zone/transition layer)

Ensure drainage media is washed prior to placement in bioretention system to remove any

fines.

(e) Step 5: Design under-drain and undertake capacity checks (if required)

The maximum spacing of the perforated under-drains in bioretention basins located in streetscape zones and small public zones (I.e., bioretention < 100 m^2) is 1.5 m (centre to centre). This ensures that the distance water needs to travel horizontally toward the perforated pipes through the drainage layer does not hinder drainage of the filter media. The maximum spacing of the perforated pipes in bioretention basins located in local parks and large open space areas (I.e., bioretention > 100 m^2) can be increased to 2.5 – 3 m.

In bioretention systems without saturated zones, perforated pipes are to grade at a minimum of 0.5%towards the overflow pit to ensure effective drainage. In bioretention systems with saturated zones, perforated pipes should be laid flat (I.e., at 0% grade) to avoid preferential flow paths forming vertically through the filter media closer to the outlet.

Perforated pipes should not use a geofabric wrapping, as this is a potential location for blockage and would require a complete resetting of the bioretention system. Where perforated pipes are supplied withgeofabric wrapping, it is to be removed before installation.

Installing parallel pipes is a means to increase the capacity of the perforated pipe system. 100 mm diameter is recommended as the maximum size for the perforated pipes to minimise the thickness of thedrainage layer. Either slotted PVC pipes or flexible perforated pipes (e.g., Ag pipe) can be used; however, care needs to be taken when selecting the type of pipe to consider the following:

(i) ensure the slots in the pipes are not so large that sediment will freely flow into the pipes from thedrainage layer. This is also a consideration when specifying drainage layer media;

(ii) minimise the potential for tree roots to enter the pipes in search of water. Generally, this is only a concern when the filter media has a low water holding capacity, or trees are planted in filter mediawhose depth is too shallow. In general, trees are not recommended if the filter media depth is lessthan 800 mm. Flexible “ribbed” pipes are more likely, than PVC pipes, to retain “beads” of moisture due to the small corrugations on the inside of the pipe. Therefore, a smooth surface perforated/slotted pipe system is recommended for use in bioretention basins exhibiting any of these characteristics; and

(iii) to ensure slotted pipes are of adequate size, several checks are required:

1. ensure the perforations are adequate to pass the maximum filtration rate;
2. ensure the pipe itself has sufficient capacity; and
3. ensure that the material in the drainage layer will not be washed into the perforated pipes(consider a transition layer).

The maximum filtration rate represents the maximum rate of flow through the bioretention filter media and is calculated by applying Darcy’s equation as follows:

$$V_s = A_c \cdot R \cdot L_o \cdot F_c$$

Where V_s = volume of forebay sediment storage required (m^3)
A_c = contributing catchment area (ha)
R = capture efficiency (assume 80%)
L_o = sediment loading rate (m^3/ha/year)
F_c = desired cleanout frequency (years)

To ensure the perforated under-drainage system has sufficient capacity to collect and convey the maximum filtration rate, it is necessary to determine the capacity for flows to enter the under-drainage system via the perforations in the pipes. To do this, orifice flow can be assumed, and the sharp-edged orifice equation used. It is conservative, but reasonable to use a blockage factor to account for partial blockage of the perforations by the drainage layer media. A 50% blockage of the perforations should be used.

The flow capacity of the perforations is thus:

$$A_s = \frac{V_s}{D_s}$$

If the capacity of the drainage system is unable to collect the maximum filtration rate additional under-drains will be required.

The Manning's roughness used will be dependent on the type of pipe used (refer to QUDM Table 7.16.3 (DNRW, IPWEA & BCC 1998)). When a saturated zone is incorporated into the design, the underdrainage pipes are laid flat however the conveyance capacity can be calculated using the Manning's equation with an assumed friction slope of 0.5%.

Under-drains should be extended vertically to the surface of the bioretention system to allow inspection and maintenance when required. The vertical section of the under-drain should be unperforated and capped to avoid short circuiting of flows directly to the drain. Reference is made to the drawings following the worked example (Clause SC6.4.10.5 (3)(i) Step 9: Undertake Verification Checks) for further guidance.

In bioretention basins with a saturated zone, the capacity of the weir or up-turned pipe (maintaining thewater level within the saturated zone) must also be checked to ensure it does not become the hydraulic "control" in the bioretention system (I.e., to ensure the filter media sets the travel time for flows percolatingthrough the bioretention system). A broad crested weir equation can be used to determine the length ofweir required (assuming free flowing conditions) to convey the maximum flow/filtration rate. The maximum depth of flow over the weir is to be 100 mm. This is important to limit increase in the saturated zone depth and avoid prolonged saturation of the filter media.

(f) Step 6: Check requirement for impermeable lining

The saturated hydraulic conductivity of the natural soil profile surrounding the bioretention system should be tested together with depth to groundwater, chemical composition and proximity to structures and other infrastructure. This is to establish if an impermeable liner is required at the base (only for systems designed to preclude ex-filtration to in-situ soils) and/or sides of the bioretention basin (refer also to discussion in Clause SC6.4.10.5 (2) (iii) Ex-filtration to in-situ soils). If the saturated hydraulic conductivity of the filter media in the bioretention system is more than one order of magnitude (10 times) greater than that ofthe surrounding in-situ soil profile, no impermeable lining is required.

(g) Step 7: Size overflow pit.

There should be a minimum of 50 mm head over the overflow pit crest to facilitate discharge of the designflow into the overflow pit.

In streetscape bioretention applications, a level of conservatism is built into the design of grated overflow pits by placing their inverts at least 50 mm below the invert of the street channel (and therefore setting the maximum ponding depth). The head over the overflow pit crest is the sum of the 50 mm and the maximum ponding in the street channel under the minor storm (Refer to Clause SC6.4.10.5 (3)(c)(v) Kerb opening configuration). To size an overflow pit, two checks must be made to test for either drowned or free flowing conditions. A broad crested weir equation can be used to determine the length of weir required (assumingfree flowing

conditions) and an orifice equation used to estimate the area between openings required in the grate cover (assuming drowned outlet conditions). The larger of the two pit configurations should beadopted (as per Section 7.05 QUDM (DNRW, IPWEA & BCC 1998)). In addition, a blockage factor thatassumes the grate is 50% blocked is to be used.

For free overfall conditions (weir equation):

$$R = 1 - \left[1 + \frac{1}{n} \cdot \frac{v_s}{Q/A}\right]^{-n}$$

Where:

R	=	fraction of target sediment removed (80%)
v_s	=	settling velocity of target sediment (100 mm/s or 0.1 m/s for 1 mm particle)
Q/A	=	applied flow rate divided by forebay surface area ($m^3/s/m^2$)
n	=	turbulence or short-circuiting parameter (adopt 0.5)

Once the length of weir is calculated, a standard sized pit can be selected with a perimeter at least the same length of the required weir length.

For drowned outlet conditions (orifice equation):

$$Q = C_w \cdot L \cdot h^{3/2}$$

Where

Q	=	flow (m^3/s)
Cw	=	weir coefficient (= 1.66)
L	=	length of opening (m)
h	=	depth of flow (m)

When designing grated field inlet pits, reference is also to be made to the procedure described in QUDMSection 7.05.4.

In terms of the actual grate, letter box or dome type grates must be used in bioretention basins.

When a saturated zone is included in the design of a bioretention system, additional components must be incorporated into the outlet design. A saturated zone can be formed at the base of a bioretention system by using a riser pipe with the outlet level set at the top of the desired saturation depth (I.e., top of the saturated zone) or by incorporating a weir/overflow structure within the outlet pit (see Figure SC6.4.10.18). The saturated zone would hold water rather than draining freely and would therefore provide a source of water to the plants during dry periods.

(h) Step 8: Specify vegetation

Refer to Clauses SC6.4.10.5 (4) Landscape design notes and SC6.4.10.7 Plant selection for WSUD systems in the coastal dry tropics for advice on selecting vegetation for bioretention basins in the coastal dry tropics.

Editor's Note - Applicants will also need to address Part 9.3.3 Landscape code and Section SC6.4.12 Landscape and open space.

(i) Step 9: Undertake verification checks

Once the detailed design is complete, a final check should be undertaken to confirm that vegetation willbe protected from scour during flood events and that the final design will achieve the required treatment performance.

(i) Vegetation scour velocity checkVelocities should be kept below:

1. 0.5 m/s for minor flood (2 to 5-year ARI) discharges; and

2. 2.0 m/s for major flood (50-year ARI) discharges.

If the inlet to the bioretention basin “controls” the maximum inflow to the basin then it is appropriate to use this maximum inflow to check velocities. In this case, velocities should be maintained below 0.5 m/s.

(ii) Confirm treatment performance

If, during the course of undertaking detailed design of the bioretention basin, the basic design parameters established by the conceptual design phase have changed (e.g., area, filter media depth, etc.) then the designer should verify that the current design meets the required water quality improvement performance. This can be done by re-modelling expected treatment performance determined in the conceptual design based on the revised configuration of the system.

(j) Design calculation summary

A calculation summary sheet for the key design elements of a bioretention basin is provided in Clause SC6.4.10.8 Checklist F - Bioretention Basin Design Calculation Summary or click here to view the document.

(4) Landscape design notes

(a) Objectives

Landscape design for bioretention basins has four key objectives:

(i) addressing stormwater quality objectives by incorporating appropriate groundcover plant species for sediment removal, erosion protection, stormwater treatment (biologically active root zone) and preventing filter media blockages;

(ii) ensuring that the overall landscape design for the bioretention basin integrates with its surrounding environment. This includes requirements for maintaining dense perennial vegetation throughout the dry season to maintain aesthetics and to minimise weed growth;

(iii) incorporating crime prevention through environmental design (CPTED) principles and traffic visibility safety standards for roadside systems. This objective also needs to incorporate public safety; and

(iv) providing other landscape values such as shade, amenity, character, buffers, glare reduction, place making and habitat.

For further guidance refer to the *South-East Queensland WSUD Conceptual Design Guidelines* (HealthyWaterways Partnership, 2008)

(b) Bioretention basin vegetation

Planting for bioretention basin elements may consist of up to three vegetation types:

(i) groundcovers for stormwater treatment and erosion protection;

(ii) shrubbery for screening, glare reduction and character; and

(iii) trees for shading, character, breaking up filter material and other landscape values.

The plant species listed in Clause SC6.4.10.7 Plant selection for WSUD systems in the coastal dry tropics tolerate free draining sandy soils and are capable of withstanding long dry periods as well as periods ofinundation. However, because the dry periods in the coastal dry tropics can be severe, bioretention systems must have supplemental temporary irrigation or include a saturated zone. These measures ensure dense perennial vegetation can be sustained to maintain aesthetics, stormwater treatment capacity and to minimise weed

growth.

(c) Parkland bioretention basins

Once the general location has been determined, it will be necessary to investigate how the elements ofthe bioretention system will be arranged within the open space including:

(i) opportunities and constraints presented by various siting options;

(ii) if the device is to be visually prominent (perhaps for educational value) or merged with the surrounding parkland space using a consistent planting layout in the basin, embankment, and parkland; and

(iii) a formal or informal style dependent on the setting and surrounding open space and urban design.

(d) Safety issues

The standard principles of informal surveillance, exclusion of places of concealment and open visible areas apply to the landscape design of bioretention basins. Regular clear sightlines should be provided between the roadway and footpaths/ property. Safety measures in accordance with the requirements of the relevant local authority should also be installed around structural components of bioretention basinswhere safety hazards exist.

(i) Crime Prevention Through Environmental Design (CPTED)

Where planting may create places of concealment or hinder informal surveillance, groundcoversand shrubs should not generally exceed 1 m in height.

(ii) Traffic sightlines

The standard rules of sightline geometry apply. Planting designs should allow for visibility atpedestrian crossings, intersections, rest areas, medians and roundabouts.

(5) Construction and establishment – bioretention basins

This section provides general advice for the construction and establishment of bioretention basins and key issues to be considered to ensure their successful establishment and operation (see Figure SC6.4.10.21).

Figure SC6.4.6.21 - Bioretention Basin Functional Installation

(a) Staged construction and establishment method

(i) Sediment and erosion control

Many soils within the coastal dry tropic's region are dispersive, highlighting the critical importanceof appropriate sediment and erosion control. All development and land disturbance activities must employ best practice sediment and erosion control practices to minimise the impact on receiving environments (Refer to Section SC6.4.8 Stormwater management, Clause SC6.4.8.11).

In relation to bioretention systems, temporary protective layers must be installed and left in placethroughout the allotment building phase to ensure sediment laden waters do not clog the filtration media and allotment building traffic does not enter the bioretention system (see FigureSC6.4.10.22). Importantly the configuration of the bioretention basin and the turf vegetation allow the system to function effectively as a shallow sedimentation basin reducing the load of sedimentdischarging to the receiving environment. Using this approach, WSUD systems can operate effectively to protect downstream ecosystems immediately after construction.

Figure SC6.4.10.22 - Bioretention Basin Sediment and Erosion Control

(ii) Operational establishment

At the completion of the allotment building phase the temporary measures (I.e., geofabric and turf)are removed with all accumulated sediment and the bioretention system re-profiled and planted in accordance with the proposed landscape design. Establishment of the vegetation to design condition can require more than two growing seasons, depending on the vegetation types, during which regular watering and removal of weeds will be required.

(iii) Quality control during construction

The primary responsibility for supervision of the construction of WSUD elements lies with the sitesuperintendent. Key milestones requiring inspection and sign off by either the superintendent or the design team are detailed in the suggested construction sequence below.

Meetings between the design team and contractors should also take place at the commencementof each phase of works, i.e.:

1. Prior to commencement of civil works.
2. Prior to commencement of landscape works; andat the completion of works.
3. Regular site inspections by a member of the design team are also recommended to ensure the bioretention basins are constructed as per the design intent and to provide ongoing construction and establishment advice to the contractors.

The suggested construction sequence for the bioretention basins are as follows:

1. survey bioretention basin location;
2. undertake bulking out, including construction of bunds surrounding basin. Construct outflowheadwall(s) and install section(s) of stormwater reinforced concrete pipes (RCP) that runsunderneath bund. Terminate pipe at interface of bund and bioretention basin;
3. excavate surrounding landform to design subsoil level (achieving surrounding level at thisstage reduces the need for earthworks adjacent to the basins after they have been constructed);
4. install overflow pit(s) and ensure pit crest(s) is at design level. The pit crest(s) will then be used as a datum from which other levels within the basin will be measured. The pit requiresholes for pipe connections, and these should be drilled at this stage;
5. detailed excavation, trimming and profiling of sides and base of basin, ensuring base has minimum 0.5% grade (0% slope when saturated zones are included in the designs) towards pit. Ensure base of basins are free from debris. As constructed survey is required at this time and should include the base and bunds of the system and all hard structures (I.e., overflow pit, overflow weir and pipe connection punch-out holes);
6. install silt fences around basin to prevent sediment entering system and to keep construction vehicles off the basin
7. **Hold Point -** Superintendent Inspection and Sign Off Required Before Proceeding
8. line basin with geofabric, ensuring geofabric extends beyond top of bioretention basin side walls, up to the sediment control fence. This ensures that exposed earth on the bunds won't wash into basins during construction;
9. install remaining RCP stormwater pipe connecting overflow pit(s) to existing RCP stormwater pipe installed as part of Step 2;
10. install slotted PVC under-drainage pipes and PVC collector pipes in specified layout. Ensure all pipes are laid at min 0.5% slope (0% slope when saturated zones are included in the designs) with no localized depressions verified using level or string line. Arrange slots so that they are not directly on top of the pipe (to minimise fine particles blocking the slots).
11. seal junctions and connections (i.e., slotted PVC pipes to PVC collector pipes; slotted PVC pipes/PVC collector pipes to overflow pits) using sealant to prevent sand/gravel/soil passing into drainage network. Connect clean out points ensuring top of clean out points will ultimately sit 200 mm below overflow pit crest;
12. **Hold Point -** Superintendent Inspection and Sign Off Required Before Proceeding
13. install drainage, transition and saturated zones as required and as detailed in the design drawings;
14. place prescribed bioretention filter media to design surface level of bioretention basin. Spread material using excavator bucket, hand tools, or a small "Pozitrack"

bobcat. Do not drive over filter media with any vehicle other than a “Pozitrack” bobcat and only if agreed to by civil superintendent. In order to remove air pockets within the filter media, apply light and even compaction by making a single pass with a “Pozitrack” bobcat (or similar). If required, apply additional filter media to ensure final surface level is correct. Use a spreader bar to flatten the surface of the filter media. Ultimately, the surface of the filter media must be level (horizontal) and free from local depressions and set at 300 mm below pit crest;

15. install temporary protective covering over bioretention surface. This involves covering the surface of filtration media with geofabric and placement of 50 mm topsoil and turf over the geofabric. This geofabric/turf layer is a temporary measure to protect the filter media from being clogged with construction sediment while allotment building is being undertaken. Once a majority of the allotment building is complete and the construction sediment load is minimal, this protective layer will be removed, and the system will be planted out with the vegetation as per designs;
16. place landscaping topsoil on top of geofabric covering the bunds and around basin as per designs;
17. flush under-drainage pipes to remove any initial ingress of material; and
18. undertake as constructed survey of the basin surface and surrounding bunds, picking up at least one spot level per 100m² on the basin surface and at least one spot level every 10m along the top of the bunds.
19. final Superintendent inspection and sign off.

(b) Construction tolerances

It is important to emphasise the significance of tolerances in the construction of bioretention basins (e.g., profiling of trench base and surface grades). Ensuring the surface of the bioretention filter media is free from localised depressions is particularly important to achieve even distribution of stormwater flows across the surface. In bioretention systems without saturated zones, the base of the trench should be sloped towards the outlet pit (min 0.5% longitudinal grade) to enable the perforated sub-surface drainage pipes to drain freely. Generally, an earthworks tolerance of plus or minus 50 mm is considered acceptable.

(c) Sourcing bioretention vegetation

Notifying nurseries early for contract growing is essential to ensure the specified species are available inthe required numbers and of adequate maturity in time for bioretention basin planting. When this is not done and the planting specification is compromised, poor vegetation establishment and increased initial maintenance costs may occur. The species listed in Clause SC6.4.10.7 Plant selection for WSUD systems in the coastal dry tropics are generally available commercially from local native plant nurseries. Availability is, however, dependent upon many factors including demand, season, and seed availability. To ensure planting specification can be accommodated, the minimum recommended lead time for ordering is 3-6 months. This usually allows enough time for plants to be grown to the required size. The following pot sizes are recommended as the minimum:

(i) “Viro” tubes - 50 mm wide x 85 mm deep;

(ii) 50 mm tubes - 50 mm wide x 75 mm deep; and

(iii) native tubes - 50 mm wide x 125 mm deep.

(d) Vegetation establishment

The following weed control measures and watering schedule are recommended to ensure successful plant establishment. Regular general maintenance as outlined in Clause SC6.4.10.6 will also be required.

(i) Weed control

Conventional surface mulching of bioretention basins with organic material like tanbark, should not be undertaken. Most organic mulch floats and runoff typically causes this material to be washed away with a risk of blocking drains. Adopting high planting densities (e.g., 8-10 plants per square metre) and if necessary, applying a suitable biodegradable erosion control matting to the basin batters will help to combat weed invasion and reduce labour intensive maintenance requirementsfor weed removal. A heavy application of seedless hydro mulch or hydro- mulch seeded with a sterile annual grass (e.g., Sterile Rye Grass) to create an anchored mulch can also provide short-term erosion and weed control prior to planting with nursery stock. No matting or hydro mulch is to be applied to the surface of the bioretention basin following the construction phase (I.e., in its final design form, vegetated as per planting schedule), as this will hinder filtration of stormwater through the filter media.

(ii) Watering

Regular watering of bioretention basin vegetation is essential for successful establishment and healthy growth. The frequency of watering to achieve successful plant establishment is dependent upon rainfall, maturity of planting stock and the water holding capacity of the soil. The following watering program is generally adequate but should be adjusted (increased) to suit the site conditions:

1. week 1-2 3 visits/ week;
2. week 3-6 2 visits/ week; and
3. week 7-12 1 visit/ week.

After this initial 3-month period, supplementary irrigation will be required in bioretention basins without submerged zones and may be required in bioretention basins with saturated zones (particularly during the 2-year plant establishment period (Refer to Figure SC6.4.10.23)). Watering requirements to sustain healthy vegetation should be determined during ongoing maintenance site visits.

Figure SC6.4.10.23 - Plant Establishment Period in Bioretention Basin

(6) Maintenance requirements – bioretention basins

Vegetation plays a key role in maintaining the porosity of the filter media of a bioretention basin and a strong healthy growth of vegetation is critical to its performance. Therefore, the most intensive

period of maintenance is during the plant establishment period (first 2 years) when weed removal and replanting may be required.

Inflow systems and overflow pits require careful monitoring, as these can be prone to scour, and litter build up. Debris can block inlets or outlets and can be unsightly, particularly in high visibility areas. Inspection and removal of debris should be done regularly, and debris should be removed whenever it is observed on a site. Where sediment forebays are adopted, regular inspection of the forebay is required (3 monthly) with removal of accumulated sediment undertaken as required.

For larger bioretention basins, a maintenance access track for maintenance vehicles (e.g., 4WD utility) should beprovided to the full perimeter of the system for maintenance efficiency and ease.

(7) Checking tools – bioretention basins

Checking aids have been developed for designers and Council's development assessment officers. In addition, Clause SC6.4.10.4 (5) Construction and establishment - bioretention basins provides general advice for the construction and establishment of bioretention basins and key issues to be considered to ensure their successful establishment and operation based on observations from construction projects around Australia.

(a) Design assessment

The checklist at Clause SC6.4.10.8 Checklist G presents the key design features that are to be reviewed when assessing the design of a bioretention basin. These considerations include configuration, safety, maintenance, and operational issues that need to be addressed during the design phase. If an item receives an "N" when reviewing the design, referral is made back to the design procedure to determine the impact of the omission or error. A copy of the completed design calculation summary from Clause SC6.4.10.8 Checklist F should be provided as part of the application to assist in the design assessment. In addition to the checklist, a proposed design is to have all necessary permits for its installation. Council development assessment officers will require all relevant permits to be in place prior to accepting a design.

Refer to Clause SC6.4.10.8 Checklist G Bioretention Basin Design Assessment Checklist or click here to view the document.

(b) Construction (during and post)

The checklist at Clause SC6.4.10.8 Checklist H presents the key items to be reviewed when inspecting the bioretention basin during and at the completion of construction. The checklist is to be used by Construction Site Supervisors and local authority Compliance Inspectors to ensure all the elements ofthe bioretention basin have been constructed in accordance with the design. If an item receives an "N" in Satisfactory criteria, then appropriate actions must be specified and delivered to rectify the construction issue before final inspection sign-off is given.

Refer to Clause SC6.4.10.8 Checklist H - Bioretention Basin Construction Inspection Checklist or click here to view the document.

(c) Operation and maintenance inspection

The example forms at Clause SC6.4.10.8 Checklist I should be developed and used whenever an inspection is conducted and kept as a record on the asset condition and quantity of removed pollutants over time. Inspections should occur every 1 - 6 months depending on the size and complexity of the system. Moredetailed site-specific maintenance schedules should be developed for major bioretention basins and include a brief overview of the operation of the system and key aspects to be checked during each inspection.

Refer to Clause SC6.4.10.8 Checklist I - Bioretention Basin Maintenance Checklist or click here to view the document.

(d) Asset transfer (following on maintenance period)

Land ownership and asset ownership are key considerations prior to construction of a stormwater treatment device. A proposed design should clearly identify the asset owner and who is responsible for its maintenance. The proposed owner should be responsible for performing the asset transfer checklist. For details on asset transfer to specific to each council, contact the relevant local authority. Clause SC6.4.10.8 Checklist J provides an indicative asset transfer checklist.

Refer to Clause SC6.4.10.8 Checklist J - Bioretention Basin Asset Transfer Checklist or click here to view the document.

(8) Example engineering drawings – bioretention basins

Where council has standard drawings appropriate to a bioretention basin application, these should be used toguide the design and construction of a bioretention basin. In the absence of local standards, Brisbane City Council have developed a set of Standard Drawings (UMS 155, 156 and 337) that can be readily applied to bioretention basin applications in the coastal dry tropics. These drawings relate specifically to inlet pits and sub-surface drains for bioretention swales but may be used to guide design for bioretention basins.

Editor's Note - These are not intended to be prescriptive drawings which must be adhered too; rather they are intended to provide detailed examples of bioretention system configurations.

(9) References and additional information – bioretention basins

BCC 2000a (with revisions 2004), *Subdivision and Development Guidelines*.BCC 2000b, *Brisbane City Plan 2000*, BCC, Brisbane.

BCC, DMR & PRSC (Brisbane City Council, Queensland Department of Main Roads & Pine Rivers Shire Council) 2001, *Preferred Species Manual: Green Routes Program*, prepared for the Green Routes Program by BCC, DMR & PRSC, Brisbane Deletic, A. and G. Mudd (2006). Preliminary results from a laboratory study onthe performance of bioretention systems built in Western Sydney saline soils, Facility for Advancing Water Biofiltration.

DMR (Queensland Department of Main Roads) 1997, *Road Landscape Manual*, prepared by EDAW (Aust) PtyLtd for DMR, Brisbane

DNRW, IPWEA & BCC (Department of Natural Resources and Water, Institute of Public Works EngineeringAustralia – Qld Division & Brisbane City Council) 1998, Q*ueensland Urban Drainage Manual (QUDM)* Second Edition, prepared by Neville Jones & Associates and Australian Water Engineering for DNRW, IPWEA & BCC,Brisbane.

Kim, H., E.A Seagren and A.P. Davis. (2003) Engineered Bioretention for Removal of Nitrate from StormwaterRunoff. *Water Environment Research*, 75(4), 355-367

Leinster, S 2006, *Delivering the Final Product – Establishing Water Sensitive Urban Design Systems*, 7th International Conference on Urban Drainage Modelling and 4th International Conference on Water Sensitive Urban Design Book of Proceedings, Volume 2, A Deletic and T Fletcher (eds), Melbourne.

LHCCREMS (Lower Hunter and Central Coast Regional Environmental Management Strategy) 2002, *WaterSensitive Urban Design in the Sydney Region: 'Practice Note 2 – Site Planning*', LHCCREMS, NSW, http://www.wsud.org/downloads/Planning%20Guide%20&%20PN%27s/02-Site%20Planning.pdf

McFarlane A 1997, *Successful Gardening in Warm Climates*, Kangaroo Press, Sydney

Standards Australia, AS 4419: *Soils for landscaping and garden use*, Standards Australia

Townsville City Council, *Water sensitive urban design for the coastal dry tropics (Townsville): Technical design guidelines for stormwater management*, 2011

Zinger, Y., A. Deletic and T. D. Fletcher (2007a). *The effect of various intermittent wet-dry cycles on nitrogen removal capacity in biofilters systems. 13th International Rainwater Catchment Systems* Conference and 5th International Water Sensitive Urban Design Conference, Sydney, Australia.

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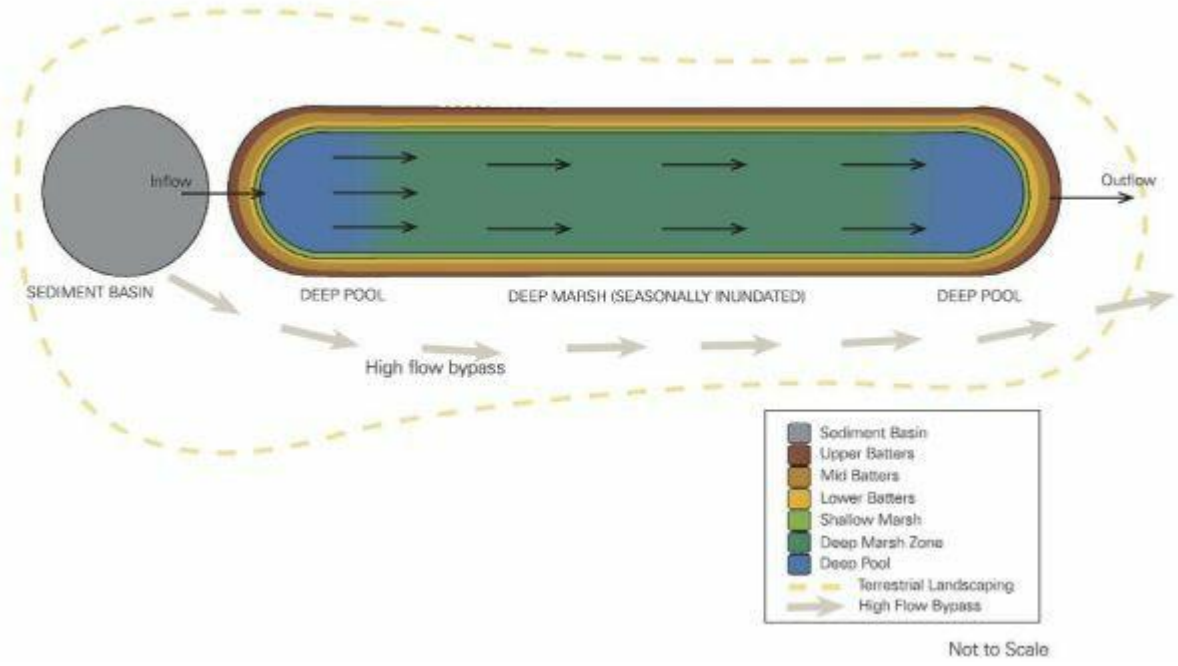
SC6.4.10.6 Constructed stormwater wetlands

Editor's Note - Due to the different climatic conditions, the design of constructed wetlands in the coastal dry topics differs from the designof wetlands in south-east Queensland and southern states. The following design considerations and criteria outlined below are specific to the coastal dry topics and are intended to address key requirements such as maintaining perennial wetland vegetation during the dry season; managing the potential for weed ingress and providing natural means of managing mosquito populations.

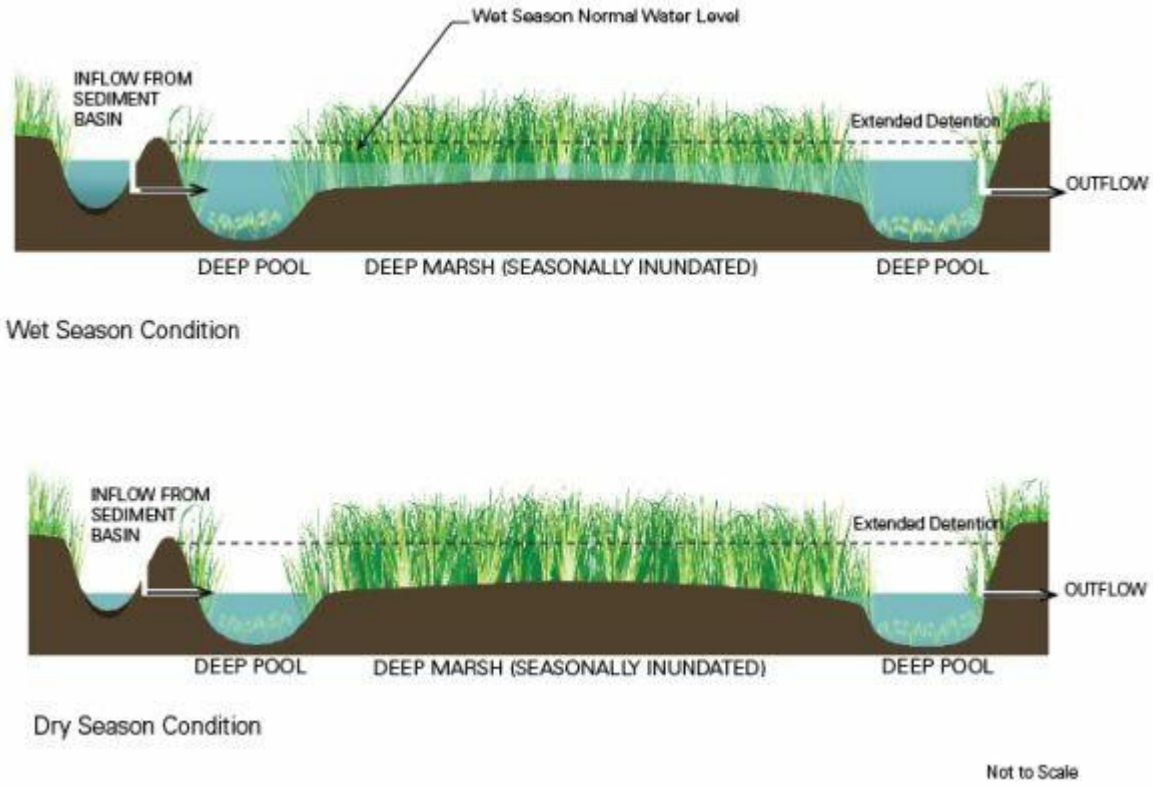
(1) Introduction

Constructed wetland systems are densely vegetated water bodies that use enhanced sedimentation, fine filtration, and biological uptake processes to remove pollutants from stormwater. Water levels rise during rainfall events and outlets are configured to slowly release flows, typically over two to three days, back to dry weatherwater levels. In addition to treating stormwater, constructed wetlands can also provide habitat, passive recreation, and improved landscape amenity.

Constructed wetlands in the coastal dry tropics will generally consist of an inlet zone (sedimentation basin to remove coarse sediments, deep pools, a deep marsh macrophyte zone (I.e., a heavily vegetated area to remove fine particulates and uptake soluble pollutants) and a high flow bypass channel (to protect the macrophyte zonefrom scour and vegetation damage). Figure SC6.4.10.24 Schematic layout of a constructed wetland system and Figure SC6.4.10.25 Wet and dry season conditions in a constructed freshwater wetland show thekey elements of constructed stormwater wetland systems.



FigureSC6.4.10.24 - Schematic Layout of a Constructed Wetland System



FigureSC6.4.10.25 - Wet and Dry Season Conditions in a Constructed Freshwater Wetland

Constructed wetlands treat stormwater by capturing runoff and slowly passing it horizontally through a densely vegetated macrophyte zone. Soluble and colloidal (fine particles held in suspension) pollutants are mostly removed by sorption (absorption – “into” and adsorption – “onto”) to biofilms on stems of wetland plants (Figure SC6.4.10.26). For this reason, dense vegetation is important for effective treatment and vegetation with a large stem surface area provides greatest treatment (I.e., plants with many small diameter stems are able to support more biofilms than plants with fewer, thicker stems). Emergent macrophytes are also important for:

(a) transferring oxygen to the sediments (oxygen pumps) thereby facilitating the processing and/or immobilising of pollutants captured and held within wetland sediments;

(b) aiding in the treatment of nutrient and heavy metal concentrations, either through direct uptake, orthrough providing a surface for biofilms and epiphytes that assist with the removal of pollutants;

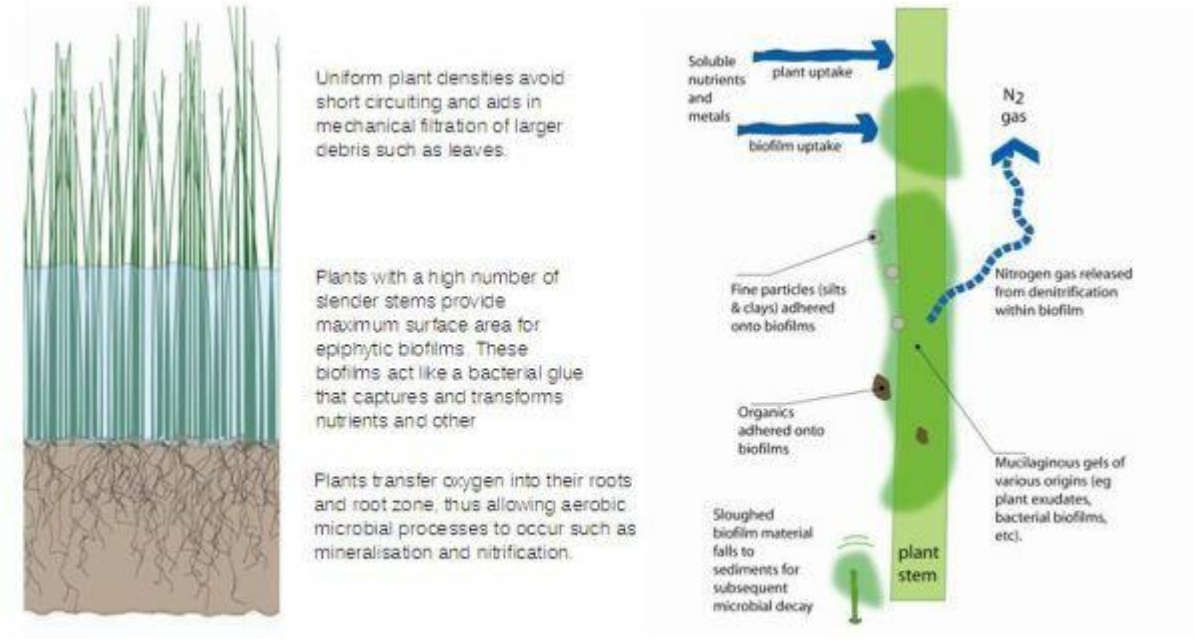
(c) influencing sediment deposition and physically filtering sediment particles from the water column;

(d) influencing hydrology and hydraulics by promoting even flow distribution through the wetland;

(e) providing shade, decreasing light availability for algal synthesis;

(f) decreasing erosion by reducing wave action and flow velocities while binding soil particles with their root systems; and

(g) providing a basis for wetland food chains and supplying shelter for mosquito predators such as macroinvertebrates and fish.



(Figure and associated text from the *Healthy Waterways WSUD Technical Design Training Notes for South East Queensland* - Version 1 June 2007)

Figure SC6.4.10.26 - Dense Emergent Macrophytes and Biofilms on the Plant Stems Play an Important Role in Nutrient Removal in Constructed Stormwater Wetlands

Source - Figure and associated text from the *Healthy Waterways WSUD Technical Design Training Notes for South-East Queensland* - Version 1 June 2007.

(2) Design considerations – constructed wetlands

Due to the different climatic conditions, the design of constructed wetlands in the coastal dry topics differs from the design of wetlands in south-east Queensland and southern states. The following design considerations and criteria outlined below are specific to the coastal dry topics and are intended to address key requirements such as maintaining perennial wetland vegetation during the dry season; managing the potential for weed ingress and providing natural means of managing mosquito populations. Constructed wetlands in the form detailed below have not yet been constructed in the Townsville region. Therefore, it is recommended that demonstration projects adopting the design guidelines detailed below are constructed and revisions/updates of this clause made, where deemed appropriate, to reflect practical learnings and understanding of the performance and sustainability of constructed stormwater treatment wetlands in the coastal dry tropics.

Community acceptance of constructed wetlands will be driven by their aesthetics and landscape amenity value. Poorly designed and/or maintained wetlands are unlikely to gain community support; therefore, it is essential to address potential issues such as pests and weeds starting at conceptual design and continuing through implementation, and long-term maintenance.

The operation of constructed wetlands involves the interaction between stormwater runoff, vegetation and hydraulic structures and the successful implementation of constructed wetlands requires appropriate integration into the landscape design. In this regard, the following sections provide an overview of the key design issues that must be considered when conceptualising and designing constructed wetlands.

(a) Landscape design

Constructed wetlands are often located within accessible open space areas and can become interesting community features. Landscape design aims to ensure that macrophyte planting fulfils the intended stormwater treatment function as well as integrating with their surrounds. Opportunities to enhance public amenity and safety with viewing areas, pathway links, picnic nodes and other elements should be exploited. Community education through signage and

public art can also be explored. It is important that the landscape of constructed wetlands addresses stormwater quality objectives whilst being sensitive to these other important landscape aims.

Terrestrial landscaping provides a visual buffer and framework for the wetland system within the community and native habitat. Native trees can encourage recreational elements such as walking and bird watching. These recreational elements, as well as education in the form of descriptive panels and signs, can increase acceptance of these systems within the community.

Figure SC6.4.10.27 - Boardwalk and Public Viewing Area on the edge of a Landscaped Wetland

(b) Invasive weed control

To protect landscape amenity and the stormwater treatment efficiency of the wetland it is important to maintain, throughout the year, the design vegetation communities to avoid excessive colonisation of the wetland by weeds. Weed infestation is a major problem in the dry tropics, particularly within ephemeral waterways and stormwater treatment facilities. The wetland design presented in this chapter is based on an ephemeral wetland (I.e., it will dry periodically) and therefore, the design and management of the wetland to manage weed infestation takes on high importance. Management of weeds is achieved as follows:

(i) designing the macrophyte zone as predominately a deep marsh system (I.e., water depth 0.5 m -0.7 m) to maintain the macrophyte vegetation by minimising the frequency and duration of wetland drying, thus permanently occupying the habitat and restricting weed colonisation opportunities;

(ii) planting dense littoral vegetation around the perimeter of the wetland to avoid the ingress of weed species. To maintain dense perennial littoral vegetation, irrigation is likely to be required, particularly during the dry season; and

(iii) during the establishment and ongoing maintenance of the wetland, prompt removal of weeds before they spread and/or set seed is of critical importance.

(c) Detention time and hydrologic effectiveness

Detention time is the time taken for each “parcel” of water entering the wetland to travel through the macrophyte zone assuming “plug” flow conditions. In highly constrained sites, simulations using quantitative computer models, such as the Model for Urban Stormwater Improvement Conceptualisation (MUSIC, CRCCH 2005), are often required to optimise the relationship between wetland detention time1 and wetland hydrologic effectiveness to maximise treatment performance. Hydrologic effectiveness is a measure of the mean annual volume of stormwater runoff captured and treated within the wetland and is expressed as a percentage of the mean. It is recommended that a notional detention time should preferably be around 48 hours to remove nutrients effectively from urban stormwater. Optimal hydrologic effectiveness in the coastal dry

tropics region is a balance between minimising overflows in the wet season and sustaining vegetation in the dry season (I.e., sizing the wetland to treat the majority of stormwater runoff while not being too large as to result in water level drawdown and drying in excess of 60–70 days in the dry season). Further discussion on hydrologic effectiveness and sizing of wetlands in the coastal dry tropics is provided in the following sections of this clause.

Editor's Note - It should be noted that detention time is rarely a constant and the term notional detention time is used throughout this chapter to provide a point of reference in modelling and determining the design criteria for riser outlet structures.

(d) Hydrodynamic design

Poor wetland hydrodynamics is often identified as a major contributor to wetland operational and management problems. A summary of desired hydrodynamic characteristics and design considerations is presented in Table SC6.4.10.16.

Table SC6.4.10.16 - Desired Wetland Hydrodynamic Characteristics and Associated Design Considerations

Inundation depth, wetness gradient, base flow and hydrologic regime	Selection of wetland size and designof outlet control to ensure compatibility with the hydrology andsize of the catchment draining into the wetland. Bathymetry layout and outlet controldesign to compliment the botanical design and the hydrology of the wetland.	Wetland area and outlet design is critical to achieve the WSUD Objectives (e.g., target pollutant load reduction) as well as ensuring the size is adequate to sustain wetland vegetation (I.e., not too large as to result in excessive water level drawdown and drying in excess of 60 days in the dry season). Inadequate attention to the inundation depth, wetness gradient of the wetland and the frequency of inundation at various depth ranges would lead to sparse vegetation cover and/or dominance of certain plant species (especially weed species over time). This results in a deviation from the intended botanical layout of the wetland and reduced stormwater treatment performance.
Uniform vertical velocity profile	Selection of plant species and location of inlet and outlet structuresto promote uniform vertical velocity profile.	Preliminary research findings have indicated that certain plant species have a tendency to promote stratification of flow conditions within a wetland leading to ineffective water pollution control and increasing the potential for algal blooms.
Scour protection	Design of inlet structures and erosion protection of banks.	Owing to the highly dynamic nature of stormwater inflows, measures are to be taken to "protect" the wetland from erosion during periods of high inflow rates.

(e) Inlet zone design considerations

The inlet zone of a constructed stormwater wetland is designed as a sedimentation basin and has two key functional roles. The primary role is to remove coarse to medium sized sediment

(I.e., 125 µm or larger) prior to flows entering the macrophyte zone. This ensures the vegetation in the macrophyte zone is not smothered by coarse sediment and allows the macrophyte zone to target finer particulates, nutrients and other pollutants.

The second role of the inlet zone is the control and regulation of flows entering the macrophyte zone and bypass of flows during "above design flow" conditions. The outlet structures from the inlet zone (I.e., sedimentation basin) are designed such that flows up to the "design flow" (typically the 1-year ARI) enter the macrophyte zone whereas "above design flows" are bypassed around the macrophyte zone. In providing this function, the sedimentation basin protects the vegetation in the macrophyte zone against scour during high flows (see Figure SC6.4.10.28).

When the available space for a constructed wetland is constrained, it is important to ensure that the size of the inlet zone (I.e., sedimentation basin) is not reduced. This ensures the larger sediments are effectively trapped and prevented from smothering the macrophyte zone. When the site constrains the size of the constructed wetland it is the macrophyte zone of the wetland that should be reduced accordingly.

Large wetland systems usually require a gross pollutant trap (GPT) as part of the inlet zone to protect the wetland from litter and debris. The decision of whether a GPT is required or not, depends on the presence of upstream GPT measures and catchment size. The relevant local authority should be consulted to determine if a GPT is required.

Figure - SC6.4.10.28 Inlet Zone Bypassing Major Design Flows Around Wetland

(f) Macrophyte zone design considerations

The layout of the macrophyte zone needs to be configured such that system hydraulic efficiency is optimised and healthy vegetation sustained. Design considerations include:

(i) the preferred extended detention depth is 0.5 m. Deeper extended detention depths, up to a maximum of 0.75 m, may be acceptable where the wetland has a high hydrologic effectiveness and where the botanic design uses plant species tolerant to greater depths of inundation;

(ii) the longitudinal bathymetry of the macrophyte zone should grade (min 0.5% grade) smoothly from 0.7 m in depth (based on design normal water level) up to a central crest 0.5 m in depth and then back down to a maximum of 0.7 m in depth. This ensures that isolated pools of water are not created within the macrophyte zone during the dry season when the normal water level slowly draws down due to evapotranspiration;

(iii) the macrophyte zone is to have a flat cross-sectional bathymetry only grading up at the edge batters. This facilitates the even distribution of flows to avoid short circuiting, creates a uniform hydraulic conveyance and maximises stormwater contact with macrophyte stems and biofilms;

(iv) the bathymetry of the macrophyte zone should be designed so that the macrophyte zone is connected to deeper open water pools (located at the inlet and outlet of the macrophyte zone) to allow mosquito predators to seek refuge in the deeper open water zones during periods of extended dry weather;

(v) the deep open water pools should be 2 m in depth to ensure that a permanent pool of water is sustained throughout the dry season. This ensures habitat is retained for fish, macroinvertebrates(mosquito predators) and submerged macrophytes;

(vi) the surface area of deep refuge pools (excluding the sediment basin) within the wetland should bebetween 20% and 30% of the total macrophyte area;

(vii) the constructed wetland is required to retain water permanently and therefore the base must be of suitable material to retain water (e.g., clay). If in-situ soils are unsuitable for water retention, a clayliner (e.g., compacted 300 mm thick) must be used to ensure there will be permanent water for vegetation and habitat;

(viii) particular attention should be given to the placement of the inlet and outlet structures, the length to width ratio of the macrophyte zone and flow control features to promote a high hydraulic efficiency within the macrophyte zone;

(ix) dense littoral vegetation around the perimeter of the wetland is required to avoid the ingress of weed species. To maintain dense perennial littoral vegetation, irrigation is likely to be required,particularly during the dry season. During extended dry periods (e.g., in excess of 60 days) wetland macrophytes may also require irrigation to sustain dense foliage and prevent habitat opportunities for weed species;

(x) provision to drain the macrophyte zone for water level management during the plant establishmentphase should also be considered; and

(xi) the macrophyte zone outlet structure needs to be designed to provide a notional detention time (usually 48 hours) for a wide range of flow depths. The outlet structure should also include measures to exclude debris to prevent clogging.

(g) Wetlands constructed within retention (Or detention) basins

In many urban applications, wetlands can be constructed in the base of retention basins, thus reducing the land required for stormwater treatment. In these situations, wetland systems will occasionally become inundated to greater depths than the extended detention depth; however, the inundation durationis usually relatively short (hours) and is unlikely to affect the wetland vegetation provided there is a safe pathway to drain the wetland following flood events which avoids scour of the wetland vegetation and banks.

When designing a wetland within a retention basin, the outlet control structure of the retention basin (typically culverts) should be placed at the end of the wetland bypass channel. This ensures flood flows“backwater” across the wetland thus protecting the macrophyte vegetation from scour by high velocity flows.

(h) Vegetation types

Vegetation planted in the macrophyte zone has an important functional role in treating stormwater flows, as well as adding aesthetic value. A dense cover of perennial emergent macrophytes is essential for both stormwater treatment function and for the control of weeds. It is necessary for the macrophytes to permanently occupy the wetland habitat to limit weed colonisation opportunities. Dense perennial littoral vegetation is also important to avoid the ingress of weed species into the wetland macrophyte zone.

Dense planting of the littoral zone will inhibit public access to the macrophyte zone, minimising potential damage to wetland plants and reducing the safety risks posed by water bodies.

The reader is referred to Clause SC6.4.10.7 Plant selection for WSUD systems in the coastal dry tropics for a list of suggested plant species suitable for constructed wetland systems in the coastal dry tropics. The planting densities recommended in the list should ensure that 70 - 80% cover is achieved within two growing seasons (2 years). The distribution of the species within the wetland will relate to their structure,function, relationship, and compatibility with other species. The plant species in Clause SC6.4.10.7 Plant selection for WSUD systems in the coastal dry tropics are listed in accordance with the wetland zone/water depth in which they should be planted. The wetland zones are deep marsh, shallow marsh, (wetland edge), lower littoral, and upper littoral.

(i) Designing to avoid mosquitoes

To reduce the risk of high numbers of mosquitoes, there are a number of design features that can be considered. Not all of these will be feasible in any one situation, but they include:

(i) providing access for mosquito predators, such as fish and predatory insects, to all parts of the water body (avoid stagnant isolated areas of water);

(ii) providing a deep permanent pool (for long dry periods or for when water levels are artificially lowered) so that mosquito predators can seek refuge and maintain a presence in the wetland;

(iii) where possible, incorporating a steep slope into the water, preferably greater than 300 or 3:1 horizontal to vertical. Note that steep edges may be unacceptable for public safety reasons, and aslope of up to 8:1 horizontal to vertical is generally used;

(iv) wave action from wind over open water will discourage mosquito egg laying and disrupt the ability of larvae to breathe;

(v) providing a bathymetry such that water draws down evenly so isolated pools are avoided;

(vi) providing sufficient gross pollutant control at the inlet such that human derived litter does notaccumulate and provide breeding habitat;

(vii) providing ready access for field operators to monitor and treat mosquito larvae if required;

(viii) ensuring maintenance procedures do not result in wheel rut and other localised depressions that create isolated pools when water levels fall; and

(ix) ensuring overflow channels do not have depressions that will hold water after a storm event.

(j) Designing for maintenance access

Access to all areas of a constructed wetland is required for maintenance. In particular inlet zones and gross pollutant traps require a track suitable for heavy machinery for removal of debris and desilting as well as an area for dewatering removed sediments. If sediment removal requires earthmoving equipment to enter the basin, then a stable ramp suitable for heavy plant will be required into the base of the inlet zone (maximum slope 1:10).

To aid maintenance, it is recommended that the inlet zone is constructed with a hard (I.e., rock) bottom. This is important if maintenance is performed by driving into the basin. It also serves an important role byallowing excavator operators to detect when they have reached the base of the inlet zone during desilting operations.

Macrophyte zones require access to the areas for weeding and replanting as well as regular inspections.Commonly, these access tracks can be incorporated with walking paths around a wetland system.

Maintenance access to constructed wetland needs to be considered when determining the layout of a wetland system.

(3) Technical note: saline/brackish constructed wetlands

Urban communities in the dry tropics are often located near large estuarine river systems. In some locations it may be useful to have an optional estuarine stormwater treatment system. While estuarine systems are typically lower nutrient environments than freshwater stormwater treatment systems, a modified salt marsh community would still have considerable nutrient processing capability and could potentially provide a stormwater treatment capacity in some locations. This is a new concept that has not yet been tested and therefore should only be considered if other design solutions are not possible or practical.

If an estuarine stormwater treatment system was to be trialled/ constructed as a demonstration project, it isrecommended that the model would need to consider the following list of features/design elements:

(a) drain a large stormwater runoff event over several tidal cycles;

(b) during a runoff event, extended detention depth should not exceed 0.5 m, but preferably be lower;

(c) the wetland should consist of a series of cells that would progressively fill and spill during a runoff event;

(d) the initial cell would be a sedimentation pond;

(e) surrounding the sedimentation pond and throughout the subsequent cells would support salt marshcommunities (ranging from herbaceous to woody);

(f) a dry weather drainage system would allow complete drainage over a single tide cycle;

(g) the wetland would be drained by a series of runnels that would be capable of completely draining the system on a low tide sequence, thus managing potential mosquito breeding habitat;

(h) high tides (exceeding mean high tide) would be allowed to penetrate the entire system;

(i) a salinity gradient would be maintained through the system for most seasons;

(j) a series of berms and chokes would be included to ensure cells progressively fill and spill and that asalinity gradient is created and maintained;

(k) in high tidal range environments particular care will be needed in the design of the hydraulic connection between the perched salt marsh treatment system and the larger and deeper estuarine drainage channels (these environments are highly susceptible to erosion particularly after catchment development); and

(l) an important element in an estuarine system will be the wetting and drying sequence in that this will heighten the capacity to process nitrogen pollutants which are critical pollutants to near shore marineecosystems.

The illustrations below (Figure SC6.4.10.29 Possible design features of saline/brackish constructed wetlands), demonstrate how a saline/brackish wetland may be configured to achieve the above design criteria.

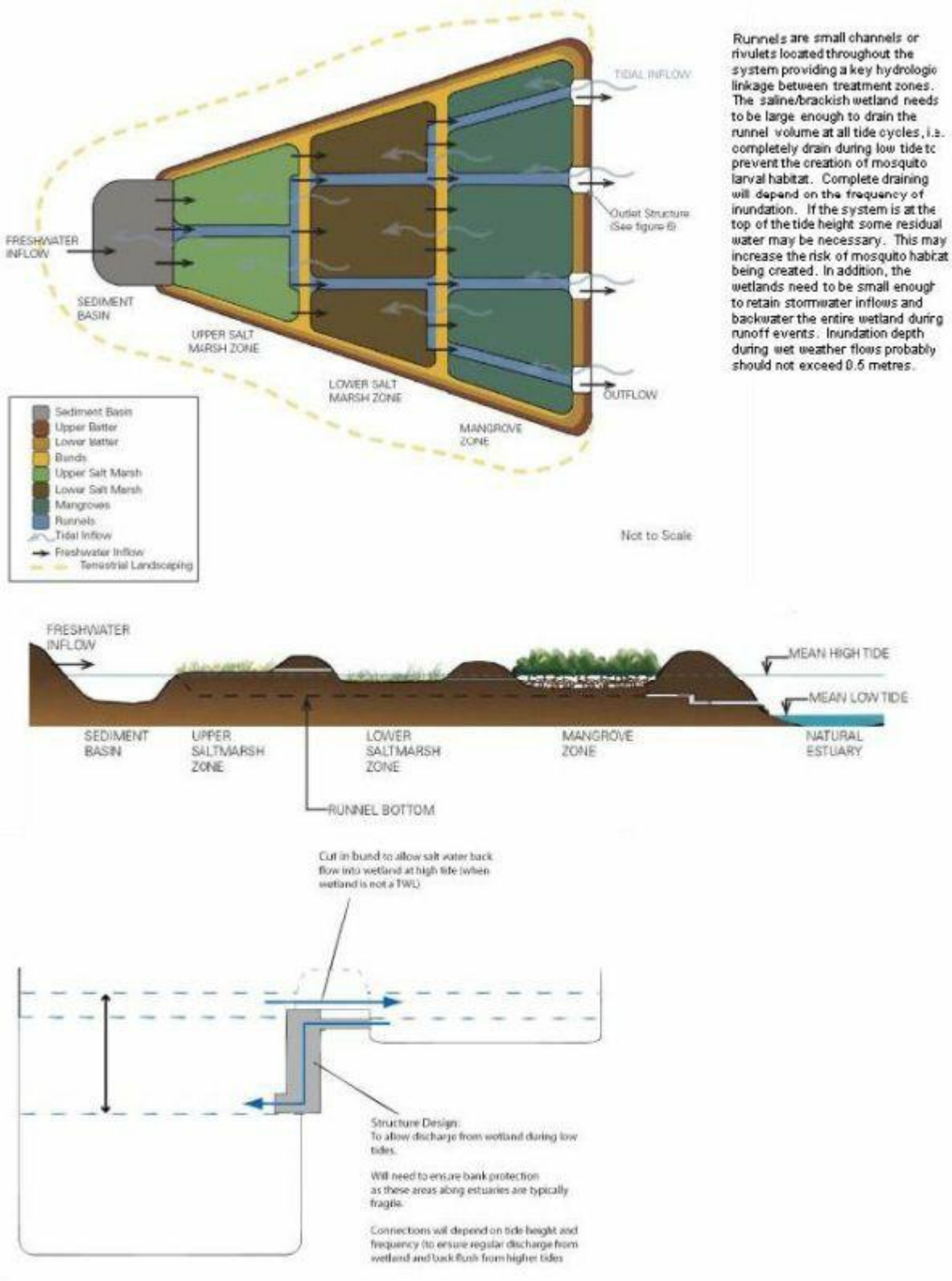


Figure SC6.4.10.29 - Possible Design Features of Saline/Brackish Constructed Wetlands

(4) Wetland design process

The key design steps following the site planning and concept development stages are:

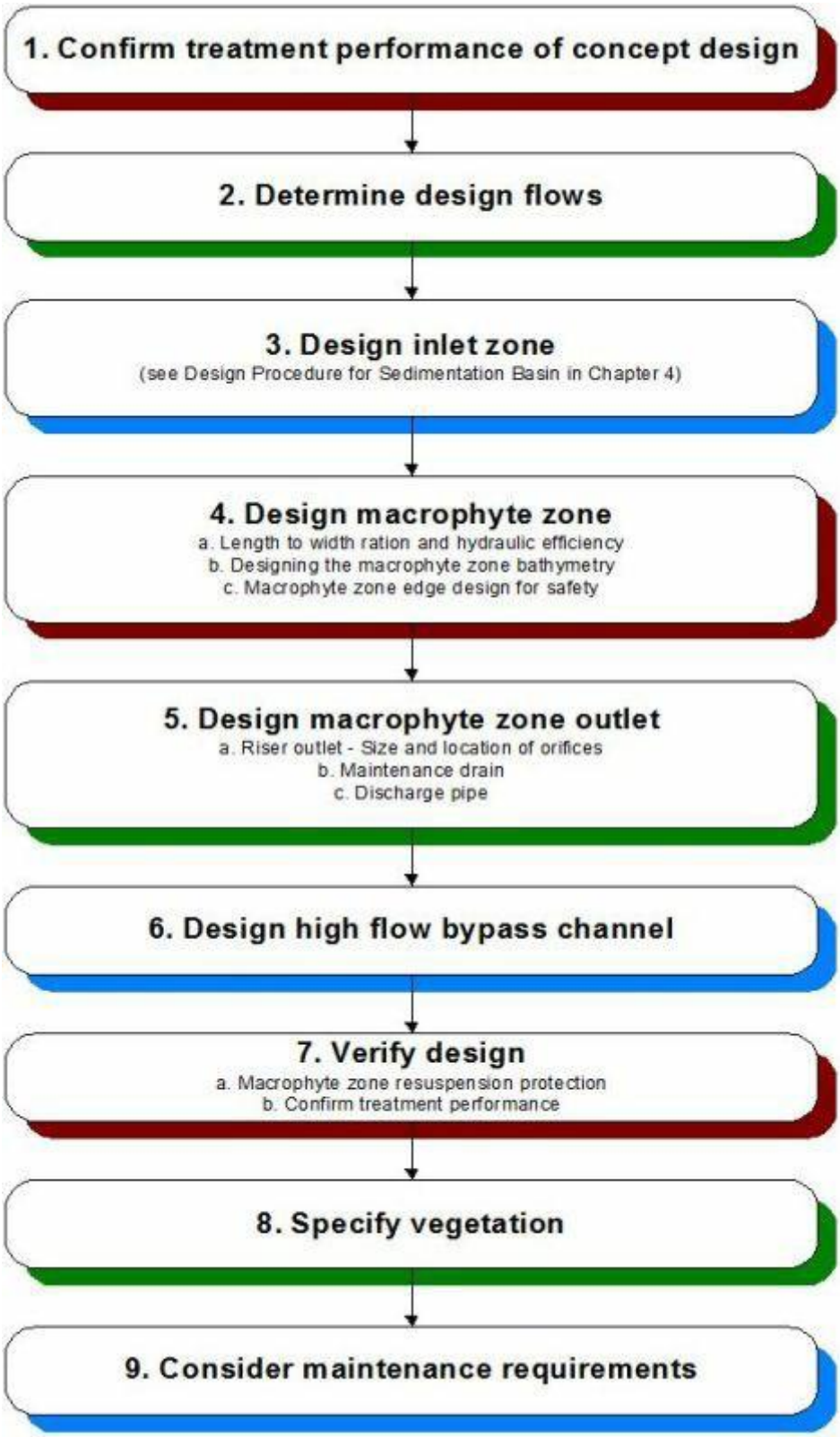


Figure SC6.4.10.30 - Site Planning and Concept Development Stages

(a) Step 1: Confirm treatment performance of concept design

Before commencing detailed design, the designer should first undertake a preliminary check to confirm the constructed wetland area (I.e., the macrophyte zone surface area) from the concept design is adequate to deliver the required level of stormwater quality improvement.

This assessment should be undertaken by a WSUD specialist and can be achieved by modelling expected treatment performance in an appropriate quantitative modelling program. Where possible, this modelling should be based on local rainfall data, the proposed configuration of the system, and based on local stormwater treatment performance data.

(b) Step 2: Determine design flows

(i) Design discharges

To configure the inlet zone and high flow bypass elements of a constructed wetland the following design flows apply:

1. design operation flow (1-year ARI) for sizing the inlet zone (I.e., sedimentation basin) and the“control” outlet structure (I.e., overflow pit and pipe connection) discharging to macrophyte zone; and
2. above design flow for design of the high flow bypass around the macrophyte zone. The discharge capacity for the bypass system may vary depending on the particular situationbut will typically correspond to one of the following:
    a) minor design flow (2-year ARI) – for situations where only the minor drainage systemis directed to the inlet zone; and
    b) major flood flow (100-year ARI) – for situations where both the minor and major drainage system discharge into the inlet zone.

(ii) Design flow estimation

A range of hydrologic methods can be applied to estimate design flows. If the typical catchmentareas are relatively small, the Rational Method design procedure is a suitable method for estimating design flows. However, if the constructed wetland is to form part of a retention basin (refer to Clause SC6.4.10.6 (2)(g) Wetlands constructed within retention (or detention) basins) or if the catchment area to the wetland is large (> 50 ha), then a full flood routing computation method needs to be used to estimate design flows.

(c) Step 3: Design inlet zone

As outlined in Clause SC6.4.10.6 (2)(g) Inlet zone design considerations, the inlet zone (see example in Figure SC6.4.10.31 Inlet zone of a constructed wetland in Brisbane) of a constructed stormwater wetland is designed as a sedimentation basin and serves two functions: (1) pre-treatment of inflow to remove coarse to medium sized sediment; and (2) the hydrologic control of inflows into the macrophyte zone and bypass of floods during “above design” operating conditions. As depicted in Figure SC6.4.10.32 Example of inlet zone connection to macrophyte, the inlet zone consists of the following elements:

(i) sedimentation basin “pool” to capture coarse to medium sediment (125 µm or larger).

(ii) inlet zone connection to the macrophyte zone (or “control” structure as defined in normally consisting of an overflow pit within the inlet zone connected to one or more pipes through theembankment separating the inlet zone and the macrophyte zone.

(iii) high flow bypass weir (or “spillway” outlet structure to deliver “above design” flood flows to the highflow bypass channel.

Figure SC6.4.10.31 - Inlet Zone of a Constructed Wetland in Brisbane

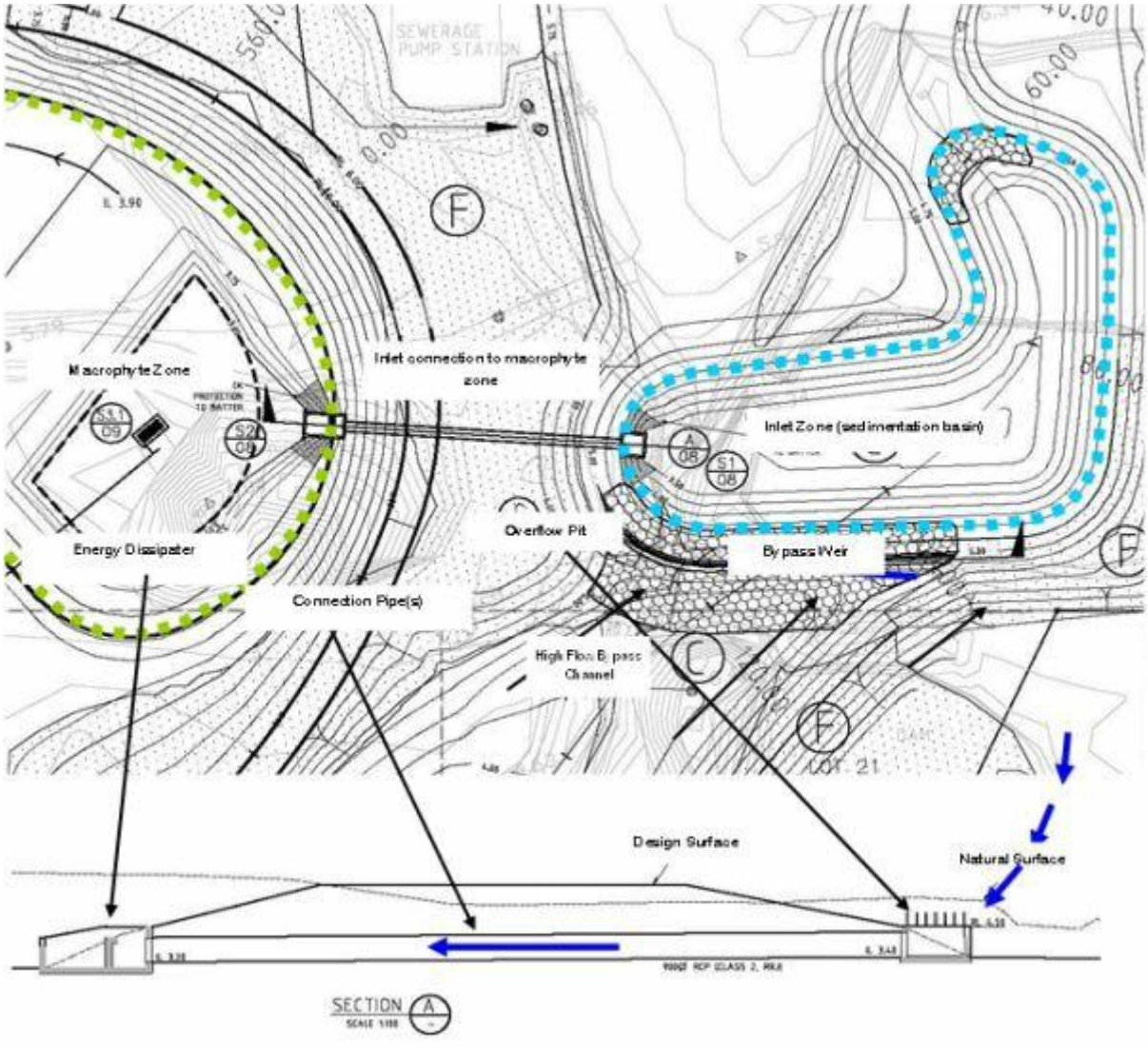


Figure SC6.4.10.32 - Example of Inlet Zone Connection to Macrophyte Zone

(iv) For more information and design guidance for each of the inlet zone elements listed above, thereader is referred to *Water sensitive urban design for the coastal dry tropics (Townsville): Technical design guidelines for stormwater management*, Chapter 4 Sedimentation Basins. When applying the design procedure outlined in the Chapter 4 above, the following should be used as a guide:

1. the inlet zone typically must comprise a deep open water body that operates essentially asa sedimentation basin designed to capture coarse to medium sized sediment (I.e., 125 µm or larger);
2. it may be necessary for a GPT to be installed such that litter and large debris can be captured at the interface between the incoming waterway (or pipe) and the open water of theinlet zone;
3. the crest of the overflow pit must be set at the normal water level of the inlet zone (which istypically set 0.3 m above the normal water level of the macrophyte zone);
4. the pipe that connects the sedimentation basin to the macrophyte zone needs to havesufficient capacity to convey a 1-year ARI flow, assuming the macrophyte zone is at thenormal water level and without resulting in any flow over the high flow bypass weir;
5. the obvert of the connection pipe can be set below the normal water level of the wetland toconceal the pipe (below the normal water level) during the dry season;
6. an energy dissipater is usually required at the end of the pipes to reduce velocities anddistribute flows into the macrophyte zone;
7. the inlet zone is to have a structural base (e.g., rock) to define the base when desilting and provide support for maintenance plant/ machinery when entering the basin for maintenance;and
8. the high flow bypass weir ("spillway" outlet) is to be set at the same level as the top ofextended detention in the macrophyte zone.

(d) Step 4: Designing the macrophyte zone

(i) Length to width ratio and hydraulic efficiency

To optimise wetland performance, it is important to avoid short circuit flow paths and poorly mixed regions within the macrophyte zone. One way to minimise this is to adopt a high length to width ratio not less than 5 to 1 for the macrophyte zone. Length to width ratios less than this can lead topoor hydrodynamic conditions and reduced water quality treatment performance.

Persson et al. (1999) used the term hydraulic efficiency (λ) to define the expected hydrodynamiccharacteristics for a range of configurations of stormwater detention systems (Figure SC6.4.10.33). Engineers Australia (2006) recommend that constructed wetland systems should not have a hydraulic efficiency (λ) less than 0.5 and preferably should be greater than 0.7.

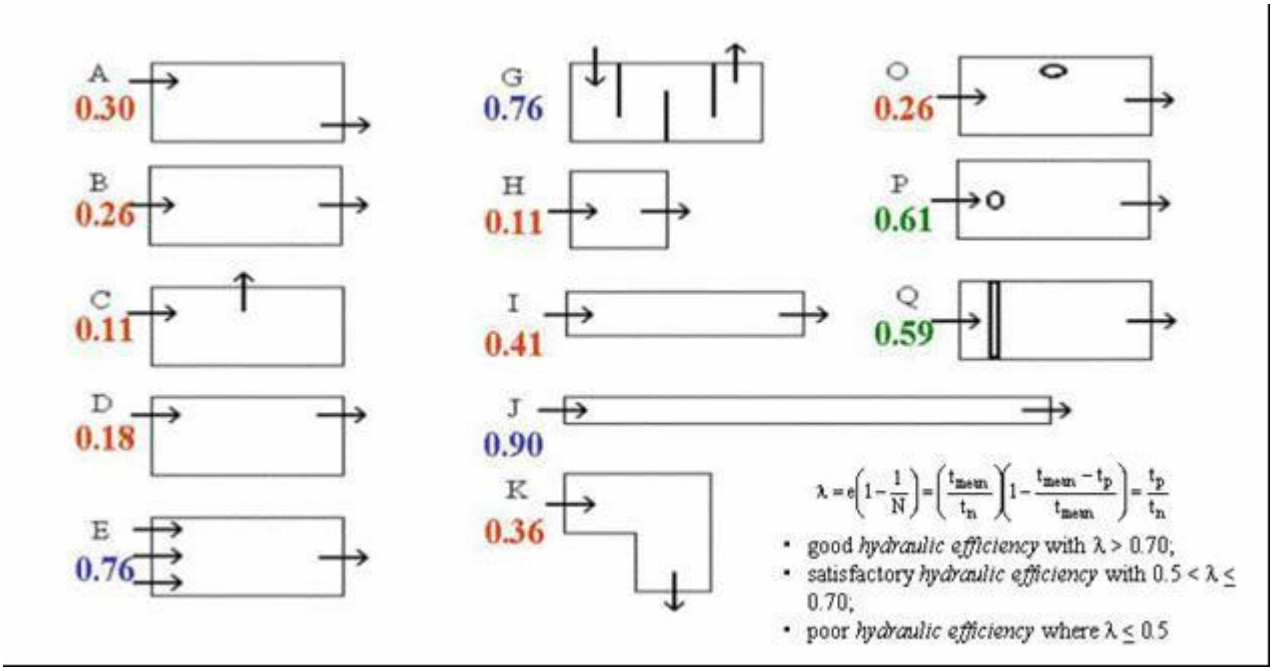


Figure SC6.4.10.33 - Hydraulic Efficiency (λ) Ranges

Hydraulic efficiency ranges from 0 to 1, with 1 representing the best hydrodynamic conditions forstormwater treatment. The o in diagrams O and P represent islands in the waterbody and the double line in diagram Q represents a weir structure to distribute flows evenly (Persson et al.1999).

(ii) Designing the macrophyte zone bathymetry

The bathymetry of constructed wetlands in the coastal dry tropics are to be designed to ensure that macrophytes can provide adequate pollutant removal during the wet season, and also be sustained during the dry season. To achieve this, the longitudinal bathymetry of the macrophytezone should gently grade (min 0.5% grade) from 0.7 m in depth (based on design normal water level) up to a central crest 0.5 m in depth and then back down to a maximum of 0.7 m in depth. This ensures that isolated pools of water are not created during the dry season when the normal water level slowly draws down due to evapotranspiration. Smaller deep open water permanent pools at the inlet and outlet of the wetland are required to provide habitat for mosquito predators during the dry season (Refer to Figure SC6.4.10.24 Schematic layout of a constructed wetland system and Figure SC6.4.10.25 Wet and Dry Season Conditions in a Constructed Freshwater Wetland). For large wetlands, this bathymetry could be repeated in series (I.e., a deep pool located between two macrophyte zones).

The macrophyte zone is to have a flat cross-sectional bathymetry only grading up at the edge batters (Figure SC6.4.10.34). This facilitates the even distribution of flows to avoid short circuiting,creates a uniform hydraulic conveyance and maximises stormwater contact with macrophyte stems and biofilms. This is also assisted by providing banded macrophyte planting perpendicular to the direction of flow (Figure SC6.4.10.35).

The deep open water pools should be 2 m in depth to ensure that a permanent pool of water is sustained throughout the dry season. This ensures habitat is retained for fish, macroinvertebrates (mosquito predators) and submerged macrophytes. Submerged macrophytes are important to provide habitat and for maintaining dissolved oxygen levels and therefore deeper pools (I.e., >2 m) should be avoided. A balance pipe connection between the deep pools is necessary to allow inflows in dry conditions to benefit and sustain the deep permanent pools. The surface area of deep refuge pool (excluding the

sediment basin) within the wetland should be between 20% and 30% of the total macrophyte area. This ensures the volume of water within the pools is sufficient to maintain permanent water during the dry season but not so large that the macrophyte zone is likely to experience dry periods of greater than 60 days (due to larger inflows required to fill the pools before wetting the macrophyte zone).

Editor's Note - Refer to Clause SC6.4.10.7 Plant Selection for WSUD Systems in the Coastal Dry Tropics for more detail on planting zones and suitable macrophyte species.

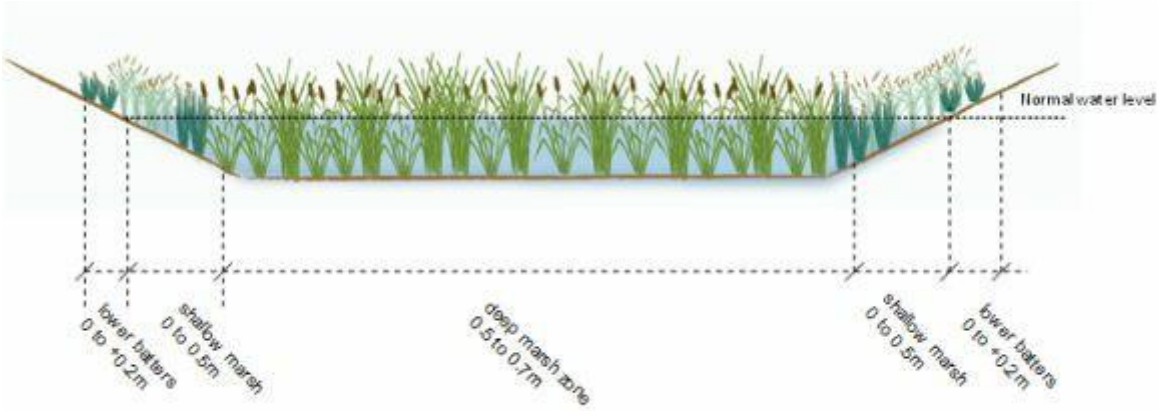


Figure SC6.4.10.34 - Typical Cross Section of a Constructed Wetland System ShowingPreferred Bathymetry and Planting Zones.

Figure S6.4.10.35 - Macrophyte Zone Banded Planting (direction of flow is from left to right)

(iii) Macrophyte zone edge design for safety

Consideration of public safety is required when wetlands are located in parklands/public open space, or any areas readily accessible. Reducing public safety risk can be achieved in a number of ways and the measures adopted should respond to the level of perceived risk given the particular site characteristics.

One method of reducing the risk posed by water bodies is to design batter slopes on approaches and immediately under the normal water level (refer Figure SC6.4.10.36). It is recommended that agentle slope to the water edge and extending below the water line be adopted before the batter slope steepens into deeper areas.

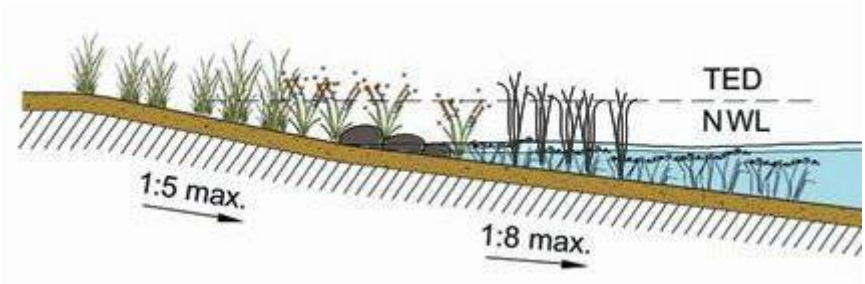


Figure SC6.4.10.36 - Example of a wetland edge design for public safety

The safety requirements for individual wetlands will vary from site to site and requires careful consideration. The following requirements from the *Sediment Basin Design, Construction andMaintenance Guidelines* (BCC 2001) can be applied to constructed wetland systems:

1. for water depths greater than 150 mm and maximum batter slope of 5:1 (H:V) or less, nofencing is required; and
2. for water depths greater than 150 mm and maximum batter slope greater than 5:1 (H:V)fencing may be required.

In some cases, vertical edges are used for wetlands (refer to Clause SC6.4.10.6 (5) Landscape design notes). When vertical edges are used, a safety fencing/ barrier should be considered on top of concrete or stone walls where:

1. there is a risk of serious injury in the event of a fall (over 0.5 m high and too steep to comfortably walk up/down or the lower surface has sharp or jagged edges);
2. there is a high pedestrian or vehicular exposure (on footpaths, near bikeways, near playing/ sporting fields, near swings and playgrounds);
3. where water ponds to a depth of greater than 300 mm on a constructed surface of concrete or stone;
4. where the water is expected to contain concentrated pollutants; and
5. where mowed grassed areas abut the asset.

The type of fence/ barrier to be considered should be a:

1. dense vegetation at least 2 m wide and 1.2 m high (minimum) may be suitable; or
2. pool fence (or similar) when there is a chance of drowning, and the surrounding area is specifically intended for use by small children (swings, playgrounds, sporting fields etc.).

(iv) Macrophyte zone soil testing

Constructed wetlands are permanent water bodies and therefore the soils in the base must be capable of retaining water. Geotechnical investigations of the suitability of the in-situ soils are required to establish the water holding capacity of the soils. Where the infiltration rates are toohigh for permanent water retention, tilling and compaction of in-situ soils may be sufficient tocreate a suitable base for the wetland. Where in- situ soils are unsuitable for water retention, acompacted clay liner may be required (e.g., 300 mm thick). Specialist geotechnical testing andadvice must be sought.

Wetland plants must be planted into suitable topsoil with a minimum depth of 200 mm (Refer to Clause SC6.4.10.6 (6)(d)Topsoil specification and preparation). Most terrestrial topsoils provide a good substratum for wetlands, nonetheless laboratory soil testing (using Australian Standard testing procedures, e.g., AS 4419-2003: Soils for landscaping and garden use) of topsoil is necessary to ensure the topsoil will support plant and

microbial growth and have a high potential for nutrient retention. Careful consideration should be given to the topsoil source and its propensity to contain weed seeds which may be viable in an ephemeral wetland habitat.

(e) Step 5: Design macrophyte zone outlet

A macrophyte zone outlet has two purposes: (1) hydrologic control of the water level and flows in the macrophyte zone to achieve the design detention time; and (2) to allow the wetland permanent pool to bedrained for maintenance.

(i) Riser outlet – size and location of orifices

The riser outlet is designed to provide a uniform notional detention time in the macrophyte zoneover the full range of the extended detention depths. The target maximum discharge ($Q_{max\ riser}$) may be computed as the ratio of the volume of the extended detention to the notional detentiontime as follows.

$$Q_{max\ riser} = \frac{\text{extended detention storage volume } (m^3)}{\text{notional detention time (s)}}$$

The placement of orifices along the riser, and determining their appropriate diameters is an iterativeprocess. The orifice equation (Equation 6.2) is applied over discrete depths along the length of the riser starting at the normal water level and extending up to the riser maximum extended detention depth.

$$A_o = \frac{Q}{C_d\sqrt{2 \cdot g \cdot h}} \qquad \text{(Small orifice equation)}$$

Where

C_d	=	orifice discharge coefficient (0.67)
h	=	depth of water above the centroid of the orifice (m)
A_o	=	orifice area (m^2)
Q	=	required flow rate to achieve notional detention time (m^3/s) at the *given h*
g	=	9.79 m/s^2

As the outlet orifices can be expected to be small, it is important that they are prevented from clogging by debris. Some form of debris guard is recommended as illustrated in Figure SC6.4.10.37 below. An alternative to using a debris guard is to install a riser in a pit located in the embankment surrounding the wetland macrophyte zone (thus reducing any visual impact). A riser within the pit can also be configured with a weir plate (by drilling holes through the plate). An advantage of using a weir plate is that it provides an ability to drain the wetland simply by removingthe weir plate entirely. Additionally, shorter weir plates may also be used during the vegetation establishment phase, thus providing more flexibility for water level manipulation.

Figure SC6.4.10.37 Example Outlet Riser Assemblies with Debris Guards

The pit is connected to the deep pool of the macrophyte zone via a submerged pipe culvert. The connection should be adequately sized such that there is minimal water level difference between the water within the pit and the water level in the macrophyte zone. With the water entering into the outlet pit being drawn from below the normal water level (I.e., pipe obvert a minimum 0.3 mbelow normal water level), floating debris is generally prevented from entering the outlet pit, while heavier debris would normally settle onto the bottom of the wetland. The riser pipe should be mounted upright on a socketed and flanged tee with the top of the pipe left open to allow overtopping of waters if any of the riser orifices become blocked. Figure SC6.4.10.38 and Figure SC6.4.10.39 show one possible configuration for a riser outlet pit.

Figure SC6.4.10.38 - Macrophyte Zone Outlet Arrangement

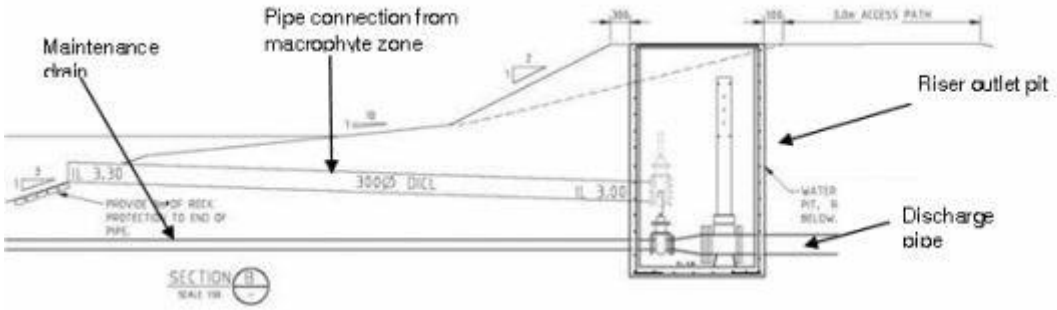


Figure SC6.4.10.39 - Typical Macrophyte Zone Outlet Arrangement

(ii) Maintenance drains

To allow access for maintenance, the wetland should have appropriate allowance for draining. A maintenance drainage pipe should be provided that connects the low points in the macrophyte zone bathymetry to the macrophyte zone outlet. A valve is provided on the maintenance drainage pipe (typically located in the outlet pit as shown in Figure SC6.4.10.39), which can be operated manually. The maintenance drainage pipe should be sized to draw down the permanent pool within 12 hours (I.e., overnight). If a weir plate is used as a riser outlet, provision should be made to remove the weir plate and allow drainage for maintenance.

(iii) Discharge pipe

The discharge pipe of the wetland conveys the outflow of the macrophyte zone to the receiving waters (or existing drainage infrastructure). The conveyance capacity of the discharge pipe is to be sized to match the higher of the two discharges (I.e., maximum discharge from the riser or the maximum discharge from the maintenance drain).

(iv) Balance pipe

A balance pipe connection between the deep permanent pools in the wetland is necessary to allowinflows in dry conditions to benefit and sustain all deep pools rather than just the pool located at the inlet. The deep pools are generally 2 m in depth and may experience up to 1m of draw down during the dry season. The invert of the balance pipe should therefore be located approximately 1 m below the normal water level. A 300 mm diameter pipe is typically sufficient for a balance pipe.

(f) Step 6: Design high flow bypass channel

The bypass channel accepts “above design flow” from the inlet zone (sediment pond) of the wetland viathe bypass weir and conveys these flows downstream around the macrophyte zone of the wetland. The bypass channel should be designed using standard methods (I.e., Manning’s Equation) to convey the “above design flow” and to avoid bed and bank erosion (see Chapter 2). Typically, a turf finish will provide appropriate protection for most bypass channel applications (but velocities need to be checked). Dense planting can be applied when appropriately designed for in terms of design roughness and management of velocities. Figure SC6.4.10.40 shows typical high flow bypass channel configurations.

Figure SC6.4.10.40 - Turfed Constructed Wetland High Flow Bypass Weir Configuration.

(g) Step 7: Verify design

Macrophyte Zone Resuspension Protection

(i) The principle pathway for biological uptake of soluble nutrients in wetlands is through biofilms (epiphytes) attached to the surface of the macrophyte vegetation. The biofilms, being mostly algae and bacteria, are susceptible to wash out under high flow conditions. Further, wetland surveys indicate that up to 90% of the total nutrients are stored in the sediments, therefore, the key to effective retention of pollutants is managing high velocity flows that could potentially resuspend and remobilise these stored pollutants.

A velocity check is to be conducted for design conditions, when the wetland water level is at thetop of the extended detention level and the riser is operating at design capacity, to ensure velocities are less than 0.05 m/s through all zones of the wetland. The following condition must bemet:

$$\frac{Q_{max\ riser}}{A_{section}} < 0.05 m/s$$

Where $Q_{max\ riser}$ = target maximum discharge (defined in Equation 6.1) (m^3/s)

Asection = minimum wetland cross-section area* (m^2) x 0.5 vegetation blockage factor**

*measured from top of extended detention

**blockage due to tall dense vegetation

(ii) Confirm treatment performance

If the basic wetland parameters established by the conceptual design phase have changed during the course of undertaking detailed design (e.g., macrophyte zone area, extended detention depth,etc.) then the designer should verify that the current design meets the required water quality improvement performance. This can be done by simulating the current design using a suitable quantitative modelling program.

(h) Step 8: Specify vegetation

Refer to Clauses SC6.4.10.6 (5) Landscape design notes and SC6.4.10.7 Plant selection for WSUD systems in the coastal dry tropics for advice on selecting suitable plant species for constructed wetlands.

(i) Step 9: Consider maintenance requirements

Consider how maintenance is to be performed on the wetland (e.g., how, and where is access available,where is litter likely to collect etc.). A specific maintenance plan and schedule should be developed forthe wetland, either as part of a maintenance plan for the whole treatment train, or for each individualasset. Guidance on maintenance plans is provided in Clause SC6.4.10.6 (7) Maintenance requirements - constructed wetlands.

(j) Design calculation summary

Following is Table SC6.4.10.17 Constructed wetlands design calculation summary, for the key designelements.

Refer to Clause SC6.4.10.8 Checklist K - Constructed Wetlands Design Calculation Summary or click here to view the document.

(5) Landscape design notes – constructed wetlands

Whilst constructed wetlands play a significant role in delivering stormwater quality objectives, they can also play an important role in creating a community landscapes and urban ecology. The following sections outlinesome of the landscape design issues that should be considered when designing constructed wetland systems.

(a) Objectives

Landscape design of wetlands generally requires consideration of the following objectives:

(i) integrated planning and design of constructed wetlands within the built and landscape environments ensuring that the overall landscape design for the wetland integrates with its host natural and/ or built environment;

(ii) achieving dense perennial littoral vegetation around the perimeter of the wetland to avoid the ingress of weed species. To maintain dense perennial littoral vegetation, irrigation is likely to berequired, particularly during the dry season;

(iii) ensuring that the wetland planting strategy is based on the wetland design depths/zones, achieves dense perennial emergent macrophyte cover and has the structural characteristics to perform particular treatment processes (e.g., well distributed flows, enhance sedimentation, maximise surface area for the adhesion of particles and provide a substratum for algal epiphytes and biofilms);

(iv) providing maintenance access to allow for the prompt removal of weeds before they spread and/orset seed;

(v) incorporating Crime Prevention Through Environmental Design (CPTED) principles; and

(vi) providing other landscape values, such as shade, amenity, character, and place making.

Comprehensive site analysis should inform the landscape design as well as road layouts, maintenance access points and civil works. Existing site factors such as roads, buildings, landforms, soils, plants,microclimates, services, and views should be considered. For further guidance refer to the *South-East Queensland WSUD Conceptual Design Guidelines* (Healthy Waterways Partnership, 2008).

(b) Wetland siting and shapes

Constructed wetlands need to be arranged to meet hydrological and stormwater quality requirements, butalso to integrate effectively into the surrounding existing landscape. The arrangement of wetland, basin and high flow bypass should be designed early in the concept design phase, to ensure that amenity of open space is enhanced.

The final shape of a wetland should provide landscape opportunities to create alternate useable spaces/recreation areas (see Figure SC6.4.10.41). Often different shapes to wetland edges can make pathway connections through and around these recreation areas more

convenient and enhances the community perception of constructed wetlands. Pathways and bridges across planted earth bunds can be the best way of getting across or around wetlands (see Figure SC6.4.10.42). The materials on the bridge and pathways are important to be low maintenance and do not impede hydrological flows. Ease of access to the inlet basin for sediment and trash removal is also important to consider.

The area required for the high flow bypass can be manipulated to provide open spaces that only periodically convey stormwater flows. Further discussion of high flow bypass configuration is provided in High flow Bypass Channel.

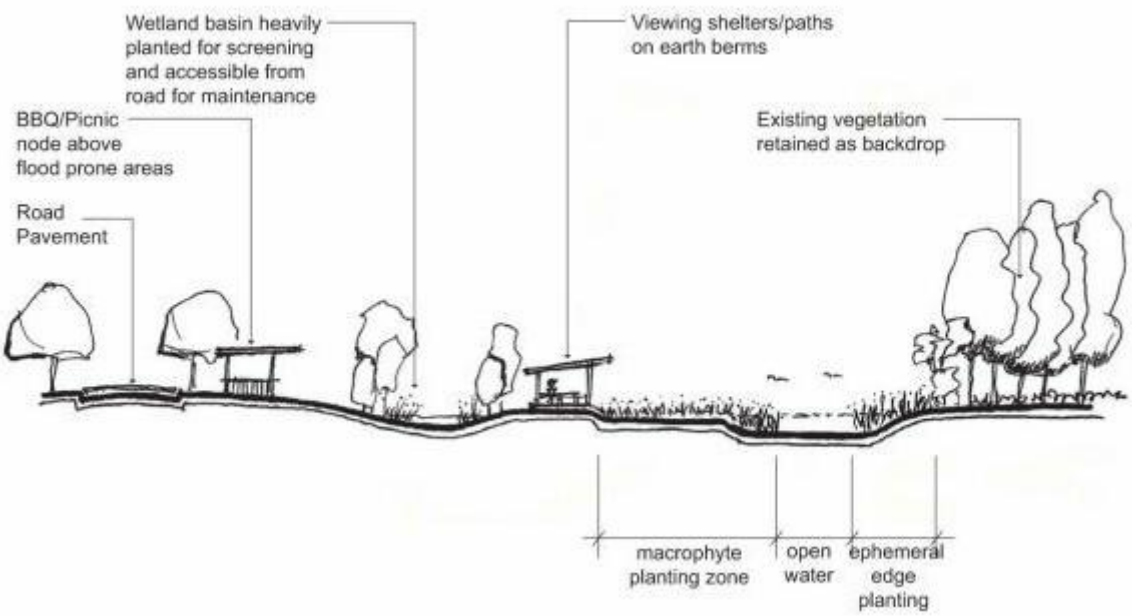


Figure SC6.4.10.41 - Typical Landscape Treatments to Constructed Wetlands in Open Space Areas

Figure SC6.4.10.42 - Boardwalk Treatment Over Wetland (left) and Integration of Urban Art with Wetland Setting (right)

(c) Specific landscape considerations

Numerous opportunities are available for creative design solutions for specific elements. Close collaboration between landscape designer, hydraulic designer, civil/structural engineer, and maintenance personnel is essential. In parklands and residential areas, the aim is to ensure elements are sympathetic to their surroundings and are not overly engineered or industrial in style and appearance. Additionally, landscape design to specific elements should aim to create places that residents, and visitors will come to enjoy and regard as an asset.

(i) Crossings

Given the size and location of wetland systems, it is important to consider if access is required across the wetland as part of an overall pathway network and maintenance requirement. Factors that should be considered include:

1. the appropriateness of hardwood timber board walks given their life-cycle costs. Where walkway footings are in contact with water, council will not accept timber piers;
2. if boardwalks are used, they should not be located near open water where they could encourage the public to feed wildlife; and
3. earth bunds located between the sedimentation basin and macrophyte zone can be used ascrossings and can be planted as shaded walkways.

Figure SC6.4.10.43 illustrates a conceptual earth bund walkway.

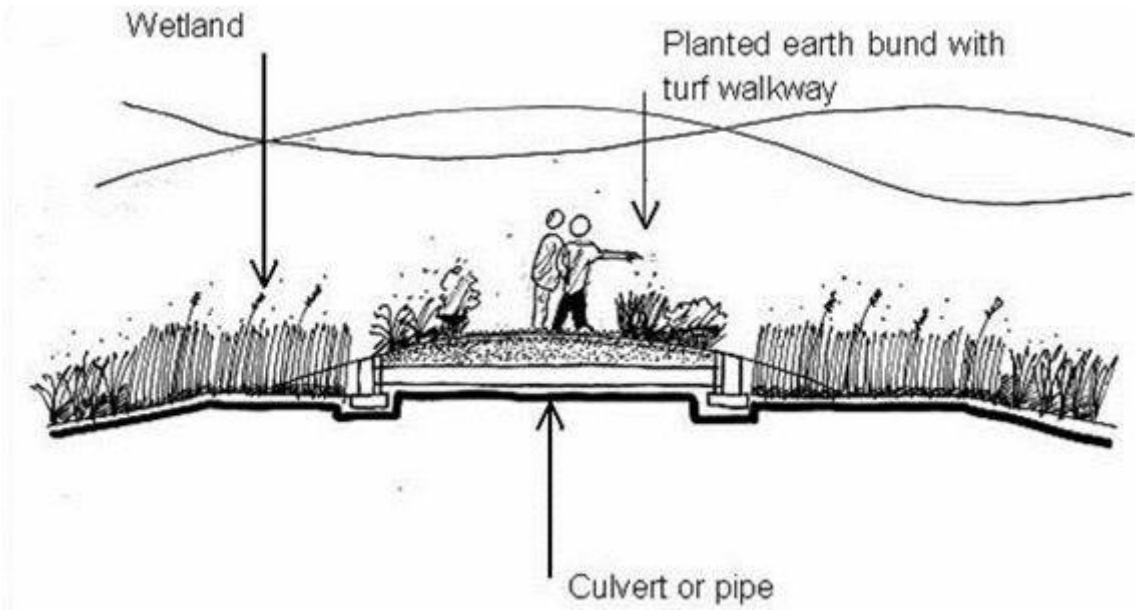


Figure SC6.4.10.43 - Earth Bund Structure as Wetland Crossing

(ii) Wetland embankments

The landscape design approach for the wetland embankments is similar to the approach taken for embankments in sedimentation basins.

(iii) High flow bypass channel

The high flow bypass channel will convey stormwater during above design flow and in some situations can form a large element in the landscape. Therefore, the design of the high flow bypassneeds to be carefully considered to provide recreational and landscape opportunities during times outside of above design flow events.

The key considerations for design of the high flow bypass area are as follows:

1. no major park infrastructure including playgrounds, barbeques, and amenity buildings to be located within the high flow bypass areas. Passive recreation infrastructure including seating and picnic tables are suitable provided they are of robust design;
2. in many cases, the high flow bypass will be formed through the use of turf, and in these cases the opportunity for creating more active spaces should be investigated;

3. designers should investigate the opportunities for locating trees and other vegetation types within the bypass channel. Provided hydraulic efficiencies can be accommodated, grassed mounds and landform;

4. grading of the embankment edge could also be explored to add variation and interest;

5. where groundcover species other than turf are adopted, plant species should be selected to ensure appropriate response after periodic flooding;

6. areas of large revegetation or garden beds that cut through the high flow bypass zoneshould use thick matting mulch types that bind well to the surface to minimise loss; and

7. the relationship between the high flow bypass channel and the permanent water bodies should be considered to create interesting spaces and forms within the open space. For example, after consideration of site constraints and hydraulic parameters, designers could investigate options to separate the elements from each other or to channel both elements alongside each other. Opportunities should also be sought to achieve balanced cut and fill earthworks. Figure SC6.4.10.44 provides an illustration of creation of open spaces through configuration of key wetland components.

(iv) Macrophyte zone outlet structure

Landscape design approach for the macrophyte outlet zone is similar to the approach taken foroverflow pits in sedimentation basins. Refer to *Water sensitive urban design for the coastal dry tropics (Townsville): Technical design guidelines for stormwater management*, Chapter 4, Section 4.4.3.6 for further guidance.

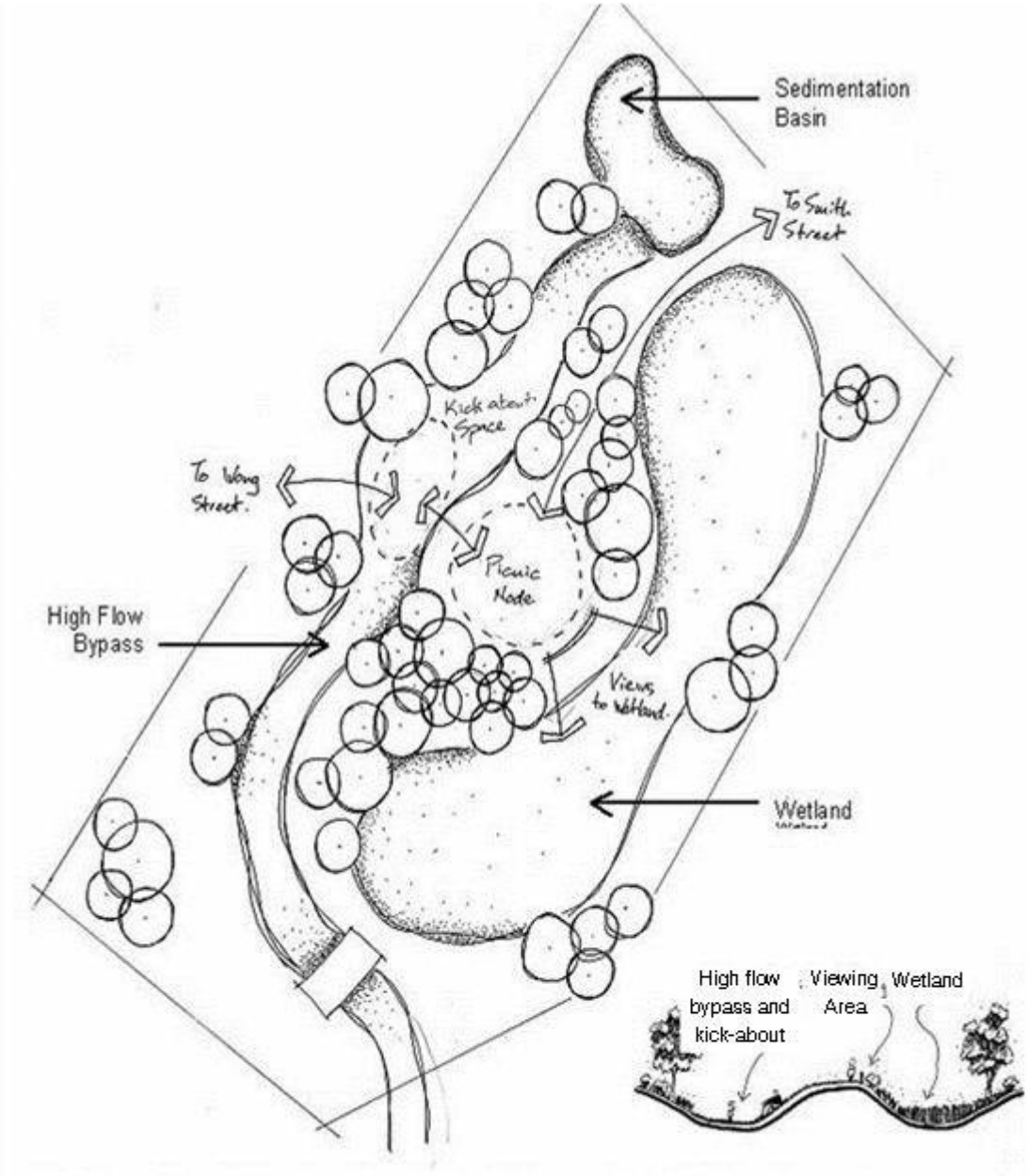
(v) Viewing areas

Refer to *Water sensitive urban design for the coastal dry tropics (Townsville): Technical design guidelines for stormwater management* Chapter 4, Section 4.4.3.8 for guidance.

(vi) Fencing

Refer to *Water sensitive urban design for the coastal dry tropics (Townsville): Technical design guidelines for stormwater management*, Chapter 4, Section 4.4.3.9 for guidance.

Editor's Note - These Chapter and Section references are to *Water Sensitive Urban Design Guidelines for South-East Queensland*.



Landscape design should explore options for siting the bypass, wetland and basin and analyse the potential for enhanced amenity. This process should initially take place at the concept development phase and can be refined during the detailed design.

Figure SC6.4.10.44 - Example Relationship Between High Flow Bypass Wetland and Basin, and the Creation of Open Space

(d) Constructed wetland vegetation

Planting for constructed wetlands systems may consist of up to three vegetation types:

(i) Macrophyte zone planting consisting of deep marsh (0.5 m – 0.7 m in depth at design normalwater level) and shallow marsh (edges) (0.5 m – 0 m in depth at design normal water level);

Macrophyte zone planting (from 1.0 m below to 0.2 m above design water level)

Clause SC6.4.10.7 Plant selection for WSUD systems in the coastal dry tropics provides guidance on selecting suitable plant species and cultivars that deliver the desired stormwater quality objectives for constructed wetlands. Often the most effective way to meet those objectives with the macrophyte planting is to create large bands of planting

perpendicular to flow that respond to designed depth zones and local biodiversity.

In general, macrophyte vegetation should provide:

1. well distributed flows;
2. enhanced sedimentation;
3. maximum surface area for the adhesion of particles;
4. a substratum for algal epiphytes and biofilms; and
5. habitat and refuge for fauna, both terrestrial and aquatic.

This is achieved by selecting species with many small diameter vertical leaves or stems and planting the vegetation in bands. When selecting suitable species, it is important to also note the ability of some species to be highly self-sustaining. Littoral planting should provide a dense bufferbetween the wetland and publicly accessible open space to discourage contact with the water.

(ii) Littoral vegetation (embankment) (above design normal water level) and parkland vegetation

Between the macrophyte zone and the top of the embankment, establishment of trees, shrubs andgroundcovers can occur in consideration of the following:

1. selecting groundcovers, particularly for slopes greater than 1 in 3, with matting or rhizomatous root systems to assist in binding the soil surface during the establishmentphase;
2. achieving dense perennial littoral vegetation around the perimeter of the wetland to avoid the ingress of weed species. To maintain dense perennial littoral vegetation, irrigation is likely to be required, particularly during the dry season;
3. preventing macrophyte zone plants and ground covers from being shaded out by minimising tree densities at the water's edge and choosing species such as Melaleuca that allow sunlight to penetrate the tree canopy;
4. locating vegetation to allow views of the wetland and its surrounds whilst discouraging the public from accessing the water body; and
5. parkland vegetation may be of a similar species to the embankment's littoral vegetation and layout to visually integrate the wetland with its surrounds. Alternatively, vegetation of contrasting species and/ or layout may be selected to highlight the water body as a feature within the landscape. Turf may be considered to achieve this goal.

(iii) Terrestrial plants, including existing vegetation, adjacent to the upper littoral edge.

(e) Safety issues

(i) General

Constructed wetlands need to be generally consistent with public safety requirements for new developments. These include reasonable batter profiles for edges to facilitate public egress from areas with standing water, and fencing, where water depths and edge profile requires physical barriers to public access. Fences can be substituted where possible by using dense edge plantings to deter public access to areas of open water. Dense littoral vegetation that can grow toaround 2 m high and 1.5 m wide are effective in deterring public access.

(ii) Restricting access to open water

Fences or vegetation barriers to restrict access should be incorporated into wetland areas, particularly on top of concrete or stone walls where:

1. there is a risk of serious injury in the event of a fall (over 0.5 m high and too steep to

comfortably walk up/ down or the lower surface or has sharp or jagged edges);

2. there is a high pedestrian or vehicular exposure (on footpaths, near bikeways, near playing/ sporting fields, near swings and playgrounds etc.);

3. where water ponds to a depth of greater than 300 mm on a constructed surface of concreteor stone. Natural water features are exempt; and

4. where grassed areas requiring mowing abut the asset.

Barriers that may be appropriate are:

1. dense vegetation at least 2 m wide and 1.2 m high (minimum) may be suitable; and pool fence (or similar) when there is a chance of drowning; and

2. the surrounding area isspecifically intended for use by small children (swings, playgrounds, sporting fields etc.).

Dense littoral planting around the wetland and particularly around the deeper open water pools of the sediment pond (with the exception of any maintenance access points), will deter public accessto the open water and create a barrier to improve public safety. Careful selection of plant species(E.g., tall, dense, or “spiky” species) and planting layouts can improve safety as well as preventing damage to the vegetation by trampling.

Dense vegetation (hedge) at least 2 m wide and 1.2 m high (minimum) may be suitable. A temporary fence may be required until the vegetation has established and becomes a deterrent to pedestrians.

An alternative to the adoption of a barrier/ fence is to provide a 2.4 m safety bench that is less than 0.2 m deep below the normal water level around the waterbody. This is discussed in *Water sensitive urban design for the coastal dry tropics (Townsville): Technical design guidelines for stormwater management*, Chapter 4 Section 4.3.3.3 with respect to appropriate batter slopes.

(6) Construction and establishment – constructed wetlands

This section provides general advice for the construction and establishment of constructed wetlands and keyissues to be considered to ensure their successful establishment and operation. Some of the issues raised have been discussed in other sections of this chapter and are reiterated here to emphasise their importancebased on observations from construction projects around Australia.

(a) Staged construction and establishment method

It is important to note that constructed wetlands, like most WSUD elements that employ soil and vegetation-based treatment processes, require approximately two growing seasons (I.e., two years) before the vegetation in the systems has reached its design condition (I.e., height and density). In the context of a large development site and associated construction and building works, delivering constructed wetlands, and establishing vegetation can be a challenging task. Therefore, constructed wetlands require a careful construction and establishment approach to ensure the wetland establishes in accordance with its design intent. The following sections outline a recommended staged construction and establishment methodology for constructed wetlands (Leinster, 2006).

(i) Construction and establishment challenges

There exist a number of challenges that must be appropriately considered to ensure successful construction and establishment of wetlands. These challenges are best described in the context ofthe typical phases in the development of a greenfield or infill development, namely the subdivision construction phase and the building phase.

1. Subdivision construction- nvolves the civil works required to create the landforms associated with a development and install the related services (roads, water, sewerage, power etc.) followed by the landscape works to create the softscape,

streetscape and parkscape features. The risks to successful construction and establishment of the WSUDsystems during this phase of work have generally related to the following:

a) construction activities which can generate large sediment loads in runoff which cansmother wetland vegetation; and

b) construction traffic and other works can result in damage to the constructed wetlands.

Importantly, all works undertaken during subdivision construction are normally "controlled" through the principal contractor and site manager. This means the risks described above can be readily managed through appropriate guidance and supervision.

2. Building phase - once the subdivision construction works are complete and the development plans are sealed then the building phase can commence (I.e., construction of the houses or built form). This phase of development is effectively "uncontrolled" due to the number of building contractors and sub- contractors present on any given allotment. For this reason, the allotment building phase represents the greatest risk to the successful establishment ofconstructed wetlands.

(ii) Staged construction and establishment method

To overcome the challenges associated within delivering constructed wetlands a staged construction and establishment method should be adopted (see Figure SC6.4.10.45):

1. Stage 1: Functional installation

   Construction of the functional elements of the constructedwetland at the end of subdivision construction (I.e., during landscape works) and the installation of temporary protective measures.

2. Stage 2: Sediment and erosion control

   During the building phase the temporary protective measures preserve the functional infrastructure of the constructed wetland against damage whilst also providing a temporary erosion and sediment control facility throughout the building phase to protect downstream aquatic ecosystems.

3. Stage 3: Operational establishment

   At the completion of the building phase, the temporarymeasures protecting the functional elements of the constructed wetland can be removed along with all accumulated sediment.

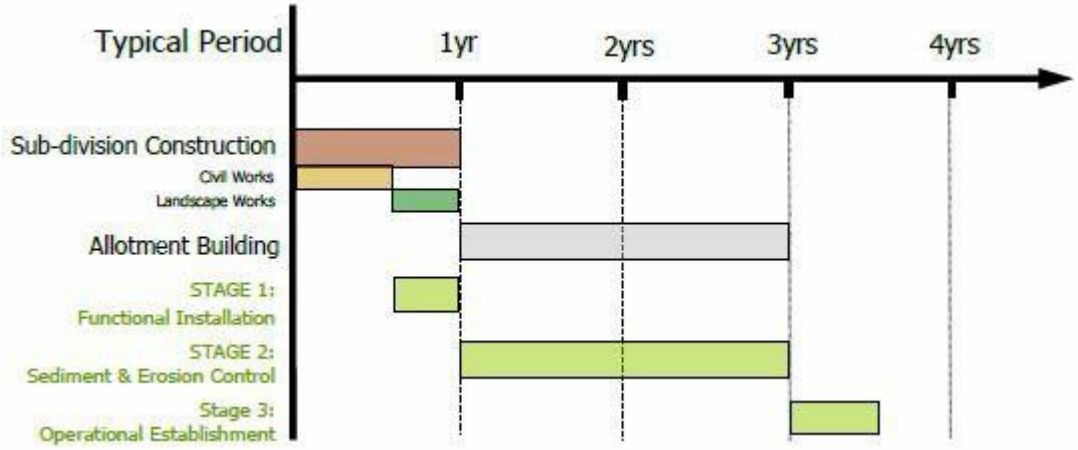


Figure SC6.4.10.45 - Staged Construction and Establishment Method

(iii) Functional installation

Functional installation of constructed wetlands occurs at the end of subdivision construction as part of landscape works and involves:

1. earthworks to configure the bathymetry of the wetland;
2. installation of the hydraulic control structures including inlet/outlet control and the high flowbypass weir;
3. placement of topsoil, trimming and profiling;
4. placement of turf in the High Flow Bypass channel to protect against erosion;
5. disconnecting the Inlet Zone from Macrophyte Zone and allowing all stormwater to flow along High Flow Bypass. This effectively isolates the Macrophyte Zone from catchment flows and allows the establishment of wetland plants without the risk of being smothered with coarse sediment during the Subdivision Construction and Allotment Building Phases;
6. planting of the Macrophyte Zone once the disconnection is in place;
7. water level in the Macrophyte Zone can be varied as required by the rate of wetland plant maturity by opening the connection for short periods or opening the outlet control. Irrigation of edges may be required; and
8. planting the littoral zone and providing irrigation to ensure fast establishment of dense vegetation to minimise weed growth.

Figure SC6.4.10.46 - Depicts the Functional Installation of a Constructed Wetland

(iv) Sediment and erosion control

During allotment building phases the sedimentation pond can be used to reduce the load of coarsesediment discharging to the receiving environment. The disconnection between the sediment pond and the macrophyte zone will remain in place to ensure the majority of flows from the catchmentcontinue to bypass the macrophyte zone thus allowing the wetland plants to reach full maturity without the risk of being smothered with coarse sediment (see Figure SC6.4.10.46).

This means the macrophyte zone can be fully commissioned and made ready for operation oncethe allotment building phase is complete.

Figure SC6.4.10.47 - Constructed Wetland Sediment and Erosion Control Operation

(v) Operational establishment

At the completion of the allotment building phase the sediment pond is de-silted, the disconnection between the sediment pond and macrophyte zone is removed and the constructed wetland is allowed to operate in accordance with the design.

Figure SC6.4.10.48 - Constructed Wetland Operational Establishment

(b) Construction tolerances

It is important to emphasise the significance of tolerances in the construction of constructed wetlandsystems. Ensuring the relative levels of the control structures (inlet connection to macrophyte zone, bypass weir and macrophyte zone outlet) are correct is particularly important to achieve appropriate hydraulic functions. Generally, control structure tolerance of plus or minus 5 mm is considered acceptable.

Additionally, the bathymetry of the macrophyte zone must be free from localised depressions and low points resulting from earthworks. This is particularly important to achieve a well distributed flow path andto prevent isolated pools from forming (potentially creating mosquito habitat) when the wetland drains.

Generally, an earthworks tolerance of plus or minus 25 mm is considered acceptable.

(c) Sourcing wetland vegetation

To ensure the specified plant species are available in the required numbers and of adequate maturity intime for wetland planting, it is essential to notify nurseries early for contract growing. When early orderingis not undertaken, the planting specification may be compromised due to sourcing difficulties, resulting inpoor vegetation establishment and increased initial maintenance costs. The species listed in Clause SC6.4.10.7 Plant selection for WSUD systems in the coastal dry tropics are generally available commercially from local native plant nurseries but availability is dependent upon many factors including demand, season, and seed availability. To ensure the planting specification can be accommodated the minimum recommended lead time for ordering is 3-6 months. This generally allows adequate time for plants to be grown to the required size. The following sizes are recommended as the minimum:

(i) viro tubes 50 mm wide x 85 mm deep;

(ii) 50 mm tubes 50 mm wide x 75 mm deep; and

(iii) native tubes 50 mm wide x 125 mm deep.

“Floral Edges”, a system of interlocking plants within one long container is recommended for wetlandplanting, particularly for the deep marsh zone. The series of plants (usually five) are grown together in asingle “strip” container. Generally, these “floral edges” are supplied as more mature plants with developing rhizomes (for rhizomatous species) and interlocking roots. This has been used very successfully in wetland planting previously because the larger more mature plants, often with a thick rhizome system, can survive in deeper water and are more tolerant to fluctuations in water level. The structure of this system slows the movement of water and binds the substrate, helping to reduce erosion.The weight of the interlocking plants also prevents birds from removing them, a common problem encountered during wetland plant establishment. Nurseries require a minimum lead time of 6 months for supply of these systems.

(d) Topsoil specification and preparation

The provision of suitable topsoil in wetlands is crucial to successful macrophyte establishment and to thelong-term functional performance of the wetland. Wetland macrophytes typically prefer medium textured silty to sandy loams that allow for easy rhizome and root penetration. Although there are a few plants that can grow in in-situ heavy clays (e.g., phragmites), growth is slow and the resulting wetland system will have low species richness, which is undesirable. The wetland must therefore have a layer of topsoilno less than 200 mm deep and preferably 300 mm in depth for improved dry season moisture retention.

During the wetland construction process, topsoil is to be stripped and stockpiled for possible wetland reuse as a plant growth medium. Most terrestrial topsoils provide a good substratum

for wetlands, nonetheless laboratory soil testing (using Australian Standard testing procedures, e.g., AS 4419-2003: *Soils for landscaping and garden use*) of the in-situ topsoil is necessary to ensure the topsoil will supportplant and microbial growth and have a high potential for nutrient retention. Typically, standard horticultural soil analysis, which includes major nutrients and trace elements, is suitable for topsoils intended for wetland use. The laboratory report will indicate the soils suitability as a plant growth medium and if any amendments are required.

Careful consideration should be given to the topsoil source and its propensity to contain weed seeds which may be viable in an ephemeral wetland habitat. If a problematic weed bank is likely to be presentwithin the topsoil, then importing alternative topsoil should be considered. If the in-situ topsoil is found tocontain high levels of salt, extremely low levels of organic carbon (<< 5%), or any other extremes that may be considered a retardant to plant growth, it should be rejected.

If the in-situ topsoil is not suitable and soil amendment is considered impractical or not cost effective,sandy loam topsoil should be purchased from a soil supplier. If the local topsoil is suitable but very shallow, mixing with an imported soil will be necessary to reach the required volume to ensure a minimum 200 mm deep topsoil for wetland planting.

Imported topsoils are generally suitable as wetland plant growth medium, however as for in-situ soils(above), testing is required to determine the appropriate gypsum or lime dosing rate. If the local topsoilwas tested and found to be suitable but then mixed with an imported soil to meet the required volume, laboratory soil testing should be repeated.

(i) Topsoil treatments

The wetland topsoil should be tested in accordance with AS 4419-2003: *Soils for landscaping andgarden use* to ensure it is appropriate for growth of vegetation. If testing finds the topsoil is not appropriate, then an alternative source should be found.

Topsoils for wetlands generally do not require fertiliser treatment. Imported foreign loam will contain sufficient nutrients for vegetation growth and local terrestrial topsoil will release nutrients after the wetting process. Submersion of terrestrial soils in water causes a shift from aerobic to anaerobicprocesses, prompting mineralisation and decomposition of organic matter contained in the soil, thus increasing available nitrogen. When soils become anaerobic, reduction processes cause iron oxides to be released from the surface of soil particles leading to increased availability of phosphorus. The addition of nutrients (fertiliser application) can facilitate the growth of algae (including cyanobacteria (blue green algae), particularly when the competing macrophytes and submerged plants are in the early stages of development, increasing the likelihood of algal blooms.

The topsoil within the wetland (macrophyte zones and open water zones) may need to be treated with gypsum or lime. The application of gypsum is standard on most construction sites for the purpose of securing or flocculating dispersive soils if entrained in runoff. The use of gypsum in wetland should only occur within catchments with dispersive soils and applied at a maximum rateof 0.4 kg/m^2. The application of lime may be required where the AS4419 (2003) soil testing identifies a potential soil pH problem (pH < 5) or where acid sulphate soils (ASS) exist in the vicinityof the wetland. The rate of lime application should be guided by soil test results, an ASS Management Plan and water quality (pH) monitoring of the wetland and inflow.

Gypsum/ lime should be applied about one week prior to vegetation planting. Subsequent application may be required at intervals depending on water quality monitoring. Application of gypsum/ lime too far in advance of planting may lead to aquatic conditions that promote algalgrowth (I.e., clear water with no aquatic plants competing for resources).

(e) Vegetation establishment

(i) Timing for planting

Timing of vegetation planting is dependent on a suitable time of year (and potential irrigation requirements) as well as timing in relation to the phases of development. October and Novemberare considered ideal times to plant vegetation in treatment elements. This allows for adequate establishment/ root growth before the heavy summer rainfall period but also allows the plants to go through a growth period soon after planting, resulting in quicker establishment. Planting late in the year also avoids the dry winter months, reducing maintenance costs associated with watering.

Construction planning and phasing should endeavour to correspond with suitable planting months wherever possible. However, as lead times from earthworks to planting can often be long, temporary erosion controls (e.g., use of matting or sterile grasses to stabilise exposed batters) should always be used prior to planting.

(ii) Water level manipulation

To maximise the chances of successful emergent macrophyte establishment, the water level of the wetland system is to be manipulated in the early stages of vegetation growth. When first planted, vegetation in the deep marsh zone may be too small to be able to exist in their prescribedwater depths (depending on the maturity of the plant stock provided). Macrophytes intended for the deep marsh sections will need to have half of their form above the water level, which may not bepossible if initially planted at their intended depth. Similarly, if planted too deep, the young, submerged plants will not be able to access sufficient light in the open water zones. Without adequate competition from submerged plants, phytoplankton (algae) may proliferate.

The water depth must be controlled in the early establishment phase. This can be achieved by closing off the connection between the sediment pond and the macrophyte zone (i.e. covering the overflow pit) and opening the maintenance drain. The deep marsh zones should have a water depth of approximately 0.2 m for at least the first 6 - 8 weeks. This will ensure the deep marsh zones of the wetland are inundated to shallow depth and the shallow marsh edges remain moist (muddy) providing suitable conditions for plant establishment. Seedlings planted in the littoral zones of the wetland will require ongoing watering at a similar rate as the terrestrial landscape surrounding thewetland. When it is evident that the plants are establishing well and growing actively, a minimum of 6 - 8 weeks following planting, the plants should be of sufficient stature to endure deeper water. At this time, the connection between the inlet pond and the macrophyte zone can be temporarily opened to allow slow filling of the wetland to the design operating water level.

(iii) Weed control

To protect landscape amenity and the stormwater treatment efficiency of the wetland it is important to maintain, throughout the year, the design vegetation communities to avoid excessivecolonisation of the wetland by weeds. Weed infestation is a major problem in the dry tropics, particularly within ephemeral waterways and stormwater treatment facilities, therefore, the design and management of the wetland to manage weed infestation takes on high importance.

Management of weeds is achieved as follows:

1. designing the macrophyte zone as predominately a deep marsh system (I.e., water depth 0.5 m - 0.7 m) to maintain the macrophyte vegetation by minimising the frequency and duration of wetland drying, thus permanently occupying the habitat and restricting weedcolonisation opportunities; and

2. planting dense littoral vegetation around the perimeter of the wetland to avoid the ingress ofweed species. To maintain dense perennial littoral vegetation, irrigation is likely to be required, particularly during the dry season; and maintaining dense macrophyte vegetation in the wetland during prolonged dry conditions is necessary to avoid opening up habitat opportunities for weeds. When the macrophyte zone dries (I.e., the macrophyte zone sediments are exposed) for a period in excessive of 60 days, irrigation of the macrophyte zone may be required to achieve this.

During the establishment and ongoing maintenance of the wetland, prompt removal of weeds before they spread and/or set seed is of critical importance.

Conventional surface mulching of the wetland littoral berms with organic material like tanbark is notrecommended. Most organic mulch floats and water level fluctuations and runoff typically causesthis material to be washed into the wetland with a risk of causing blockages to outlet structures.

Mulch can also increase the wetland organic load, potentially increasing nutrient concentrationsand the risk of algal blooms. Adopting high planting density rates and if necessary, applying a suitable biodegradable erosion control matting to the wetland batters (where appropriate), will help to combat weed invasion and will reduce maintenance requirements for weed removal. If the use ofmulch on the littoral zones is preferred, it must be secured in place with appropriate mesh or netting (e.g., jute mesh).

(iv) Watering

Regular watering of the littoral vegetation during the plant establishment phase is essential for successful establishment and vigorous growth. The frequency of watering to achieve successful plant establishment is dependent upon rainfall, maturity of planting stock and the water level withinthe wetland. However, the following watering program is generally adequate but should be adjusted(i.e. increased) as required to suit site conditions:

1. week 1-2 3 visits/ week;
2. week 3-6 2 visits/ week; and
3. week 7-12 1 visit/ week.

After this initial 3-month period, irrigation will still be required, particularly during the dry season. Watering requirements to sustain healthy dense vegetation should be determined during ongoing monitoring and maintenance site visits.

(v) Bird protection

During the early stages of wetland establishment, water birds can be a major nuisance due to theirhabit of pulling out recently planted species. Interlocking planting systems (I.e., where several plants are grown together in a single container such as “floral edges”) can be used, as water birds find it difficult to lift the interlocking plants out of the substrate unlike single plants grown in tubes.

(7) Maintenance requirements – constructed wetlands

Wetlands treat runoff by filtering it through vegetation and providing extended detention to allow sedimentation to occur. In addition, they have a flow management role that needs to be maintained to ensure adequate floodprotection for local properties and protection of the wetland ecosystem.

Maintaining healthy vegetation and adequate flow conditions in a wetland are the key maintenance considerations. Weeding, planting, mowing, and debris removal are the dominant tasks (but should not include use of herbicides as this affects water quality). In addition, the wetland needs to be protected from high loads ofsediment and debris and the inlet zone needs to be maintained in the same way as sedimentation basins (Refer to *Water sensitive urban design for the coastal dry tropics (Townsville): Technical design guidelines for stormwater management*, Chapter 4). Routine

maintenance of wetlands should be carried out once a month.

(a) The most intensive period of maintenance is during plant establishment period (first two years) when weed removal and replanting may be required. It is also the time when large loads of sediments couldimpact on plant growth, particularly in developing catchments with poor building controls. Debris removal is an ongoing maintenance function. If not removed, debris can block inlets or outlets, and can be unsightly if in a visible location. Inspection and removal of debris should be done regularly. Typical maintenance of constructed wetlands will involve:

(i) irrigation of the littoral zone plants (especially during dry periods) to prevent the ingress of invasiveweeds;

(ii) prompt removal of weeds before they spread and/or set seed is of critical importance;

(iii) desilting the inlet zone following the construction/ building period;

(iv) routine inspection of the wetland to identify any damage to vegetation, weed growth, scouring, formation of isolated pools, litter and debris build up or excessive mosquitoes;

(v) routine inspection of inlet and outlet points to identify any areas of scour, litter build up and blockages;

(vi) removal of litter and debris;

(vii) removal and management of invasive weeds;

(viii) repair to wetland profile to prevent the formation of isolated pools;

(ix) periodic (usually every 5 years) draining and desilting of the inlet pond;

(x) watering of wetland macrophytes during prolonged dry periods (in excess of 60 days);

(xi) water level control during plant establishment;

(xii) replacement of plants that have died (from any cause) with plants of equivalent size and species as detailed in the planting schedule; and

(xiii) vegetation pest monitoring and control.

Inspections are recommended following large storm events to check for scour and damage.

(b) All maintenance activities must be specified in a maintenance plan (and associated maintenance inspection forms) to be developed as part of the design procedure (Step 9: Consider Maintenance Requirements). Maintenance personnel and asset managers will use this plan to ensure thewetlands continue to function as designed. To ensure maintenance activities are appropriate for the wetland as it develops, maintenance plans should be updated a minimum of every three years. The maintenance plans and forms must address the following:

(i) inspection frequency;

(ii) maintenance frequency;

(iii) data collection/ storage requirements (I.e., during inspections);

(iv) detailed clean-out procedures (main element of the plans) including:

1. equipment needs;
2. maintenance techniques;
3. occupational health and safety;
4. public safety;
5. environmental management considerations;
6. disposal requirements (of material removed);

7. access issues;

8. stakeholder notification requirements; and

9. data collection requirements (if any); and

(v) Design details.

An approved maintenance plan is required prior to asset transfer to the local authority. Refer to theguidelines or direction from the relevant local authority for more specific guidance on requirements for asset transfer.

An example operation and maintenance inspection form is included in the checking tools provided in Operation and Maintenance Inspection Form. These forms must be developed on a site-specific basis as the configuration and nature of constructed wetlands varies significantly.

(8) Checking tools – constructed wetlands

A number of checking aids has been developed for designers and Council's development assessment officers. Inaddition, Clause SC6.4.10.6 (6) Construction and establishment provides general advice for the construction and establishment of wetlands and key issues to be considered to ensure their successful establishment andoperation, based on observations from construction projects around Australia.

(a) Design assessment

The checklist in Clause SC6.4.10.8 Checklist L presents the key design features to be reviewed when assessing a design of a wetland. These considerations include configuration, safety, maintenance, and operational issues that should be addressed during the design phase. Where an item results in an "N" when reviewing the design, referral should be made back to the design procedure to determine the impact of the omission or error. In addition to the checklist, a proposed design must have all necessary permits for its installations. Council development assessment officers will require supporting evidence/ proof from the developer that all relevant permits are in place.

Refer to Clause SC6.4.10.8 Checklist L- Wetland Design Assessment Checklist or click here to view the document.

(b) Construction (during and post)

The checklist in Clause SC6.4.10.8 Checklist M presents the key items to be reviewed when inspecting the bioretention basin during and at the completion of construction. The checklist is to be used by Construction Site Supervisors and Local Authority Compliance Inspectors to ensure all the elements ofthe bioretention basin have been constructed in accordance with the design. If an item receives an "N" in Satisfactory Criteria, then appropriate actions must be specified and delivered to rectify the construction issue before final inspection sign-off is given.

Refer to Clause SC6.4.10.8 Checklist M - Wetland Construction Inspection Checklist or click here to view the document.

(c) Operation and maintenance inspection

The example form in Clause SC6.4.10.8 Checklist N should be developed and used whenever an inspection is conducted and kept as a record on the asset condition and quantity of removed pollutants over time. Inspections should occur every 1 - 6 months depending on the size and complexity of the system. Moredetailed site-specific maintenance schedules should be developed for major constructed wetland systems and include a brief overview of the operation of the system and key aspects to be checked during each inspection.

Refer to SC6.4.10.8 Checklist N - Wetland Maintenance Checklist or click here to view the

document.

(d) Asset transfer (following on maintenance period)

Land ownership and asset ownership are key considerations prior to construction of a stormwater treatment device. A proposed design should clearly identify the asset owner and who is responsible for its maintenance. The proposed owner should be responsible for performing the asset transfer checklist. Clause SC8.4.10.8 Checklist O provides an indicative asset transfer checklist.

Refer to Clause SC8.4.10.8 Checklist O - Asset Transfer Checklist or click here to view the document.

(9) References – constructed wetlands

BCC 2000 (with revisions 2004), *Subdivision and Development Guidelines*, BCC, Brisbane BCC 2001, *Sediment Basin Design, Construction and Maintenance: Guidelines*, BCC, Brisbane Engineers Australia 2006, *Australian Runoff Quality, Engineers Australia*, ACT

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SC6.4.10.7 Plant selection for WSUD systems in the coastal dry tropics

(1) Introduction

This clause provides guidance on selecting appropriate plant species for water sensitive urban design (WSUD) systems where the plants have a functional role in stormwater treatment and/ or erosion protection. Selecting suitable plant species is critical to the long-term landscape amenity, functional performance, and structural integrity of WSUD systems.

Due to the strong seasonal rainfall patterns in the dry tropics, weed infestation is a major problem, particularlywithin ephemeral waterways and stormwater treatment facilities. The vegetation design to manage weed infestation takes on high importance and requires special consideration to achieve the following objectives:

(a) maintain, throughout the year, a dense cover of the design vegetation to occupy habitat and avoidexcessive colonisation by weeds;

(b) manage potential weed ingress from edges by sustaining perennial littoral vegetation;

(c) in bioretention systems the vegetation must be able to tolerate long dry periods, periodic inundation andfree draining sandy soils;

(d) provision of irrigation to wetland littoral zones; and

(e) provision of irrigation to bioretention systems designed without saturated zones.

Careful selection of plant species and by adopting suitably high planting densities can significantly reducecosts associated with weed management.

(2) Recommended plant species

A list of recommended plant species for various WSUD systems, including appropriate planting densities, isprovided in the following tables:

(a) Clause SC6.4.10.8 Attachment A1 Groundcover plant species list for swales (incorporating buffer strips), bioretention swales and bioretention basins and Clause SC6.4.10.8 Attachment A2 Shrub and Tree Plant Species list for bioretention basins:

(i) swales (incorporating buffer strips);

(ii) bioretention swales; and

(iii) bioretention basins; and

(b) Clause SC6.4.10.8 Attachment A3 Macrophyte and Groundcover Plant Species list for wetlands and sedimentation basins and Clause SC6.4.10.8 Attachment A4 Shrub and Tree Plant Species list for wetlands and sedimentation basins:

(i) sedimentation basins; and

(ii) wetlands.

The plant species lists in Clause SC6.4.10.8 Attachment A1 and Clause SC6.4.10.8 Attachment A2 are not exhaustive and other plants may be used provided their physiological and structural characteristics match the characteristics of the plant species listed in the tables.

Non-indigenous natives and exotics should only be considered when there is a specific landscape need, and thespecies has the appropriate growth form and habit. If non-indigenous natives and exotics are chosen, careful consideration should be given to the potential impacts on downstream receiving ecosystems. Species (including natives) that have the potential to become invasive weeds should be avoided.

(3) Plant selection

Swales (and buffer strips), bioretention swales and bioretention basins - plant selection

(a) Required plant characteristics

Planting for bioretention basin elements may consist of up to three vegetation types:

(i) groundcovers for stormwater treatment and erosion protection;

(ii) shrubbery for screening, glare reduction and character; and

(iii) trees for shading, character, and other landscape values.

For specific guidance on plant species the designer is directed to Clause SC6.4.10.8 Attachment A1 and Clause SC6.4.10.8 Attachment A2 which outline plant species suitable for the coastal dry tropics. The designer shouldalso refer to any relevant local guidelines.

(i) Groundcovers

The plant (groundcover) species listed in Clause SC6.4.10.8 Attachment A1 have been specifically selected, based on their life histories, physiological and structural characteristics, to meet the functional requirements of swales, buffer strips and bioretention systems (I.e., bioretention swales and bioretention basins). Bioretention

systems must have filter media with a minimum depth of 400 mm for groundcover plants to provide an adequate depth of aerobic soil for healthy root development.

Plant species selected for bioretention systems must be able to tolerate free draining sandy soilsand be capable of withstanding long dry periods punctuated by short periods of temporary inundation. The addition of saturated zones in bioretention systems will help retain moisture during the dry season where supplemental irrigation is not provided. Suitable plants species are listed in Clause SC6.4.10.8 Attachment A1. Where irrigation of bioretention systems is provided, a more diverse range of species may be selected to achieve the desired landscape aesthetic provided they are tolerant of the filter media conditions and have the required features to fulfil the functional roles of the WSUD element. In general, the plant species in Clause SC6.4.10.8 Attachment A1 have the following features:

1. they are able to tolerate short periods of inundation punctuated by longer dry periods. For bioretention systems these dry periods may be reasonably severe due to the free drainingnature (relatively low water holding capacity) of bioretention filter media. In the dry tropics climate irrigation of bioretention vegetation will be required unless saturated zones are provided to maintain soil moisture;
2. they generally have spreading rather than clumped growth forms;
3. they are perennial rather than annual;
4. they have deep, fibrous root systems;
5. groundcover plants can be turf, prostrate or tufted;
6. prostrate species would typically be low mat forming stoloniferous or rhizomatous plants; and
7. tufted species would typically be rhizomatous plants with simple vertical leaves.

Most of the groundcovers listed in Clause SC6.4.10.8 Attachment A1 are widespread, occurring throughout the coastal dry tropics. However, alternative locally occurring species that display the required features may be selected to tailor the species list to match the native vegetation associations of the area and to compliment surrounding vegetation communities.

(ii) Shrubs and trees

Shrubs and trees are not a functional requirement within swales, bioretention swales or bioretention basins, but can be integrated to provide amenity, character, and landscape value. Planting trees and shrubs in bioretention systems requires the filter media to have a minimum depth of 800 mm to avoid root interference with the perforated subsurface drainage pipes. They must also be accompanied by densely planted shade tolerant groundcover species with the characteristics outlined above. Trees and shrubs are to be managed so that the ground cover layeris not out-competed. To avoid over-shading, trees and shrubs should be planted at low densities.Periodic thinning of the upper vegetation layers may also be required. In general, tree and shrub species that can be incorporated into bioretention systems have the following general features:

1. trees need to be able to tolerate short periods of inundation punctuated by longer dry periods. These dry periods may be reasonably severe due to the free draining nature (relatively low water holding capacity) of bioretention filter media. In the dry tropics climateirrigation of bioretention vegetation will be required unless saturated zones are provided to maintain soil moisture;
2. they need to have relatively sparse canopies to allow light penetration to support dense groundcover vegetation;
3. have shallow root systems and root systems that are not known the be adventurous

"water seekers" to reduce the risk of root intrusion into subsurface drainage pipes;

4. trees must not be deciduous; and

5. preferably native and occur naturally in the local area.

The shrubs and trees listed in Clause SC6.4.10.8 Attachment A2 are recommended as they display the abovefeatures.

Most of the shrub and tree species listed in Clause SC6.4.10.8 Attachment A2 are widespread, occurring throughout the coastal dry tropics. However, alternative locally occurring species that display therequired features may be selected to tailor the species list to match the native vegetation associations of the area and to compliment surrounding vegetation communities.

(b) Plant species selection

Well established uniform groundcover vegetation is crucial to the successful operation of swale and bioretention system treatment elements. As a result, plant species selection needs to consider both the aesthetic and functional requirements. The functional plant traits required for effective water treatment aredifferent for different devices. For example:

(i) swales

require plants with vigorous growth and a spreading habit to hold soil in place against flow. They should also be suited to growth in wet clay soils. Examples include turf grasses, tuftedgrasses, and sedges;

(ii) bioretention swales

require plants with vigorous growth and a spreading habit to hold soil in place against flow. They should be drought tolerant and suited to growth in sandy soils. Examples include turf grasses, tufted grasses, and sedges;

(iii) bioretention basins

plants should be drought tolerant and suited to growth in sandy soils.

examples include grasses, shrubs, and trees. A diverse mix is recommended; and

(iv) when selecting plant species from Clause SC6.4.10.8 Attachment A1, consideration must be given to thefollowing factors:

1. other WSUD objectives such as landscape, aesthetics, biodiversity, conservation, and ecological value;

2. region, climate, soil type and other abiotic factors;

3. roughness of the channel (Manning's *n* roughness factor) (for swales); and

4. extended detention depth (for bioretention systems).

Typical heights of each plant species and comments relating to shade and salt tolerances and soil moisture requirements are provided in Clause SC6.4.10.8 Attachment A1 and will help with the selection process.

The low growing and lawn species are suitable for swale elements that require a low hydraulic roughness. The treatment performance of bioretention systems, in particular requires dense vegetation to a height equal to that of the extended detention depth. Therefore, a system with a 300 mm extended detention depth should have vegetation that will grow to at least 300 mm high. Turf is not considered to be suitable vegetation for bioretention basins. The stems do not grow high enough, and the root structure of turf is not suitably robust to ensure the surface of the bioretention filter media is continuously broken up to prevent clogging.

Included in Clause SC6.4.10.8 Attachment A1 is a recommended planting density for each plant species. The groundcover planting densities should ensure that 70-80% cover is achieved after two growing seasons (2 years) given adequate irrigation and weed control. High density planting to avoid weed ingress is particularly important in the dry tropics due to the climatic conditions which favour opportunistic (colonising) seasonal weed species. High density planting also ensures runoff does not establish preferential flow paths around the plants and erode the swale/ bioretention surface. Dense vegetation is also required to ensure a uniform root zone, which is particularly important in bioretention systems.

If prostrate shrubs that form scrambling thickets are used (in place of or in conjunction with the plant species in Clause SC6.4.10.8 Attachment A1 they should be planted at high densities (8-10 plants/m²) and mayrequire pruning to ensure even plant cover and to maintain an even root distribution below ground.

(c) Vegetation establishment and maintenance

Swales, buffer strips and bioretention basins are living systems and require two years of establishment before the vegetation matures and reaches fully functional form. During this establishment period, regular site monitoring and maintenance is critical to the success of these systems. In addition, specific requirements for plant stock sourcing, topsoil selection and testing and vegetation establishment, as detailed in the relevant WSUD element chapters, are necessary to maximise successful vegetation establishment and system treatment performance. Particular reference is made to the sections titled “Landscape Design Notes”, “Maintenance Requirements” and “Construction and Establishment” for guidance on vegetation establishment and maintenance procedures. The “Construction and Establishment” section also details a staged implementation approach by which the functional elements of the WSUD system are protected from building site runoff and associated sedimentation, weeds, andlitter during the building phase.

(4) Wetlands and sedimentation basins -plant selection

Due to the strong seasonal rainfall patterns in the dry tropics, weed infestation is a major problem, particularlywithin ephemeral waterways and stormwater treatment facilities such as wetlands and sediment basins.

Therefore, the design and management of these systems to manage weed infestation takes on high importance. Management of weeds is achieved through the plant selection and landscape design as follows:

(a) planting dense littoral vegetation around the perimeter of the wetland to avoid the ingress of weed species. To maintain dense perennial littoral vegetation, irrigation is likely to be required, particularlyduring the dry season; and

(b) designing the macrophyte zone as predominately a deep marsh system (I.e., water depth 0.5 m - 0.7 m) to maintain the macrophyte vegetation by minimising the frequency and duration of wetland drying, thus permanently occupying the habitat and restricting weed colonisation opportunities.

During the establishment and ongoing maintenance of the wetland, prompt removal of weeds before they spread and/or set seed is of critical importance.

(a) Required plant characteristics

Planting for wetlands and sedimentation basins may consist of two vegetation types:

(i) macrophyes and groundcovers for stormwater treatment, erosion protection and weed management. The macrophytes are divided further into several different zones as outlined in SC6.4.10.8 Attachment A3; and

(ii) shrubbery and trees for screening, shading, character, and other landscape values.

For specific guidance on plant species the designer is directed to SC6.4.10.8 Attachment A3 and SC6.4.10.8 Attachment A4 which outline plant species suitable for the coastal dry tropics.

(i) Macrophytes and groundcovers

The plant species listed in SC6.4.10.8 Attachment A3 have been specifically selected based on their life histories and physiological and structural characteristics, to meet the functional requirements of wetland systems. Plant species suitable for wetlands will also be suitable for edge planting around sedimentation basins. The following sections address wetlands specifically as they have very defined vegetation requirements for stormwater treatment. This includes consideration of the wetland zone/ depth range, typical extended detention time (typically 48 hrs) and extended detention depth (typically 0.5 m).

Other species can be used to supplement the core species listed in SC6.4.10.8 Attachment A3 provided they have the required features to fulfill the functional roles of the wetland zone. Careful consideration of the water depth range and wetland hydrological regime (water depth and inundation period) is also required to assess the suitability of alternate species for constructed wetlands. Wetland plants in the dry tropics must be able to tolerate large water level variations anddry periods of up to 60 days. Short growing emergent macrophytes will not be suitable for the deepmarsh zone as they will become over inundated. As a guide, emergent macrophytes require 1/3 of their foliage to extend above the water level 80% of the time. However, during the plant establishment phase emergent macrophytes require 50% of their foliage above the water level.

In general, the species in SC6.4.10.8 Attachment A3 have the following features:

1. they grow in water as either submerged or emergent macrophytes, or they grow adjacent towater and tolerate periods of inundation (typically sedge, rush, or reed species);
2. they generally have spreading rather than clumped growth forms;
3. they are perennial rather than annual;
4. they generally have rhizomatous growth forms;
5. they have fibrous root systems; and
6. they are generally erect species with simple vertical leaves (e.g., Juncus spp, Baumea spp).

(ii) Shrubs and trees

Shrubs and trees are not a required element of wetlands or sedimentation basins but can be integrated to provide amenity, character, and landscape value. Shrubs and trees (generally only planted in the littoral zones) should be accompanied by dense shade tolerant groundcover species as an understorey to occupy habitat and provide a weed ingress barrier. SC6.4.10.8 Attachment A4 provides a list of shrubs and trees that are natives to the coastal dry tropics and are suitable forplanting in the littoral zone (I.e., on the batters) around wetlands and sedimentation basins.

Littoral zone vegetation is primarily for weed management (to avoid weed ingress into the macrophyte zone), batter stabilisation, aesthetics and to restrict public access, rather than for stormwater treatment. For this reason, species that do not have all of the above structural features,but fulfill the primary littoral zone requirements (e.g., weed management and erosion protection) and landscape objectives may still be acceptable for inclusion in this zone (refer to the “LandscapeDesign Notes” section in the relevant WSUD chapter).

(b) Plant species selection

Plant species listed in SC6.4.10.8 Attachment A3 are recommended as core species for wetland planting. These plant species have been grouped into a wetland macrophyte zone according to their preferred water depth and the hydrologic conditions of the zone. The perennial wetland plants must be able to tolerate large water level variations and periodic drying (potentially of up to 60 days duration). In general,the deep marsh emergent macrophytes must be capable of a standing water level of 0.5 m – 0.7 m punctuated with short episodes of extended detention (up to 1.2 m in total water depth) and seasonal drying.

While individual plant species can have very specific water depth requirements other species can be quite adaptive to growing across various zones over time. It is however, recommended that the suggestedzones and plant groups are adhered to for planting purposes. Plant species listed against the shallow marsh and lower batters are only suited for edge planting in wetlands and sedimentation basins. Planting densities recommended should ensure that 70-80 % cover is achieved after two growing seasons (2 years). This is particularly important for weed management and therefore the recommended planting densities should not be reduced.

Suitable plant species for the littoral zone that surrounds wetlands and sedimentation basins have also been recommended in SC6.4.10.8 Attachment A3. The littoral zone relates to the berms, batters, or embankments around the systems. Plants that have a drier habit should be planted towards the top of batters, whereas those that are adapted to more moist conditions should be planted closer to the waterline. High density planting of the littoral zone is required to provide a barrier (by occupying habitat) to prevent weed ingress into the wetland or sediment basin

(c) Vegetation establishment and maintenance

To maximise the success of plant establishment in wetland macrophyte zones specific procedures are required in site preparation, stock sourcing, vegetation establishment and maintenance. Reference is tobe made to procedures detailed in Sourcing Wetland Vegetation as follows:

(i) sourcing plant stock (Clause SC6.4.10.6 (6)(c) Sourcing wetland vegetation):

1. lead times for ordering plants; and
2. recommended planting systems/ products;

(ii) topsoil specification and preparation (Clause SC6.4.10.6 (6)(d)) Topsoil specification and preparation):

1. sourcing, testing and amendment; and
2. topsoil treatments (e.g., gypsum, lime, fertiliser); and

(iii) vegetation establishment (Clause SC6.4.10.6 (6)(e) Vegetation establishment):

1. weed control;
2. watering; and
3. water level manipulation.

Constructed wetlands are living systems and they require two years of establishment before the vegetation matures and reaches fully functional form. During this establishment period, regular site monitoring and maintenance is critical to the success of these systems. Reference must also be made to the Clauses SC6.4.10.6 (7) Maintenance requirements – constructed wetlands and SC6.4.10.6 (6) Construction and establishment – constructed wetlands for guidance on maintenance procedures and vegetation establishment.

Similarly, the vegetation planted in sedimentation basins require an equivalent vegetation establishment period (I.e., 2 years) and level of attention to site preparation, stock sourcing, vegetation establishment and maintenance to ensure success. Reference must be made to the sections entitled “Landscape Design Notes”, “Maintenance Requirements” and “Construction and Establishment” in *Water sensitive urban design for the coastal dry tropics (Townsville): Technical design guidelines for stormwater management*, Chapter 4.

(d) Vegetation selection for mosquito management

Species selected should have a stiff, thin, upright growth habit. This allows mosquito predators to accessall wet areas and control mosquito larvae. Species with a spreading habit such as turf grasses or wide strappy leaves such as Typha can isolate pockets of water where mosquitoes can breed and avoid predation.

(5) References – plant selection

BCC 2005, *Growing Native Plants in Brisbane, BCC,* Brisbane, accessed 25th July 2005

BCC, DMR & PRSC (Brisbane City Council, Queensland Department of Main Roads and Pine Rivers Shire Council) 2001, *Preferred Species Manual: Green Routes Program*, prepared for the Green Routes Program byBCC, DMR and PRSC, Brisbane

SC6.4.10.8 Attachments and checklists

Checklists and Attachments	**To obtain a copy of the document**
Checklist A - Bioretention Swales Design Calculation Summary	Click here
Checklist B - Bioretention Swale Design Assessment Checklist	Click here
Checklist C - Bioretention Swale Construction Inspection Checklist	Click here
Checklist D - Bioretention Swale Maintenance Checklist	Click here
Checklist E - Bioretention Swale Asset Transfer Checklist	Click here
Checklist F - Bioretention Basin Design Calculation Summary	Click here
Checklist G - Bioretention Basin Design Assessment Checklist	Click here
Checklist H - Bioretention Basin Construction Inspection Checklist	Click here
Checklist I - Bioretention Basin Maintenance Checklist	Click here
Checklist J - Bioretention Basin Asset Transfer Checklist	Click here
Checklist K - Constructed Wetlands Design Calculation Summary	Click here
Checklist L - Wetland Design Assessment Checklist	Click here
Checklist M - Wetland Construction Inspection Checklist	Click here
Checklist N - Wetland Maintenance Checklist	Click here
Checklist O - Asset Transfer Checklist	Click here
Attachment A1 - Groundcover Plant Species List for Swales (incorporating buffer strips), Bioretention Swales and Bioretention Basins	Click here
Attachment A2 - Shrub and Tree Plant Species List for Bioretention Basins	Click here
Attachment A3 - Macrophyte and Groundcover Plant Species List for Wetlands and Sedimentation Basins	Click here
Attachment A4 - Shrub and Tree Plant Species List for Wetlands and Sedimentation Basins	Click here

Development manual planning scheme policy (PSP)
SC6.4.11 Water and sewerage

Index

SC6.4.11.1 Water and sewerage infrastructure

(1) Introduction - planning and design guidelines
(2) Introduction - network modelling guidelines
(3) Determining when to complete a network modelling analysis.
(4) Provision of the TCC network model data
(5) General requirements for network modelling
(6) Copyright and ownership of submitted models

SC6.4.11.2 Water supply planning and design guidelines

(1) Introduction
(2) Water supply planning
(3) Bulk water storage and water treatment
(4) Water network modelling
(5) Pump stations
(6) Storage reservoirs
(7) Water mains

SC6.4.11.3 Water supply construction

(1) Introduction
(2) Materials
(3) Valves and hydrants
(4) Pipeline construction
(5) Pipeline testing and restoration
(6) Pump stations
(7) Construction compliance

SC6.4.11.4 Sewerage planning and design guidelines

(1) Introduction
(2) Sewage collection system planning
(3) Sewer network modelling
(4) Gravity sewer design
(5) Sewage pump station design
(6) Pressure main design

SC6.4.11.5 Sewerage system construction

(1) Introduction
(2) Materials
(3) Pipeline construction
(4) Pipeline testing and restoration
(5) Pump stations
(6) Construction compliance

SC6.4.11.6 Water and sewerage electrical and mechanical

(1) Introduction
(2) Electrical supply requirements
(3) Emergency power supply
(4) Determining electrical site loads

(5) Electricity point of supply
(6) Cabling
(7) Wiring enclosures
(8) Switchboard design guidelines
(9) Monitoring/control guidelines
(10) Field equipment installation, wiring and terminations
(11) Radio telemetry and SCADA system
(12) Mechanical services
(13) Equipment manuals

SC6.4.11.7 On-site water supply

(1) Introduction
(2) On-site water supply general requirements
(3) Water quality for on-site supplies generally
(4) Rainwater harvesting (tanks)
(5) Groundwater (bore water)
(6) Surface water
(7) Carted drinking water
(8) Recycled water
(9) Non-restricted water supply risks
(10) Requirements for non-potable water supply
(11) Requirements for fire-fighting supply
(12) Water resource catchment overlay

SC6.4.11.8 On-site sewerage facilities

(1) Introduction
(2) Application guidelines
(3) Design considerations

SC6.4.11.9 Attachments, forms and checklists

Attachment A - Applicant's Network Model Needs Consultation Process
Attachment B - Map of Available Sewer Network Model Areas (ex Toomulla)
Online Form A - Form M1: Request for Network Modelling Information
Checklist A - Model Submission Checklist (Water and Sewer)

SC6.4.11.1 Water and sewerage infrastructure

(1) Introduction – planning and design guidelines

(a) General

This section has been developed to document the requirements for delivery of water and wastewater services to the community.

(b) Intent of the section

This section has been developed to detail relevant information pertaining to planning and design projects, and to collate Council practices not documented elsewhere. Its intended use is as a reference manual for:

(i) internal Council staff;

(ii) external consultants engaged to perform specific commissions; and

(iii) developments that include water and wastewater infrastructure.

(c) Application

These guidelines shall apply to sewerage and water supply distribution, collection, and pumping in the areas of:

(i) planning;

(ii) design;

(iii) technical specifications for approval;

(iv) preparation of technical contract documentation; and

(v) collection and submission of As Constructed details.

It excludes information on the presentation of drawings.

(d) Purpose

The purpose of these guidelines is to ensure that:

(i) all water supply and sewerage works are planned, designed and constructed to common standards throughout Townsville city and comply with codes and standards established by the relevant government authorities; including the *CTM Water Alliance Design and Construction Code*;

(ii) the reticulation and pumping systems provided are hydraulically adequate for the demands from the currently planned stage of development within any Water Supply/Sewerage Scheme at any point in time;

(iii) the total system of reticulation, pumping, and treatment, is progressively planned and developed with adequate capacity to meet the ultimate requirements of the particular Water Supply/Sewerage Scheme; and

(iv) the quality of water supplied, and the quality of effluent disposed by the Council meets acceptable minimum standards established by the relevant government authorities.

(e) Cairns, Townsville, Mackay (*CTM*) *Water Alliance Design and Construction Code*

Unless otherwise noted within these guidelines, the *CTM Water Alliance Design and Construction Code* (including associated references) applies to the planning, design and construction of all water and wastewater works in Townsville. The document is included as intrinsic material to the Development Manual.

(f) Acceptance of designs and documentation

Externally produced designs and documentation including drawings shall be certified by a Registered Professional Engineer of Queensland (RPEQ).

(2) Introduction – network modelling guidelines

(a) Reference and source documents:

Clause SC6.4.11.2 (4) and SC6.4.11.4 (3) Water and sewer network modelling guidelines must be read in conjunction with:

Clauses SC6.4.11.2 Water planning and design guidelines and SC6.4.11.4 Sewerage planning and design guidelines;

Cairns, Townsville, Mackay (*CTM) Water Alliance Design and Construction Code*; and

Townsville City Plan.

Editor's Note - These guidelines are not intended for use in building hydraulic services or irrigation design.

(3) Determining when to complete a network modelling analysis.

The circumstances under which a network model is required is listed under Clauses SC6.4.11.2 (4) Water network modelling, and SC6.4.11.4 (3) Sewer network modelling. The process flow chart in Clause SC6.4.11.9 Attachment A demonstrates the decision process that is to be followed when considering the requirement for a network analysis.

(a) Available information

Planning demand and loading rates for water and sewerage infrastructure design are listed in Part 4 Local Government Infrastructure Plan of the Townsville City Plan.

Council has established a number of sewer network models covering service catchments across the city. A map showing sewer catchments, modelling status and latest planning report information can be requested from the Development Assessment Unit (DAU) of Council.

A city-wide water network model is also available for use.

Editor's Note - Access to Council's citywide water and/or sewer network model/s are available to appropriately qualified users approved by the Strategic Infrastructure Planning Unit of Council.

Plans for Trunk Infrastructure (PFTI) are available and detail trunk infrastructure that is planned for by Council to service the Priority Infrastructure Area (PIA). These should also be referred to in order to determine if your development may affect or should take into consideration planned infrastructure in its vicinity.

(b) Conducting a preliminary needs analysis

An applicant for a development must follow the flow chart in Clause SC6.4.11.9 Attachment A for their development to identify any potential impacts on the water and sewer networks. Where an impact is anticipated, it is likely that an analysis will be required to demonstrate compliance with design standards. The level of modelling assessment required is dependent on the impact expected.

Editor's Note - Designers should contact the DAU of Council to confirm the level of modelling necessary. It is encouraged that this assessment be completed prior to application lodgement to ensure an efficient approval process.

Editor's Note - The "Preliminary Needs Analysis" will determine if:

(i) a network analysis is not required; or

(ii) you are required to do a simplified network analysis; or

(iii) you are required to do a detailed network analysis, involving establishment of a new model, or use an existing model; or

(iv) you need to incorporate a network modification in your application, with details specified by Council.

(v) If a network analysis is required, it must be done in accordance with these guidelines.

(4) Provision of the TCC network model data

(a) Requesting information to inform your analysis

Modellers may request boundary condition information from Council, and/or access to Council's network models by submitting a “Request for Network Modelling Information” form included in Clause SC6.4.11.9 Online Form A - Form M1 - Request for network modelling information.

Editor’s Note - Click here to view Online Form A - Form M1 - Request for network modelling information.

In most cases it is desired that boundary condition information is sufficient to enable a modeller to prepare their own network model. However, depending on the size or impact of the development being considered, it may be necessary for the modeller to utilise Council’s network models to demonstrate:

(i) in the case of the sewer network:

1. receiving network capacity is sufficient; and
2. modified or realigned infrastructure as a result of the development has not adversely affected existing or planned for system hydraulics; and

(ii) in the case of the water network:

1. network supply capacity is sufficient; and
2. existing network hydraulic capacity is not adversely affected by any changes to the supply network as a result of the proposed development.

Generally, where trunk infrastructure may be affected by the proposed works, Council’s network models must be used to verify the impact and identify required mitigation/augmentation options.

(b) Access to Council’s models

Access to Council's network model/s is available to appropriately qualified users approved by the Infrastructure Planning Unit of Council.

Editor's Note - For information on the approval process applicants should contact the Strategic Infrastructure Planning Unit of Council.

Council will make available copies of the relevant model/s to enable analysis of a development or for viewing existing network model information. The applicant must apply for copies of Council's network model/s by submitting the duly completed Agreement Contract Form - SC6.4.11.9 Online Form A - Form M1 - Request for network modelling information form. The modeller will need o agree to Council’s terms of use on this form.

(5) General requirements for network modelling

(a) Scale and spatial reference

“Simplified Models” may be developed as representative schematics of the proposed network. Manual calculations without the use of network modelling software may be permitted.

“Detailed Models” shall be constructed based on proposed design and/or development layouts. The layouts may be schematic but should remain representative of the proposed development layout. In order to enable import of models into Council’s existing network models, they shall be developed to the GDA1994 MGA Zone 55 coordinate system unless otherwise notified.

(b) Modelling timeframes

Refer to Sections 5.1 and 11.1 of the *CTM Water Alliance Design and Construction Code*. In particular, the reporting years shall coincide with the census collection years viz. 2026, 2031, 2036, and ultimate design scenario.

(c) Model calibration

Refer to *CTM Water Alliance Design and Construction Code*.

(d) Modeller experience and qualifications

Network modelling must be carried out by professionals suitably experienced and qualified in the undertaking of network modelling analysis and design. Models, associated reports, and designs must be certified by the appropriately qualified and experienced RPEQ.

(6) Copyright and ownership of submitted models

When a technical report or study is submitted to Council as part of a development application, this report/study, along with all components of the submission, can be made available to the public as part of the notification stage. The report can be provided to anyone seeking the report during this stage and following the approval. Use of the report for any third-party use will be at the complete risk of the third party. It should be noted that only the approved report including any Council requested amendments, will be referred to in future.

Once a development application is approved Council is permitted to use the model for incorporation into its overall city water and sewer models to inform its infrastructure planning.

SC6.4.11.2 Water supply planning and design guidelines

(1) Introduction

(a) Scope

The work to be carried out under Clause SC6.4.11.2 includes the design of a water supply system either as a stand-alone project or as part of a development.

(i) Inclusions

Clause SC6.4.11.2 covers the design of water infrastructure elements as per the scope of the CTM Water Alliance Design and Construction Code.

(ii) Exclusions

Clause SC6.4.11.2 does not cover requirements for:

1. bulk water storage – dams etc; and
2. water treatment plant design considerations.

Bulk water supply infrastructure will be planned and designed by Council in conjunction with experienced specialist consultants.

(b) Reference and source documents

Clause SC6.4.11.2 is to be read in conjunction with the current version of the following documents:

Section SC6.4.3 Standard drawings

Editor's Note - Standard drawings other than water and sewerage (such as road crossings) also contain information on water and sewerage infrastructure and shall also be referred to.

Cairns, Townsville, Mackay (CTM) Water Alliance Design and Construction Code; and

Workplace Health and Safety Queensland, Safe Design of Structures – Code of Practice.

(c) Document precedence

The order of precedence (highest to lowest) of documents shall be:

(i) This section;

(ii) *Cairns, Townsville Mackay* (*CTM) Water Alliance Design and Construction Code*; and

(iii) Section SC6.4.3 Standard drawings.

(2) Water supply planning

(a) Scope

Water supply system planning covers the requirements of the water distribution and reticulation system from the bulk supply system to the service connections. This includes pump stations, storage reservoirs, trunk water mains, and reticulation mains.

(b) Hydraulic loading assessment

(i) General

Refer to Section 5 of the *CTM Water Alliance Design and Construction Code*.

Hydraulic loadings shall be determined in terms of equivalent persons (EP) and developed into flows using the unit loading factors and peaking factors detailed in the following sections.

(ii) Equivalent population estimations

The ultimate equivalent population (EP) used to determine design flows shall be determined from the following:

1. designated value of EP per hectare for each zone type provided in Section 4.2.3 of Part 4 of the Townsville City Plan;
2. the location of various zone types as specified in the Townsville City Plan;
3. an assessment of the ultimate population, including the expected peak occupancy rates and the quantity of undeveloped land for each zone type listed in the Townsville City Plan; and
4. estimation of contributing loads for “Special Purpose” zonings (university, refineries, hospitals, etc.) shall be determined by an analysis of historic consumption and consultation with the institution regarding future development.

Editor's Note - Where staging of the works is necessary, the planner is to consider the expected growth rate for the area to develop loadings for intermediate planning horizons. This shall be based on the Council Growth Model which is available from Strategic Infrastructure Planning Unit. This model is based on population projection information available from the Planning Information Forecasting Unit (PIFU) and Queensland Government Statistician’s Office.

(iii) Design flows

Peak demands are to be calculated in accordance with *CTM Water Alliance Design and Construction Code Section 5.*

(iv) Design criteria

Water supply systems shall be sized in accordance with the requirements of *CTM Water Alliance Design and Construction Code* Part B.

(c) Network planning

(i) Purpose

Network planning is to be undertaken to meet the objectives of the *CTM Water Alliance*

Design and Construction Code Part A.

(ii) Network modelling

A water network model is required for all code or impact assessable material change of use (MCU)and reconfiguring a lot (RAL) applications where:

1. new trunk and/or reticulation mains are to be constructed as part of a development; or
2. the development requires trunk infrastructure identified in Council's Plans for Trunk Infrastructure to be constructed ahead of its planned date, or out of sequence identified in master planning; or
3. the proposed land use results in an increase in demand greater than what is presently allowed for in the Townsville City Plan; or
4. water mains are required to be relocated or reconfigured as part of the proposed works, and these works are expected to change the hydraulics of the existing supply.

   Council also requires the development of a network model for:

   a) the preparation of Infrastructure Master Plans; and

   b) the preparation of Plans for Trunk Infrastructure.

Network modelling shall be undertaken in accordance with the *CTM Water Alliance Design and Construction Code* Section 5.6.

(iii) Level of assessment

Depending on the type of works in question, simplified or detailed modelling may be required todemonstrate compliance with these guidelines. Simplified or detailed assessments are defined below:

1. Simplified assessment

   An assessment that demonstrates network capacity through manual calculations, or through the use of simplified network models (schematic style models); and

2. Detailed assessment

   An assessment involving the preparation of detailed network models based on proposed design and/or development layouts.

Water and sewerage network modelling guidelines outline the process to be followed to obtain Council advice as to what level of assessment is required.

(iv) Timeframes

Master planning and associated whole of life cost analysis shall be undertaken in accordance with timeframes as indicated in the *CTM Water Alliance Design and Construction Code* in addition to the existing scenario. In particular, the reporting years shall coincide with the census collection years viz. 2026, 2031, 2036, and ultimate design scenario.

Council may request that master planning consider provision to adjacent developments to enable an efficient trunk network.

(3) Bulk water storage and water treatment

(a) General

Bulk water storage and water treatment are considered trunk assets and are beyond the scope of SC6.4 Development manual planning scheme policy.

(4) Water network modelling

(a) Scope

A water network model is required where listed under the requirements of Clause SC6.4.11.2 (2)(c)(ii) above.

(b) Model requirements – simplified assessment

A simplified assessment involves the use of manual calculations or simplified network models to demonstrate compliance with design standards. A simplified assessment must include:

(i) assessment of design demands in accordance with the *CTM Water Alliance Design and Construction Code*;

(ii) where necessary, hydraulic calculations based on fixed boundary conditions for both peak hour domestic and fire- fighting demand;

(iii) calculations can be undertaken manually, using spread sheets, or using network modelling software. Where modelling software is used, the model files shall be provided to Council as part of the submission; and

(iv) a brief report covering the requirements of this clause. Sketches of results are to be provided where they make it easier to interpret results.

(c) Model requirements – detailed assessment

(i) Format

The current network modelling software must be used for the development of new water network models. Models shall be set up such that all scenarios and options considered for the study are incorporated into a single model file. The model file(s) shall be provided to Council as part of the submission.

(d) Scenario planning

A scenario plan must be developed by the modeller prior to commencing modelling such that each scenario required for analysis is identified and that differences between scenarios are clearly understood.

The modeller must utilise parent and child scenarios and alternatives such that common information for each scenario is inherited to child scenarios, and that unique changes are clearly identifiable. A “parent” scenario should be applied for each design horizon or stage, and ultimate development. The following model structure provides an example of a model scenario structure.

1000- Existing Peak Day Demand (Extended Period Analysis)

1100- Existing Peak Hour Demand (Steady State Analysis)

e.g. Scenario 1110 - Existing Peak Hour with Infrastructure Option 1
e.g. Scenario 1120- Existing Peak Hour with Infrastructure Option 2 (Preferred)

1121- Existing Fire Fighting Assessment (Steady State analysis, automated)

2000- Ultimate Peak Day Demand (Extended Period Analysis)

2100- Ultimate Peak Hour Demand (Steady State Analysis)
e.g. 2110- Ultimate Peak Hour with Infrastructure Option 3 (Preferred)

2111- Ultimate Fire Fighting Assessment (Steady State analysis, automated)

As shown the scenario structure naming should be clear and transparent as to which design

case it represents, and the preferred option applied for the design should be marked.

(e) Technical specification

(i) Hydraulic method

Modelling must be undertaken using the Hazen Williams hydraulic calculation method, with pipe friction coefficients as listed in Clause SC6.4.11.2 Water and Clause SC6.4.11.4 Sewerage planning and design guidelines.

(ii) Losses across valves

Where control valves are required in the system, the valve should be modelled with appropriate loss factors/curves. The modeller must ensure that loss factors applied for design of a system can be achieved in reality by available products, and where possible apply the loss factor or curve for a design valve.

(iii) Pump curves

A design duty (single point pump curve) may be used initially when designing a pumping system however the modeller is to ensure that the pump duty proposed can be achieved by readily available pumps. Where possible an actual pump curve for a design pump shall be applied for modelling purposes. The pump curve/s shall illustrate compliance with the minimum and maximum velocity limitations.

(iv) Pump controls

Pumps shall be modelled with simple controls where possible. The modeller must consult with Council when applying pump controls to ensure it meets the requirements of Townsville Water operators.

(v) Reticulation

Master Planning Models shall model trunk infrastructure but may be requested to include non-trunk infrastructure, where deemed necessary by Council. Refer to Part 4.6 Definitions of theTownsville City Plan for the definition of trunk infrastructure.

Design Models shall model reticulation down to a DN63 pipe.

(f) Demands

(i) General

Design demands are to be calculated in accordance with Clause SC6.4.11.2 (2) of Water and sewerage planning and design guidelines.

Demands must be applied as Peak Day demand in litres per second (L/s), with the appropriate diurnal pattern applied for the particular land use.

Demands should be applied at the nearest network node, and within 40 m of the property boundary.

Where a node represents demands generated from different land uses, separate demand entries should be applied to the node to enable quick identification of the source of the demand.

(ii) Use of unit demand factors

The current network modelling software must enable unit demand factors to be applied, such that the resultant demand from the unit load, loading rate, and peaking factors are calculated as part of the modelling process. The use of this feature is required for master planning models, enabling tracking of design EPs modelled.

(iii) Diurnal patterns

Diurnal patterns represent fluctuations in demand load across a day. Patterns for various land uses are included below.

Table SC6.4.11.1 – Water Demand Daily Diurnal Variations

TIME	Demand Curve 10	Demand Curve 14	Demand Curve 17
	100% Commercial/ Industrial	100% Residential Former Townsville Area	Parks Demands
12:00 AM	0.63	0.26	3
12:30 AM	0.63	0.27	3
1:00 AM	0.65	0.31	3
1:30 AM	0.69	0.33	3
2:00 AM	0.76	0.34	3
2:30 AM	0.78	0.40	3
3:00 AM	0.76	0.44	3
3:30 AM	0.65	0.48	3
4:00 AM	0.52	0.54	3
4:30 AM	0.50	0.63	3
5:00 AM	0.56	0.70	3
5:30 AM	0.69	0.75	3
6:00 AM	0.82	0.81	0
6:30 AM	1.01	0.94	0
7:00 AM	1.12	1.02	0
7:30 AM	1.22	1.11	0
8:00 AM	1.32	1.18	0
8:30 AM	1.37	1.21	0
9:00 AM	1.41	1.08	0
9:30 AM	1.45	0.95	0
10:00 AM	1.47	0.83	0
10:30 AM	1.48	0.75	0
11:00 AM	1.50	0.68	0
11:30 AM	1.50	0.63	0
12:00 PM	1.50	0.57	0

12:30 PM	1.50	0.54	0
1:00 PM	1.49	0.52	0
1:30 PM	1.48	0.53	0
2:00 PM	1.44	0.54	0
2:30 PM	1.39	0.58	0
3:00 PM	1.31	0.68	0
3:30 PM	1.22	0.74	0
4:00 PM	1.11	0.93	0
4:30 PM	0.98	1.15	0
5:00 PM	0.86	1.55	0
5:30 PM	0.71	2.02	0
6:00 PM	0.61	2.43	0
6:30 PM	0.64	2.55	0
7:00 PM	0.74	2.57	0
7:30 PM	0.82	2.49	0
8:00 PM	0.89	2.28	3
8:30 PM	0.93	2.07	3
9:00 PM	0.97	1.88	3
9:30 PM	0.99	1.51	3
10:00 PM	0.97	1.28	3
10:30 PM	0.93	0.94	3
11:00 PM	0.84	0.65	3
11:30 PM	0.71	0.44	3
12:00 AM	0.63	0.26	3

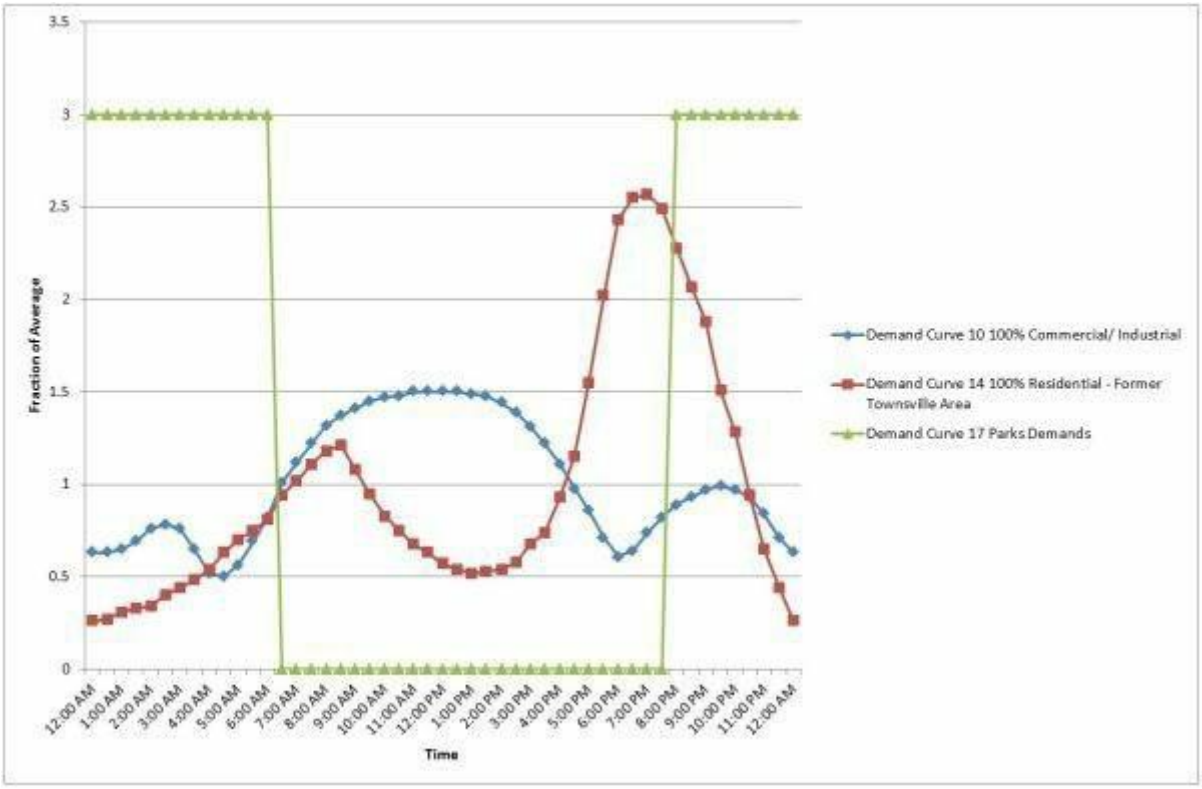


Figure 6.4.11.1 - Water Demand Daily Diurnal Variations

(g) Scenarios

(i) Extended period analysis

Refer to *CTM Water Alliance Design and Construction Code Section 5.6.2*.

(ii) Steady state analysis

Refer to *CTM Water Alliance Design and Construction Code Section 5.6.1*.

(iii) Boundary conditions

Demands may be applied directly as Peak Hour demand, or at Peak Day demand with peaking factor to represent Peak Hour.

(iv) Fire-fighting analysis

Refer to *CTM Water Alliance Design and Construction Code Section 6.1.3*.

(h) Reporting requirements

A water network modelling report must be prepared to document the process, assumptions and analysis employed through modelling to develop the infrastructure design and/or master plan.

The following provides details of sections to be incorporated into the modelling report. The modeller may provide further information as needed to justify decisions made through the modelling and design process.

(i) Introduction

1. development locality, lot/plan description, application number (if applicable);
2. objectives of study – design/master plan; and
3. brief methodology – describe level of modelling undertaken (simplified/detailed),

software used, reference to model overview in its appendix.

(ii) Population and demand assessment

1. population assessment based on land use categories, site plan showing layout and land use;
2. demand assessment showing demand calculation and peaking factors applied;
3. summary table showing total demand, with breakdown for each land use category, Average Day (kL/d), Peak Day demand (kL/d or L/s); and
4. summary table showing demand breakdown for each service catchment, where applicable.

(iii) Modelling assessment

1. modelling method – simplified or detailed assessment;
2. scenarios analysed, including description or reference to design standards applied;
3. modelling assumptions;
4. existing network description, including proposed connection points; and
5. modelling assessment:
   a) existing system capacity;
   b) existing system + ultimate development; and
   c) augmentations, new infrastructure options analysis including assessment of options at interim stages as specified in the *CTM Water Alliance Design and Construction Code* and shall coincide with the census collection years viz. 2026, 2031, 2036, etc., and ultimate design scenario.

(iv) Options analysis

Option analysis to be completed in accordance with *CTM Water Alliance Design and Construction Code*.

(v) Summary

1. preferred option, justification, capital works program.

(vi) RPEQ Certification statement as detailed Section SC6.4.2 Development application guidelines.

(vii) Appendix

1. for detailed models, model overview to be included in appendix (covering scenario structure, options and clearly outlining which scenario represents the design solution);
2. model map showing model layout (nodes, pipes, labels, and any relevant boundary conditions. e.g. reservoirs or head points applied); and
3. tabulated data and results – to be provided at peak hour analysis and firefighting analysis:

Nodes	Element ID Node Elevation Peak Hour Demand

	Calculated Hydraulic Grade (m) Calculated Pressure (m) For fire-fighting analysis Available fire-fighting flow Available pressure at firefighting demand
Pipes	Element ID Pipe diameter Material and class Length Start node Stop node Hazen Williams C value Flow rate Velocity Headloss gradient
Pump Stations	Element ID Pump type (fixed, variable speed) Pump configuration (duty/standby, etc.) Pump curve, if selected
Reservoirs	Element ID Reservoir capacity Top water level Bottom water level

(viii) pump stations - system resistance curve/s with pump curve/s overlaid. Pump curve/s may be duty point however the designer shall consider the capability of pumps on the market to meet such a duty (I.e. it needs to be physically achievable).

(5) Pump stations

(a) General

This section covers the design of:

(i) water supply pumping stations to service reservoirs; and

(ii) smaller booster pumping stations to boost pressure in the distribution system.

(b) Capacity and pump sizing

For sizing of all pumps refer to Refer to *CTM Water Alliance Design and Construction Code* Section 6.2.

(i) Pump station capacity

For sizing of all pumps refer to *CTM Water Alliance Design and Construction Code* Section 6.2.

(ii) System resistance curves

System Resistance Curves covering all expected duties of the pumps, including maximum and minimum head cases shall be prepared. A net positive suction head available (NPSHA) curve shall also be prepared.

(c) Building structure and general arrangement issues

(i) General

Refer to *CTM Water Alliance Design and Construction Code* Section 6.2.1.

(ii) Materials

Pump stations shall be contained in above ground structures, constructed from reinforced masonry block and/or reinforced concrete walls with concrete or metal (Colourbond) roofs.

(iii) Buildings - General

Level of pump station floor to be located a minimum of 300 mm above 1% AEP flood level.

(d) Pipework

(i) Each pump shall be provided with suction and discharge isolation valves and a non-slam non- return valve on the pump discharge.

(ii) At least one easily removable piece of pipework is required on each pump to enable efficient removal and replacement.

(iii) Steps and walkways in accordance with AS 1657 Fixed platforms, walkways, stairways and ladders - Design, construction and installation shall be provided over pipework such that access is readily available to both sides of each pump.

(e) Power supply and telemetry/instrumentation

Refer to *CTM Water Alliance Design and Construction Code* Section 6.2.5. Refer to water service provider for specific requirements.

(6) Storage reservoirs

(a) General

Storage reservoirs are considered trunk infrastructure. Consult with Council for specific requirements.

(7) Water mains

(a) General

(i) Extent

Mains shall be provided to service all properties within the development. Developer to refer to Council for any trunk mains to be allowed for in development design.

(b) Water main sizing

(i) Demands

Refer to *CTM Water Alliance Design and Construction Code* Table 4.1 and Section 6.3.

(c) Mains layouts and general arrangements

(i) Configuration

1. Distribution mains shall comply with the following:

a) configuration and extent of distribution mains is to be determined to suit the requirements of the ultimate development to the approval of Council, and

b) connections to reticulation mains network, unless required under the project and approved by Council.

(ii) Temporary dead ends are not permitted for more than the 12-month defect liability period, temporary loops are to be installed prior to end of defect liability period.

(iii) Pipe jointing

Pipelines should generally be rubber ring jointed. Mild steel cement lined pipes will normally be rubber ring jointed unless there are specific reasons for installation of continuously welded pipe segments. PE pipe shall be connected by butt thermal fusion. The use of electrofusion couplings are subject to approval by Council.

The following applies for flanged Joints:

1. flanged pipework shall be used where necessary at connections, to transfer thrust, or provide beam action for the pipeline to span;
2. flange classes shall be selected to suit the pipeline design pressures; and
3. flange classes shall be to AS/NZS 4087 Metallic flanges for waterworks purposes except where connecting to existing flanges from a different standard. Minimum flange classes shall be:

a) Class 14 for Steel Cast Iron; and

b) Class 16 for DICL.

(iv) Pipe anchorage

TYTONLOK joints or similar may be approved by Council in special circumstances. Marker tape shall be provided above the pipe to clearly show the extent of the restrained jointing.

(v) Above ground water mains

Above ground construction is to be approved by Council and shall comply with the requirements of the *CTM Water Alliance Design and Construction Code* and associated references.

(vi) Restoration

Refer to *CTM Water Alliance Design and Construction Code* and associated references.

For restoration under roadways refer to SEQ-WAT-1204-1.

(vii) Trenchless construction

Trenchless construction methods may be required as part of design. Trenchless construction shall be in accordance with *CTM Water Alliance Design and Construction Code* and associated references.

Trenchless construction shall also be considered where crossing of environmentally sensitive areas is deemed necessary as part of design.

(viii) Stop valves

The following applies:

1. stop valves for reticulation shall be provided in accordance with the requirements of *CTMWater Alliance Design and Construction Code* and associated references;
2. stop valves shall be provided so that a maximum of ten dwellings are isolated for maintenance purposes, and a maximum of four valves to be closed to isolate any section of reticulation main (maximum of one block to be shut down within the ten dwellings);
3. valves shall be located to avoid conflicts with driveways, telephone house service pits, and underground electrical boxes; and
4. stop valves are to be located on either side of a road crossing.

(ix) Envelopers

Refer to *CTM Water Alliance Design and Construction Code* and associated references.

SC6.4.11.3 Water supply construction

(1) Introduction

(a) Scope

This policy section provides standards, advice, and guidelines for the construction of water supply infrastructure including:

(i) mains up to DN600 nominal size; and

(ii) small pump stations.

This section excludes the construction of:

(i) reservoirs, including repainting of reservoirs;

(ii) treatment plants;

(iii) dams;

(iv) headworks, including bores and weirs;

(v) dosing plant; and

(vi) larger pump stations.

The Contractor shall carry out the work, and supply materials meeting the requirements of the reference documents, and, in particular, in accordance with the requirements of the *Water Supply Code of Australia* except as otherwise specified herein.

(b) Reference and source documents

References to the *Water Supply Code of Australia* are made where there are parallel sections or equivalent clauses to those in this section. Where not called up as part of this section, these references are identified by part and section numbers and enclosed in brackets thus (WSA Part, Section).

Reference and source documents that must be read in conjunction with this section are as follow:

(i) SC6.4 Dvelopment manual planning scheme policy sections:

Section SC6.4.3 Standard drawings

Section SC6.4.18 Concrete works

Editor's Note - Section SC6.4.3 Standard drawings shall take precedence over the Water Services Association of Australia (WSAA) standard drawings. Where any standard drawing used in conjunction with this section includes technical requirements that conflict with this section, the requirements of this section shall take precedence.

(ii) Australian standards:

Editor's Note - References in this section or on the drawings to Australian Standards are noted by their prefix AS or AS/NZS. Where not otherwise specified in this section or the drawings, the Contractor shall use the latest Australian Standard, including amendments and supplements, available within two weeks of close of tenders.

AS/NZS 1111	*ISO metric hexagon commercial bolts and screws*
AS/NZS 1112	*ISO metric hexagon nuts*
AS/NZS 1260	*PVC-U pipes and fittings for drain, waste, and vent applications*
BS7786	Specification for unsintered PTFE tapes for general use
AS 681	*Elastomeric Seals – Material requirements for pipe joint seals used in water and drainage applications*
AS 1289.5.4.1	*Methods of testing soils for engineering purposes – Method 5.4.1: Soil compaction and density tests- Compaction control test – Dry density ratio, moisture variation and moisture ratio*
AS 1289.5.6.1	*Methods of testing soils for engineering purposes – Method 5.6.1: Soil compaction and density tests- Compaction control test – Density index method for a cohesionless material*
AS 1289.5.7.1	*Methods of testing soils for engineering purposes – Method 5.7.1: Soil compaction and density tests- Compaction control test – Hilf density ratio and Hilf moisture variation (Rapid method)*
AS 1349	*Bourdon tube pressure and vacuum gauges*
AS 1432	*Copper tubes for plumbing, gasfitting and drainage applications*
AS 1444	*Wrought alloy steels – Standard, hardenability (H) series and hardened and tempered to designated mechanical properties*
AS/NZS 3678	*Structural steel – hot rolled plates, floorplates and slabs*
AS/NZS 1477	*PVC pipes and fittings for pressure applications*
AS 1565	*Copper and copper alloys – Ingots and castings*
AS 1579	*Arc welded steel pipes and fittings for water and waste water*
AS/NZS 1594	*Hot-rolled steel flat products*
AS 1627.4	*Metal finishing – Preparation and pre-treatment of surfaces - Part 4: Abrasive blast cleaning of steel*
AS 1646	*Elastomeric seals for waterworks purposes*
AS 1657	*Fixed Platforms, walkways, stairways and ladders – Design, construction and installation*
AS 1830	*Grey cast iron*
AS 60529	*Degrees of protection provided by enclosures (IP Code)*
AS/NZS 2032	*Installation of PVC pipe systems*

ASNZS 2033	*Design and installation of polyolefin pipe systems*AS 2129 *Flanges for pipes, valves and fittings*
AS/NZS 2280	*Ductile iron pipes and fittings*
AS 2419.2	*Fire hydrant installations – fire hydrant valves*
AS 2528	*Bolts, studbolts and nuts for flanges and other high and low temperature applications*
AS/NZS 2566.1	*Buried flexible pipelines – Structural design*
AS/NZS 2566.2	*Buried flexible pipelines – Installation*
AS/NZS 2638.1	*Gate valves for waterworks purposes – Part 1: Metal seated*
AS/NZS 2638.2	*Gate valves for waterworks purposes – Part 2: Resilient seated*
AS 2738	*Copper and copper alloys – compositions and designations of refinery products, wrought products, ignots and castings*
AS/NZS 3000	*Electrical installations (known as the Australian/New Zealand Wiring Rules)*
AS/NZS 3008	*Electrical installations – selection of cable (Set)*
AS 3439	*Low voltage switchgear and control gear assemblies (Set)*
AS/NZS 3518	*Acrylonitrile butadine styrene (ABS) compounds, pipes and fittings for pressure applications*
AS 3571.1	*Plastics piping systems - Glass-reinforced thermoplastics (GRP) systems based on unsaturated polyester (UP) resin - Part 1: Pressure and non-pressure drainage and sewerage which may not be relevant to this section*
AS 3571.2	*Plastics piping systems — Glass reinforced thermoplastics (GRP) systems based on unsaturated polyester (UP) resin - Part 2: Pressure and non-pressure water supply*
AS 3681	*Application of polyethylene sleeving for ductile iron piping*
AS/NZS 3690	*Installation of ABS pipe systems*
AS 3879	*Solvent cement and priming fluids for PVC (PVC-U and PVC-M) and ABS pipes and fittings*
AS 3862	*External fusion-bonded epoxy coating for steel pipes*
AS 3952	*Water supply –Spring hydrant valve for waterworks purposes*
AS 3996	*Access covers and grates*
AS/NZS 4087	*Metallic flanges for waterworks purposes*
AS/NZS 4129	*Fittings for polyethylene (PE) pipes for pressure applications*
AS/NZS 4130	*Polyethylene (PE) pipes for pressure applications*
AS/NZS 4158	*Thermal-bonded polymeric coatings on valves and fittings for water industry purposes*
AS/NZS 4321	*Fusion bonded medium density polyethylene coating and lining for pipes and fittings*
AS/NZS 4680	*Hot-dip galvanised (zinc) coatings on fabricated ferrous articles*

AS/NZS 4765	*Modified PVC (PVC-M) pipes for pressure applications*
AS 4794	*Non-return valves for waterworks purposes – Swing check and tilting disc*

(iii) Other:

Department of Energy and Water Supply	*Planning Guidelines for Water Supply and Sewerage, April 2010 Chapter 6 amended March 2014*
Water Services Association of Australia (WSAA)	WSA 03 – 2011 - *Water Supply Code of Australia*
International Erosion Control Association (IECA)	*Best Practice Erosion and Sediment Control*, 2008

BS 410	Specification for test sieves
BS 7786	*Specification for unsintered PTFE tapes for general use*
ISO 3310	*Test sieves – Technical requirements and testing (set)*

(2) Materials

(a) General

The Contractor shall comply with the requirements of the manufacturer's recommendations regarding the handling, transport and storage of materials and as further specified in this section.

Prior to the delivery of products and materials, the Contractor is expected to obtain relevant product or material certification from the manufacturer which shall be presented to the Superintendent if requested.

The Contractor shall not use damaged or defective materials, including coatings and linings, outside the manufacturer's recommended limits.

If the Contractor proposes to use alternative products and materials other than the products and materials authorized by Council, the design drawings and this section, an approval from Council is required prior to delivery and use of alternative products or materials.

(b) Unplasticised and modified PVC (uPVC and PVC-M)

Unplasticised PVC (uPVC) and modified PVC (PVC-M) pipes and fittings for mains and suction pipes shall comply with AS/NZS 1477 and AS/NZS 4765, shall be suitable for use with rubber ring (elastomeric) seals complying with AS 1646 joints, and shall be of the class and size as shown on the design drawings. (WSA 03 – 2011, Part 1, Section 4.)

PVC pipes and fittings for mains and suction pipes shall be installed in accordance with AS/NZS 2032 and AS/NZS 2566.1.

Pipes and fittings are to be handled and stored protected from sunlight. The Contractor shall provide protection for the pipes and fittings from ultraviolet light and damage. The Contractor shall take account of the time for storage and type of shelter.

(c) Acrylonitrile Butadine Styrene (ABS)

ABS pipes and fittings shall comply with AS/NZS 3518 to the class, size, use, shape, and colour as shown on the design drawings and installed in accordance with AS/NZS 2566.2 and AS/NZS 3690.

ABS pipes and fittings shall be joined in accordance with the manufacturer's instructions using solvent cement to AS 3691.

(d) Glass Reinforced Plastic (GRP)

The use of this material is not permitted by Council.

(e) Ductile Iron (DI) pipe and fittings

Ductile iron (DI) pipes and fittings shall comply with AS/NZS 2280 and shall be of the class, size, and lining, as shown on the design drawings, and installed in accordance with AS/NZS 2566.2.

Jointing shall be with rubber rings (elastomeric), complying with AS 1646, to the class and type as shown on the design drawings.

Flanges shall be to the table shown on the design drawings. Bolts and nuts for flanged joints shall be galvanised, or stainless steel as for the pumps specified herein, unless shown otherwise on the design drawings.

All pipework shall be sleeved externally with polyethylene sleeving in accordance with the requirements of AS 3681 unless specified otherwise to be coated and lined. All fittings shall be fusion bonded coated, in accordance with AS/NZS 4321, or wrapped. The Contractor shall wrap all unprotected joints in the trench with a petrolatum tape system approved by the Superintendent.

(f) Steel pipeline and fittings

Steel pipelines and fittings shall comply with AS 1579 and AS/NZS 1594 and shall be of the class, size, lining, and coating as shown on the design drawings. (WSA 03 – 2011, Part 1, Section 4).

The Contractor shall wrap all unprotected joints in the trench with a petrolatum tape system approved by the Superintendent.

The jointing system shall be rubber ring (elastomeric), complying with AS 1646, unless shown otherwise on the design drawings.

The Contractor shall not lay continuously welded steel pipelines parallel to, when in close proximity to high voltage power lines.

(g) Copper pipe and fittings

Copper tube and fittings shall comply with AS 1432 and shall be of the size and type as shown on the design drawings.

The Contractor shall install copper tube, capillary, and compression fittings, insulated from ferrous mains, as shown on the design drawings (WSA 03 - 2011).

(h) Polyethylene (PE)

Polyethylene pipe shall comply with AS/NZS 4129 and AS/NZS 4130 and shall be of the class and size as shown on the design drawings and installed in accordance with AS/NZS 2033 (WSA 03 – 2011, Part 1, Section 4).

Jointing shall be by butt thermal fusion or by electrofusion couplings, or with compression fittings.

Fittings up to 110 mm shall comply with AS/NZS 4129. Fittings from 110 mm to 600 mm shall be ductile iron in accordance with AS/NZS 2280 and coated internally and externally in polyethylene in accordance with AS/NZS 4129.

The Contractor shall provide pipe of the appropriate external diameter consistent with the required internal diameter shown on the design drawings.

(i) Steelwork

Structural steelwork, including ladders, brackets, and covers, complying with AS 1657, shall be abrasive blast cleaned to AS 1627.4 Class 2.5 and hot dip galvanised to AS/NZS 4680. (WSA 03 – 2011, Part 1, Section 4.)

(3) Valves and hydrants

(a) General

The Contractor shall ensure that the valves and hydrants supplied are compatible with the pipework such that proper sealing is provided between the pipe flanges and the valve. The concrete lining in pipework shall not be chipped away or reduced to provide clearance from the working parts of valves.

The Contractor shall ensure that the valves and hydrants are installed to facilitate maintenance. The Contractor shall take into account the manufacturer's recommendations, the requirements shown on the design drawings, the type of connection, lubrication of connecting bolts, and the location of valves within valve chambers or type of backfill material. (WSA 03 – 2011, Part 2, Section 15.13.)

The type of external corrosion protection of buried valves and hydrants shall be fusion bonded medium density polyethylene coating to AS 3862 and AS/NZS 4321 or thermal bonded polymeric coating to AS/NZ S4158.

Flanges shall comply with AS 2129 and AS 4087 and shall be of the class and size shown on the design drawings.

(b) Stop valves

Sluice valves shall be resilient seated valves manufactured in accordance with AS/NZS 2638.2. The valves shall be flanged where permitted by Council unless shown otherwise on the drawings *(*WSA 03 - 2011, Part 1, Section 8.2).

Ball valves shall be flanged where permitted by Council unless shown otherwise on the design drawings (WSA 03 - 2011, Part 1, Section 8.2).

Butterfly valves shall be flanged where permitted by Council unless shown otherwise on the design drawings (WSA 03 - 2011, Part 1, Section 8.2).

Knife Gate valves shall be flanged where permitted by the Council unless shown otherwise on the design drawings (WSA 03 - 2011, Part 1, Section 8.2).

Scour valve assemblies shall be as shown on the design drawings.

Valves shall be operated by a removable key. The Contractor shall size "Tee Key" valve operators and hand wheels to operate the valves under all operating conditions throughout their full range with no greater than 180 Newtons applied to the ends of the key bar or the rim of the wheel.

Hand wheels, where specified, shall display an embossed or engraved arrow, together with "open" and/or "close" corresponding to the valve operation.

(c) Air valves

Air valves shall be of the double air valve type with integral isolating valve of minimum size DN80 and shall be installed as shown in the design drawings (WSA 03 – 2011, Part 1, Section 8.4).

Air valves shall be installed such that they can be maintained without affecting supply.

The Contractor shall obtain the consent of Council for the use of other types of air valves.

(d) Non-return valves

Non-return valves shall be of the swing check type to AS 3578 or AS 4794 of cast iron or steel body, cover, and disc with bronze body and disc seat rings. The leaf shall swing clear and provide an unobstructed waterway (WSA 03 – 2011, Part 1, Section 8.5). Wafer style non-return valves shall not be used.

The body cover shall be located and sized to allow the valve flap to be removed and the seat to be inspected without removing the valve body.

Where shown on the design drawings, non-return valves shall have an extended spindle, minimum grade 316 stainless steel complying with AS/NZS 3678, fitted with an adjustable counterweight, together with a proximity switch to indicate a no flow condition.

No flow switches shall have the following features:

(i) Be of the eccentric cam operated limit switch type.

(ii) Have a minimum rating of 10 amps, 240 V AC, 50- Hz.

(iii) Be oil tight and dust proof to IP 65.

(iv) Be suitable for 25 mm conduit entry.

(v) Be mounted on rigid stainless-steel complying with AS/NZS 3678 adjustable brackets. The brackets shall be free of sharp edges and exposed corners.

(e) Spring hydrants

Spring hydrant bodies shall be manufactured in accordance with AS 3952 and installed in accordance with AS 2419.2 except as varied below (WSA 03 - 2011, Part 1, Section 8.8).

The top of spring hydrants shall be between 100 mm and 300 mm below finished surface level as detailed in SEQ-WAT-1302-1. If necessary, this shall be achieved using hydrant risers of various heights.

Spring hydrants shall be protected internally and externally with fusion bonded coating in accordance with AS 4158, or equivalent protection approved by the Superintendent.

(4) Pipeline construction

(a) General

The Contractor, employees, or subcontractors, engaged in excavations, including tunnelling, are to be accredited for the work. Proof of accreditation must be provided to the Superintendent for approval prior to the release of the hold point.

The Contractor shall not change the pipeline alignment without prior concurrence of Council. The Contractor shall provide full details, of any proposed changes to the pipeline alignment, to the Superintendent for submission to Council. The Superintendent shall obtain the decision of Council prior to the release of the hold point.

(b) Location

The location of the mains and pump stations, sizes of mains, types of chambers and covers, and the classes of pipes shall be as shown on the design drawings. The pipelines shall be laid to grades and locations shown on the design drawings and to tolerances in the Water Supply Code unless directed otherwise by the Superintendent (WSA 03 – 2011, Part 2, Section 21). The Contractor shall confirm the locations immediately prior to construction

(WSA 03 – 2011, Part 2, Section 11).

(c) Cover over pipelines

The minimum depth of cover to be provided for mains, measured vertically from the finished ground level to the top of any socket, shall be in accordance with SEQ-WAT-1200-2:

Lesser cover may be provided where special protection of the pipelines has been shown on the design drawings or directed by the Superintendent; and

the maximum cover shall be 1200 mm, however, greater cover may be provided where special situations occur, where there is conflict with other services or to meet grading requirements.

(d) Crossings

Where a pipeline crosses a road, creek or involves features shown on the design drawings, under the control of any Authority, the Contractor shall carry out the work in accordance with the requirements of that Authority. The Contractor shall provide written notification to the Authority of the intention to carry out the work and pay the appropriate fees. (WSA 03 - 2011, Part 2, Section 15.16.) The Contractor shall obtain the written approval from the Authority prior to commencement of work. Such written approval shall be supplied to the Superintendent if requested. The Superintendent shall advise at the time of notification by the Contractor whether the option to request the written approval is to be exercised.

Where shown on the design drawings, the Contractor shall use trenchless methods for the installation of the mains. The installation of the main by open trenching shall not be permitted over the lengths designated for trenchless installation (WSA 03 – 2011, - Part 2, section 15.15).

The Contractor shall address, in its method statement for trenchless conduit installation, the following:

(i) general description of method and sequence of operation;

(i) size, depth and position of temporary pits required;

(ii) use of specialist subcontractors;

(iii) specialist equipment to be used; and

(iv) grout type and method of injection.

The encasement pipe shall be as detailed on the design drawings. The encasement pipe shall extend 1 m behind the back of kerb on either side of the carriageway.

The carrier pipe shall be positioned on support cradles and the carrier pipe shall be centrally located within the encasement pipe.

After installation and pressure testing of the carrier pipe, the Contractor shall fill the annular space between the carrier pipe and the encasement pipe with suitable grout or cementitious grout filler.

Where the carrier pipe is ductile iron cement lined (DICL), any length of pipe which is enclosed within the encasement pipe need not be wrapped in polyethylene tubing.

(e) Earthworks

The Contractor shall carry out all excavations for structures and pipelines to the lines, grades and forms shown on the design drawings or as directed by the Superintendent within the specified tolerances.

With excavation near existing underground services and structures, the Contractor shall be responsible in obtaining approval of the appropriate Authority and comply with all the requirements of the approval including having regard for drainage, dewatering, silt control, noise abatement, proximity to existing buildings and generally for the amenity of adjacent owners (WSA 03 - 2011, Part 2, Section 13). The Contractor shall locate, protect, and repair, as necessary, all services affected by the Works at the Contractor's expense.

The Contractor shall leave a clear space of 600 mm minimum between the edge of any excavation and the inner toe of stockpiles. No excavated materials shall be stockpiled against the walls of any building or fence without the written permission of the owner of such building or fence. Topsoil from excavations shall be stockpiled separately and utilised to restore the surface after backfilling.

At the completion of work each day, the Contractor shall install safety fencing to statutory requirements along the edges of open excavations to isolate them from the public. The Contractor shall provide fenced walkways and vehicular crossings across trenches to maintain access at all times from carriageway to individual properties or within individual properties and advise all affected residents beforehand. All installations shall be of adequate size and strength and shall be illuminated to prevent accidents.

The Contractor shall carry out erosion and sedimentation control at all construction sites in accordance with *Best Practice Erosion and Sediment Control*.

The Contractor shall take account of safety issues and possible wet weather effects to limit the extent of excavation left open. (WSA 03 – 2011, Part 2, Sections 13.1 and 13.2.).

(f) Minimum trench widths for pipelines

The minimum clear width of trench (inside internal faces of timbering or sheet piling, if used) to a height of 150mm above the top of the pipe shall be as shown in Table SC6.4.11.2.

Table SC6.4.11.2 - Minimum Trench Widths

Nominal Size of Pipe (DN)	Minimum clear width of trench (mm) (inside timbering or sheet piling, if any)	
	Pipe other than PVC/PE	PVC/PE Pipe
100	450	450
150	450	450
200	500	450
225	550	500
250	550	500
300	600	550
375	700	650
400	700	650
450	750	700
500	850	800
525	850	800
600	950	900

Where the design drawings provide for a trench to be excavated across a paved or improved surface, the width of the trench shall be kept to a minimum. Bitumen and concrete surfaces shall be carefully cut, by saw-cutting or other means approved by the Superintendent, to provide a neat straight line free from broken ragged edges. The Contractor is responsible in obtaining approval from the relevant Authority and/or owner before starting any excavation across paved or improved surface.

The Contractor shall widen the trench where necessary for the installation of valves and fittings and protective coating systems.

(g) Excavation depth

The Contractor shall excavate trenches to 75 mm below the underside of the pipe barrel and socket or coupling except for mains to be laid on other than rock foundations or as otherwise shown on the design drawings.

The excavation shall be carried out such as to ensure solid and uniform support for each pipe over the whole length of barrel with chases provided for joints and wrapping.

(h) Support of excavation

The Contractor shall adequately support all excavations to statutory requirements as the Works proceed. When withdrawing supports, the Contractor shall exercise every precaution against slips or falls (WSA 03 – 2011, Part 2, Section 13.5).

The Contractor shall ensure that timber is left in place where its removal may endanger structures in the vicinity of the excavation.

(i) Pipe bedding

When excavation of the trench has been completed, the Contractor shall obtain the Superintendent's approval prior to commencing pipe laying, jointing, and bedding. The Superintendent’s approval of the excavated trench is required prior to the release of the hold point.

Crusher screenings shall only be used for pipe bedding where sand or other non-cohesive material is not readily available locally or where the Contractor can demonstrate that its use will not impede operations (WSA 03 – 2011, Part 2, Section 14.).

Pipes (excluding PVC/PE pipes) may be laid directly on other than rock foundation. The Contractor shall provide non-cohesive granular bedding, having a minimum thickness of 100 mm below the barrel and socket of the pipe, where rock or other hard material occurs in the bottom of the trench. The bedding material shall conform to the “sands” classification described in SEQ-WAT-1200-1, either loose clean sand and /or medium dense clean sand.

For PVC/PE pipes, irrespective of foundation, the material to be used for pipe bedding (underlay a minimum of 75 mm below the underside of the pipe barrel and socket, side support and overlay to a depth of 150 mm above the top of the pipe) as shown in Figure 5.1 in AS 2032 shall be in sand or other non-cohesive granular material, either crushed, natural or blended, and its grading shall fall within the limits in Table SC6.4.11.3, except that where the materials cannot be reasonably sourced from within the vicinity, the Contractor may use materials satisfying the classification in the second paragraph above provided also that the material meets the requirements for passing sieve sizes 9.5 mm and 6.7 mm shown in Table SC6.4.11.3.

Table SC6.4.11.3 - Grading of Bedding Material for PVC and PE Pipes

Sieve size aperture width (ISO 3310)	Equivalent BS sieve size (BS 410)	Percentage passing
9.5 mm	3/8 inch	100
6.7 mm	1/4 inch	90 - 100
425 µm	No. 36	40 - 90
150 µm	No. 100	0 - 10

All mains laid on grades steeper than 50% shall be encased in concrete as detailed on the design drawings.

(j) Laying and jointing pipes

Unless detailed otherwise in this section, the Contractor shall install pipes in accordance with AS/NZS 2032, AS/NZS 2033, AS/NZS 2566.1 or AS/NZS 3690 as appropriate (Refer WSA 03 – 2011, Part 2, Sections 15 and SEQ-WAT-1102-1 SEQ-WAT-1103-1 and SEQ-WAT-1105-2).

Before being laid, all pipes, fittings, valves, and materials to be used shall be cleaned and examined by the Contractor and, if required by the Superintendent, the Contractor shall suspend each one in a sling to enable the Superintendent to inspect it. If directed by the Superintendent, the Contractor shall oil valves and repack valve glands.

The Contractor shall ensure that the interior of the pipeline is clean and free from obstructions. Plugs shall be used to prevent foreign matter entering sections of pipeline which are left uncompleted overnight.

The Contractor shall take all necessary precautions to prevent flotation of pipes during laying, backfilling, and initial testing. Any temporary supports shall be removed prior to completion of backfilling.

Except where solvent cement joints are needed to make up or install fittings, joints in pipelines shall be flexible, rubber ring (elastomeric) joints, either roll on or skid type or, where shown on the design drawings, mechanical joints, either fixed flange or bolted gland type.

For pipes with rubber ring (elastomeric) joints, only the lubricant specified in writing by the manufacturer shall be applied in making the joint. The Contractor shall make the joint such that the witness mark shall, at no point, be more than 1 mm from the end of the socket.

Pipes may be cut as needed or directed by the Superintendent to suit closing lengths, to remove damaged pipe or fittings or to remove sockets (if necessary) when jointing a socketed fitting.

For field cuts, a mechanical pipe cutter shall be used, except that PVC/PE pipes may be cut using a power saw or a fine-toothed hand saw and mitre box. For field cuts of ductile iron or steel, the Contractor shall ensure that fire-fighting equipment, in working order, is on the site prior to the field cuts being made. If the Contractor proposes to use a petrol engined pipe cutter in an excavation, the Contractor shall ensure that a safe atmosphere is maintained in the excavation at all times.

The Contractor shall prepare the ends of any pipes cut in the field to the manufacturer's written instructions, or as directed by the Superintendent.

Where pipes are cut in the field, the Contractor shall make a witness mark on the pipe using a felt tip marking pen at the length specified by the manufacturer from the end of the pipe. The Contractor shall not use PVC/PE pipes with scored witness marks. Where the same manufacturer does not make spigots and sockets, the Contractor shall refer to the socket manufacturer for the correct marking depth.

Where PVC/PE pipes are to be joined to ductile iron pipes, the joints shall be made by inserting a PVC/PE spigot into a ductile iron socket. Ductile iron spigots shall not be joined to PVC/PE sockets. Alternatively, multi fit mechanical couplings or flanged adaptor couplings may be used to join pipes of different materials.

The Contractor shall conform to the relevant statutory and work, health and safety requirements when cutting and disposing of asbestos cement pipes and submit a method statement for approval of the Superintendent.

Flexibly jointed pipelines with gradual changes in alignment or grade shall be laid with the joint being deflected after it has been made. The Contractor shall comply with the manufacturer's written recommendations in respect of maximum deflection for each joint provided that no joint shall be deflected to such an extent as to impair its effectiveness.

The maximum angle of deflection between adjacent pipes shall be limited to 2^{o} or 0.035 radian in areas subject to mine subsidence or slippage.

Unless otherwise directed by the Superintendent, the Contractor shall lay pipes on continuously rising grades from scour valve to air release valve, notwithstanding any minor irregularities in the ground surface.

Detectable identification tape shall be laid along the line of non-metallic mains within 150 mm of the finished surface (Refer SEQ-WAT-1200-2).

(k) Trench stops

Where a pipe is laid on bedding at a grade of 5% to 14%, the Contractor shall construct trench stops consisting of bags filled with clay, or sand or cement stabilised sand and sealed (Refer SEQ-WAT-1209-1):

(i) at the socket side of the joint nearest to the position of a stop required in accordance with the formula hereinafter, a recess 100 mm deep to suit the width of bag shall be excavated into the bottom of the trench across its full width and into both sidewalls and extend to within 300 mm below finished surface level; and

(ii) the bags shall be placed around and above the pipe, as in (i) above, to give close contact with the pipe and to fill the entire space between the excavated recess and the pipe. Bags shall not be placed onto sand bedding.

The distance between trench stops shall be determined by the following formula:

$D = \frac{100}{G}$, whereby

D = Distance between stops in m

G = Grade of pipe expressed in %.

(l) Concrete bulkheads

Where a pipe is installed at a grade of 15% to 29%, the Contractor shall construct concrete bulkheads. Where a pipe is installed at a grade 30% to 50%, the Contractor shall construct concrete bulkheads integral with concrete encasement. Where a pipe is to be installed at a grade of 50% or more the Contractor shall provide a site-specific design. Bulkheads shall be

of 25 MPa concrete complying with Section SC6.4.18 Concrete works, 150 mm minimum thickness as follows (Refer SEQ-WAT-1209-1 and WSA 03 – 2011, Part 2, Section 15.10):

(i) Where concrete bedding or encasement to pipe is required, the 150 mm thick bulkhead shall be cast integral with the concrete bedding or encasement across the width of trench and shall be keyed into both sidewalls a minimum of 150 mm. The bulkhead shall extend to 300 mm below finished surface level or such other level as directed by the Superintendent.

(ii) Where other bedding, or no bedding, is applicable, the bulkhead shall also be keyed into the bottom of the trench 150 mm for the full width of trench.

(iii) A 75 mm nominal diameter drain hole shall be provided in the concrete bulkhead immediately above the top of the encasement bedding or foundation and crushed rock or gravel shall be placed in and at the upstream end of the drain hole to act as a filter. The gravel shall be 10 to 20 mm in size within 150 mm in all directions upstream and above the invert of the drain hole beyond which another 150 mm thick surround of gravel 2 to 10 mm in size shall be placed.

The distance between concrete bulkheads shall be determined by the following formula:

Concrete bulkhead (grade of 15% to 29%)

$$D = \frac{L}{G}$$

Concrete encasement (continuous) and concrete bulkhead (grade of 30 per cent to 50 per cent)

$$D = \frac{100}{G}$$ whereby

L = 80 x Pipe length in m = 450 m maximum

If L > 100 m use intermediate trench stops at spacing < 100/G

D = Distance between bulkheads in m

G = Grade of pipe expressed in %

(m) Valve and hydrant chambers

The Contractor shall construct around each valve and hydrant a chamber of the type and to the details shown on the design drawings (WSA 03 – 2011, Part 2, Section 15.13).

The concrete shall comply with Section SC6.4.18 Concrete works.

Valve chamber covers shall be painted with white pavement marking paint while hydrant chamber covers shall be painted with yellow pavement marking paint.

Where the type of valve chamber is such that the body, or part of the body, of the valve is to be backfilled before the valve chamber is constructed, the Contractor shall either wrap the valve using a tape consisting of synthetic fibre open weave cloth impregnated with saturated hydro-carbons, applied in accordance with the valve manufacturer's written instructions, or apply at least one coat of corrosion preventing material to the valve body after the valve has been installed but before backfilling. The coating material shall be compatible with the coating material which has been applied to the valve prior to delivery.

(n) Chamber covers and frames

Covers and frames shall not be warped or twisted. Surfaces shall be finished such that there are no abrupt irregularities and gradual irregularities shall not exceed 3 mm. Unformed

surfaces shall be finished to produce a surface that is dense, uniform, and free from blemishes. Exposed edges shall have a minimum 4 mm radius.

Tolerances for the dimensions on the COVER shall be 3 mm + NIL. Tolerances for the dimensions on the FRAME shall be - 3 mm + 3 mm.

Covers shall be seated as shown on the design drawings or as directed by the Superintendent.

Covers shall be finished flush with the surface in road pavements, footpaths, and other paved surfaces. Elsewhere, covers shall be finished 25 mm above the surface of the ground, or such other level as directed by the Superintendent, in a manner designed to avoid as far as possible, the entry of surface water.

Cast iron covers and frames shall be manufactured in accordance with AS 3996 and shall be installed and filled with concrete, as necessary, in accordance with the manufacturer's written requirements.

The Contractor shall take care to avoid lateral movement, cracking and subsidence when installing plastic covers and frames.

(o) Service connections

Not applicable

(p) Thrust and anchor blocks

Thrust and anchor blocks shall be constructed where shown on the design drawings to the dimensions depicted therein or as otherwise directed by the Superintendent. The blocks shall be provided at valves, flexibly jointed bends, tees, enlargers and reducers or any other point where unbalanced forces resulting from internal pressures will occur (Refer SEQ-WAT-1205-1, SEQ-WAT-1206-1 and SEQ-WAT-1207-1 and WSA 03 – 2011, Part 2, Section 15.7).

The Contractor shall provide permanent thrust blocks of 20 MPa concrete, complying with Section SC6.4.18 Concrete works, such that the thrust blocks bear against undisturbed material normal to the direction of thrust resulting from internal pressures over the bearing area not less than that directed by the Superintendent.

The Contractor shall provide permanent anchor blocks of 20 MPa concrete, complying with Section SC6.4.18 Concrete works, of a volume not less than that directed by the Superintendent.

The Contractor shall provide temporary anchorages adequate to restrain the pipe when under test.

The Contractor shall obtain the consent of Council for the type and use of restrained joints, as an alternative to thrust blocks, in the case of congested service corridors and urgent commissioning.

(q) Concrete encasement

The use of Concrete encasement shall not be permitted unless otherwise approved by Council.

(r) Wrapping of pipelines

Where shown on the design drawings, the Contractor shall enclose a pipeline or a section thereof, in lay flat polyethylene sleeving (WSA 03 – 2011, Part 2, Section 15.11).

The materials to be used shall be high impact resistance polyethylene sleeving, of minimum thickness 0.2 mm polyethylene film approved by the Superintendent and 50 mm wide plastic

adhesive tape.

The width of the sleeving when flat shall be in accordance with the manufacturer's written recommendations for the size and type of the pipeline which is to be encased. Precautions shall be taken so that exposure to direct sunlight does not exceed 48 hours.

For dual trenching, pipelines shall be identified by colour sleeving, blue stripe for potable water and lilac for recycled water, or an appropriate identification tape.

Application of the polyethylene sleeving and plastic adhesive tape shall be in accordance with the pipe manufacturer's written instructions or as directed by the Superintendent. The Contractor shall take due care not to damage the sleeving during its application or during the backfilling of the trench. Each pipe shall be encased in a length of sleeving overlapped for a minimum of 250 mm at each field joint, and the ends of each length of sleeving shall be held in position with at least three circumferential turns of adhesive tape. As the polyethylene sleeving material covering the pipe will be loose, excess material shall be neatly drawn up around the pipe barrel, folded into an overlap on top of the pipe and held in place by means of strips of plastic tape at approximately 1 metre intervals. Bends, tapers, and similar fittings shall be covered by polyethylene sleeving as specified for the pipes. The Contractor shall hand wrap valves, hydrants and irregular shaped fittings and joints using flat polyethylene sheets secured with plastic adhesive tape, or other suitable material, to provide an adequate seal. The flat polyethylene sheets may be obtained by splitting suitable lengths of sleeving.

The Contractor shall rectify any damage done to the polyethylene sleeving before, during or after backfilling of the trench.

(s) Corrosion protection of steel bolts and nuts

The Contractor shall wrap all galvanised steel bolts and nuts, used for installation below ground, of flanges, bolted gland joints, mechanical joints, tapping bands, using a tape, approved by the Superintendent, consisting of synthetic fibre open weave cloth impregnated with saturated hydrocarbons applied in accordance with the manufacturer’s recommendations or as directed by the Superintendent. Bolts and nuts shall be dry, clean, and free from rust immediately before wrapping.

(5) Pipeline testing and restoration

(a) Testing of pipeline

The hydrostatic pressure testing shall be conducted in accordance with Section 6 and Appendix M of AS/NZS 2566.2.

The Contractor shall pressure test mains to detect leakage and defects in the pipeline including joints, thrust and anchor blocks. Pipelines shall be tested in sections approved by the Superintendent as soon as practicable after each section has been laid, jointed, and backfilled provided that:

(i) if so specified, or if the Contractor so desires, some or all of the pipe joints shall be left uncovered until the whole of the section has been successfully pressure tested to the satisfaction of the Superintendent; and

(ii) the pressure testing shall not be commenced earlier than seven days after the last concrete thrust or anchor block in the section has been cast.

For the purpose of this clause, “a section” shall be defined as a length of pipeline which can be effectively isolated for testing, e.g. by means of main stop valves.

Pressure testing shall not be carried out during wet weather unless otherwise approved by the Superintendent.

During pressure testing, all field joints, which have not been backfilled, shall be clean, dry, and accessible for inspection.

During the pressure testing of a pipeline, each stop valve shall sustain at least once, the full test pressure on one side of the valve in closed position with no pressure on the other side for at least 15 minutes.

Before testing a pipeline section, the Contractor shall flush and clean it to the satisfaction of the Superintendent and fill it slowly with water, taking care that all air is expelled. Purging of air from rising mains shall be promoted by opening air valves to achieve conditions as stable as possible for testing by allowing for absorption, movement of the pipeline and escape of entrapped air, the section shall be kept full of water for a period of not less than 24 hours prior to the commencement of the pressure testing.

The hydrostatic test pressure, which shall be applied to each section of the pipeline, shall be 1200 kPa.

The Contractor shall maintain the specified test pressure as long as required by the Superintendent while the Contractor examines the whole section. In any case, the specified test pressure shall be maintained for not less than 4 hours. For the purpose of determining the actual leakage losses, the Contractor shall carefully measure and record the quantity of water added in order to maintain the pressure during the period of testing.

The pressure testing of a section shall be considered to be satisfactory if:

(i) there is no failure of any thrust block, anchor block, pipe, fitting, valve, joint or any other pipeline component;

(ii) there is no visible leakage;

(iii) the measured leakage rate for pipes other than PE does not exceed the permissible leakage rate as determined by the following formula:

Q1 = 0.14DLH

where

Q1 = permissible leakage rate (litres per hour) D = nominal diameter of pipe (m)

L = length of section tested (km)

H = average test head (m); and

(iv) for PE Pipes:

V2≤ 0.55V1 + 0.14DLH

where

V1 = water volume (litres) added between Hour 2 and Hour 3 to maintain test pressure

V2 = water volume (litres) added between Hour 4 and Hour 5 to maintain test pressure

D = nominal diameter of pipe (m)

L = length of section tested (km)

H = average test head (m).

Any failure, defect, or visible leakage which is detected during the pressure testing of the pipeline or during the defects-liability period shall be made good by the Contractor at the Contractor's expense. This constitutes a hold point.

Unless directed by the Superintendent, the maximum test length shall be 1000 m.

(b) Connection to existing pipelines

Connections to existing pipes carrying water shall be made at such times as will cause the least interference with the supply. The Contractor shall make arrangements with Council or other Authority concerned for the timing of the work including the need to isolate the existing mains and notification of affected dwelling occupants. The Superintendent shall be given 5 working days' notice of such arrangements (WSA 03 – 2011, Part 2, Section 22.).

(c) Disinfection and flushing of pipelines

The Contractor shall disinfect all water mains after satisfactory testing in accordance with this sub-section (WSA 03 – 2011, Part 2, Section 20). The Contractor shall adopt procedures for the disinfection of the mains with the concurrence of Council. All test results submitted are required to be NATA certified.

After disinfection and testing is completed, the Contractor shall flush all water mains to ensure that the disinfected water used in the process do not enter sections of the system already in service. Flushing and disposal of disinfected water shall be in accordance with WSA 03 – 2011, Part 2, Section 20.2.

(d) Bacteriological testing

(i) General

Disinfection of a water main may be required to ensure suitable water quality parameters are maintained. When disinfection of a main is required, bacteriological testing of the disinfected water must be undertaken.

Disinfection may also be required where there is a likelihood of contamination. A bacteriological test must also be undertaken on all new disinfected mains following satisfactory completion of swabbing/flushing and pressure testing of the water main.

(ii) Test procedure

Water mains shall be tested as follows:

1. scour past the sampling point;
2. engage a NATA registered laboratory to collect representative water samples from the test section of the water main; and
3. dispose of testing water in accordance with the relevant environmental Regulator and/or WaterAgency requirements.

(iii) Satisfactory bacteriological test

The water main will be deemed compliant if:

1. the test results fall within the water quality parameter limits specified below; or
2. the water quality parameter test results in the test section of water main are no worse than the water quality parameter test results measured by testing an influent sample of existing mains water, provided that the influent sample was collected by the NATA registered laboratory at the same time as water sample from the test section of water main was collected.

Table SC6.4.11.4 – Water Quality Parameter Limits

Water Quality Parameter	Unit	Acceptable Range
pH	-	6.8–8.5*
Chlorine (free)	mg/L	0.5–2.0
Total Coliform count	cfu/100mL	0
Faecal Coliform count or E.Coli count	cfu/100mL	0
Heterotrophic Plate count	cfu/mL	0–10

* for cement mortar lined mains an upper level pH of 9.2 is acceptable

For failed tests, the water main shall be swabbed, flushed and/or disinfected and then re-tested. This shall be undertaken until all test results are satisfactory.

(e) Backfill and compaction

After laying and jointing of a pipeline has been completed the Contractor shall present the laid and jointed pipes for inspection by the Superintendent prior to the commencement of trench backfilling. The Superintendent's approval to the laid and jointed pipes is required prior to the release of the hold point. Backfill shall not be placed until the Superintendent has given approval.

Material for the side support and overlay of the pipe shall comply with the requirements for Clause SC6.4.11.3 (4)(i) Pipe bedding. The material shall be compacted in layers of not more than 150 mm to a Density Index of 70 as determined in accordance with AS 1289.5.6.1 and with reference to WSA 03 – 2011, Part 2, Section 16.3.

The Contractor shall backfill the remainder of the excavation and compact the backfill in layers of not more than 150 mm thick as follows: (WSA 03 – 2011, Part 2, Section 17).

(i) Where the trench is within a roadway, proposed roadway, or footpath area, the remainder of the trench shall be backfilled (WSA 03 – 2011, Part 2, Section 17):

1. with a non-cohesive granular material, with a grading falling generally within the limits detailed herein for pipe bedding and compacted to Density Index of 70 when determined in accordance with AS 1289.5.6.1 for cohesionless materials:

   a) below 0.3 m of the subgrade road surface; and

   b) in the road reserve, up to top of overlay zone;

2. with selected material and compacted to 100% of the standard maximum dry density of the material when determined in accordance with AS 1289.5.4.1, to top of subgrade level of the road surface, but excluding the pavement layers;

3. with selected material and compacted to 95% of the standard maximum dry density of the material when determined in accordance with AS 1289.5.4.1, to finish surface level of the areas of trench outside of roadways; and

4. with road base and sub-base material as per existing or proposed pavement layers and compacted to 100% of the standard maximum dry density of the material when determined in accordance with AS 1289.5.4.1.

(ii) Elsewhere, unless stated otherwise, the remainder of the trench shall be backfilled with ordinary excavated backfill material. Where suitable material is not available, granular material may be used for the full depth of backfilling. The material shall be compacted to a density Index of 70 when determined in accordance with AS 1289.5.6.1 for

cohesionless materials or 98% of the standard maximum dry density of the material when determined in accordance with AS 1289.5.7.1 for cohesive materials.

The Contractor shall carry out backfilling and compaction without damaging the pipe or its external coating or wrapping or producing any movement of the pipe.

The Contractor shall carry out compaction tests 75 mm to 100 mm below the level being tested.

Where a roadway is to be sited over existing infrastructure, excavation of trench material down to overlay zone and subsequent backfilling with appropriate select material to the underside of sub-base to the compaction requirements stated above.

The Contractor may compact backfill by trench flooding only where:

1. the ground and backfill material is cohesionless sand;
2. water for flooding has been sourced at the site;
3. the process will not create mud which would be moved off site by vehicles or construction plant.The process is closely monitored to ensure adequate volumes are added to sufficiently compact the materials to achieve the compaction requirements as specified in WSA 03 – 2011, Part 2 – Table 19.1; and
4. additives are not used.

(f) Valve and hydrant marking

The Contractor shall clearly mark the position of each stop valve, scour valve, air valve and hydrant on completion of backfilling in a manner and position in accordance with SEQ-WAT-1300-2 and/or shall be consistent with the method(s) in use by Council.

Where, in the opinion of the Superintendent, a valve or hydrant is at too great a distance from any existing wall, fence, kerb face, or post, the Contractor shall provide and set in the ground a post with the relevant marking plate fixed at the top of the post, facing the fitting. The distance to the valve or hydrant in metres, to an accuracy of 0.1 m, shall be permanently marked on the plate with legible numbers a minimum 80 mm high. Wooden posts are not to be used where there is evidence, by rotting or termite activity, that the integrity of the posts will be affected.

The post shall conform to the following requirements:

(i) the post shall be of sufficient length to be set firmly in place under saturated ground conditions;

(ii) when installed, the post shall project 1000 mm above the ground, provided that where tall grass or crops are likely to obscure the post, its height above the ground shall be increased to 1500 mm; and

(iii) the post shall be painted with 2 coats of white enamel for exterior use.

The Contractor shall fix marking plates as soon as practicable after each valve or hydrant is installed. However, the Contractor shall temporarily cover marking plates for hydrants using masking tape or other approved cover which the Contractor shall remove on satisfactory completion of the pressure testing of the pipeline.

For hydrants, the Contractor shall affix blue two-way reflective raised pavement markers to the road pavement in accordance with SEQ-WAT-1300-1.

(g) Restoration of surfaces

The Contractor shall clean pavements, lawns and other improved areas and leave them in the same order as they were at the commencement of the Works. The Contractor shall restore any fencing removed during construction and shall restore lawns with turf cut and set aside from the original surface and with turf imported from a source approved by the Superintendent (WSA 03 – 2011, Part 2, Section 23). The restoration works shall be done progressively and as soon as possible after the section of works is completed.

The Contractor shall maintain all restored surfaces in the condition to which they are restored until the expiry of the defects-liability period applicable to those surfaces, notwithstanding that any deterioration of the restored surfaces, and the need for their maintenance may or may not be due to defects which become apparent or arise from events which occur during the defects-liability period. The Contractor shall maintain pavements with crushed igneous rock, gravel or other suitable material allowing for consolidation and shall then restore them to a condition equivalent to that of the original pavement.

The Contractor shall maintain all restored surfaces in the condition to which they are restored until the expiry of the defects-liability period applicable to those surfaces, notwithstanding that any deterioration of the restored surfaces, and the need for their maintenance may or may not be due to defects which become apparent or arise from events which occur during the defects-liability period. The Contractor shall maintain pavements with crushed igneous rock, gravel, asphaltic concrete, or other suitable material allowing for consolidation and shall then restore them to a condition equivalent to that of the original pavement. Final restoration may include, if required by the Superintendent, the removal of temporary restoration.

In other than roadways, the Contractor shall place the backfill sufficiently high to compensate for expected settlement and further backfilling shall be carried out or the original backfill trimmed at the end of the defects-liability period in order that the surface of the completed trench may then conform to the adjacent surface.

Surplus material shall be removed and disposed of to areas arranged by the Contractor. Where dry weather conditions have persisted after the original backfilling, including during the defects-liability period, the Contractor shall take all necessary steps to consolidate the trench before removing surplus materials from the site.

In locations where, in the opinion of the Superintendent, surplus material left in the vicinity of the trench would not be objectionable, the surplus material may be disposed by spreading neatly in the vicinity of the trench to the satisfaction of the Superintendent in such a way as to avoid future erosion of the backfill and adjacent ground surfaces. The Contractor shall maintain the backfill and adjacent ground until the expiry of the defects-liability period.

Where, within public or private property, the reasonable convenience of persons will require such, the Contractor shall level trenches at the time of backfilling or otherwise as directed by the Superintendent. The Contractor shall make good any subsequent settlement, as required by placing additional fill.

The Contractor shall immediately restore any damaged or disturbed private property and services.

Should the Contractor elect to tunnel under paving, kerb and channel or other improved surfaces in lieu of trenching, backfilling shall be so carried out as to restore full support to those surfaces, and payment shall be made for the restoration of the surfaces as though they had been removed and replaced. The Contractor shall remain responsible for the repair of the improved surfaces, if subsequently damaged due to subsidence of the backfill, until

the end of the defects-liability period.

The Contractor shall provide notice to affected property owners of any pending works.

(6) Pump stations

(a) Pumps

Pump construction materials for centrifugal end suction pumps shall comply with the following:

Description	Material
Pump	
Casing and suction bend	Cast iron AS1830 Gr T200
Wear rings	Cast iron AS1830 Gr T200
Impeller	316 Stainless steel AS/NZS 3678
	Gunmetal AS 1565-905C
Impeller nut	316 Stainless steel AS 5200.053
Shaft	Phosphor bronze AS 1565-9060/316
Shaft sleeve	Phosphor bronze AS 1565-9060
Neck bush, lantern ring	Cast Iron AS 1830 Gr T200
Gland	316 Stainless steel AS 2837
Gland studs	316 Stainless steel AS 2837
Gland nuts	316 Stainless steel AS 2837
Fixing nuts and bolts handhold	316 Stainless steel AS/NZS 3678
Covers	316 Stainless steel AS 2837
	316 Stainless steel AS 2837
Fitted bolts and nuts, casing and dowels	316 Stainless steel AS/NZS 3678
Forcing screws	Cast iron AS 1830 Gr T200/ Fabricated steel
Water thrower and drip tray	
Pump set base plate	
Motor	
Motor frame and end shield	Cast iron/ mild steel
Motor terminal box	Cast iron/ mild steel
Motor fan cover	Mild steel
Motor fan	Metal
Holding Down Bolts	316 Stainless steel AS 2837
Mechanical Seals	
Seal faces	Tungsten carbide or equal

Springs	Nickel chrome steel
Secondary seal	Fluoro carbon or nitrite rubber

The Contractor shall provide a written warranty from the Manufacturer of the equipment. This action constitutes a hold point. The Superintendent's approval of the warranty is required prior to the release of the hold point.

The Manufacturer's warranty shall require the Manufacturer to accept liability for any defect in materials or workmanship which becomes apparent at any time within two years after the date of delivery of any piece of equipment used in Work under the Contract.

All nuts and bolts shall be manufactured in accordance with AS/NZS 1111 and AS/NZS 1112 150 metric series and fitted with washers beneath bolts heads and nuts.

Requirements are:

(i) all bolts, nuts and washers shall be stainless steel to AS/NZS 3678 and AS 2837, minimum grade 316. All bolts, nuts and washers are to be of the same grade and supplied passivated;

(ii) all threads are to be rolled;

(iii) all bolt heads and nuts shall be hexagonal;

(iv) all bolts, studs, set screws and nuts for bolting flanges and other pressure containing purposes shall conform to AS 2528;

(v) all nuts and bolts subjected to vibration shall be fitted with lock washers or lock nuts;

(vi) all concrete anchor bolts, nuts, locking nuts and large series washers required for the bolting down of pump set discharge bends shall be provided. These anchor bolts shall be as recommended by the equipment designer with a minimum diameter of 16 mm; and

(vii) concrete anchor bolts shall be chemical masonry anchor type, set to their full depth, suitable for the required duty.

Bolts on all flanges will protrude no more than 10 mm past the nut when tightened.

The Contractor shall apply sufficient anti-seize/anti-galling material to the threads of all stainless-steel fasteners. The material shall be Polytetrafluoroethylene (PTFE), either tape to AS 1272, dipped or sprayed, or molybdenum disulphide.

(b) Pressure gauges

The Contractor shall install one diaphragm protected, glycerine oil filled, direct mounting, bottom connection pressure gauge complying with AS 1349 per centrifugal pump installation. Cases shall be fabricated from stainless steel complying with AS/NZS 3678 or bronze. The protective diaphragm shall be suitable for dismantling for cleaning without affecting the accuracy of the gauge.

The gauge face shall be 100 mm in diameter and calibrated in metres head of water. The gauge shall accurately indicate the pump operating head and the pump no flow head.

Each gauge shall be supplied with the nominally sized metric equivalent of three of the following bronze fittings: gate valve, union, nipple and reducing nipple.

Gauges and fittings shall be screwed into the pipe wall of ductile iron pipes, or pipe fittings, 150 mm and larger. In pipework less than 150 mm, gauges and fittings shall be screwed into a tapping band. Where shown on the design drawings, the Contractor shall install a ball valve to allow removal of the gauge.

The pressure gauge range for single or parallel pumps duty shall be 0 to 1.7 times the closed valve head of the pumps.

(c) Electrical compliance

The Works shall be in accordance with the requirements specified in Clause SC6.4.11.6 Water and sewerage electrical and mechanical, except where this section or the design drawings indicate otherwise. The technical requirements detailed on the design drawings shall take precedence over the requirements of this section should clauses be in disagreement.

Except where Clause SC6.4.11.6 Water and sewerage electrical and mechanical requires a higher standard, works shall be carried out in accordance with AS/NZS 3000, the service rules of the supply authority and all relevant statutory authorities.

The Contractor shall supply the Superintendent a proof of compliance with a standard or specified test. Such proof shall comprise a test certificate from an approved independent testing authority.

The Contractor shall submit all designs and material to each Authority having jurisdiction for approval. The Contractor shall arrange for each Authority having jurisdiction to inspect the works. The Superintendent shall be advised a minimum of 7 working days in advance of the date of any inspection by an Authority. The Superintendent shall advise at the time of notification by the Contractor whether the option to attend the inspections is to be exercised.

(d) Switchgear and control gear assembly (SCA)

The Contractor shall supply and install the SCA designed and assembled by a manufacturer approved by the Superintendent.

The SCA shall be of outdoor, stationary, free standing, metal enclosed, cubicle type series with a minimum degree of protection of IP56D as specified in AS 60529.

All equipment shall be securely mounted on suitable mounting panels and comprise individual compartments. A hot dipped galvanised steel channel base shall be provided.

Starter contactors shall have the appropriate rating for the proposed pumps to AC3.

All necessary terminals with terminal and cable numbers shall be supplied and installed in accordance with the design drawings.

The Contractor shall liaise with the electricity supply authority to supply pad locks for the metering equipment, at the Contractor’s expense. The Council shall supply pad locks for use on the SCA at no cost to the Contractor.

The electrical characteristics of the SCA shall be:

(i) Main Circuit: 415/240 V, 50 Hz, 3-phase, 4-wire;

(ii) Motor Control Circuit: 240 V, 50 Hz;

(iii) Common Control Circuit: 240 & 24 V, A.C;

(iv) Prospective short circuit current: 14 kA for 1 second;

(v) Peak Factor: 2.2;

(vi) Power Factor Correction (Determined in consultation with Council); and

(vii) Earthing (M.E.N. system).

All cables shall enter the SCA from below.

The Contractor shall supply data from the switchgear supplier confirming Type “2” coordination between contactors, motor protection relays and corresponding circuit breakers, to the Superintendent.

Refer to standard specification TCC24 clause 18 for starter selection requirements and functional requirements for the project.

The Contractor shall carry out factory tests in the presence of the Superintendent's Representative and in accordance with the requirements stipulated in Clause SC6.4.11.6 Water and Sewerage Electrical and Mechanical and the results shall comprise all routine Tests specified in AS 3439.

Inspections and functional tests shall be in accordance with TCC24 clause 21.

The Contractor shall ensure, after approval has been given by the Superintendent, that any relays, programmable logic controllers, and fittings likely to be adversely affected during delivery shall be adequately protected or shall be removed and packed separately in protected containers. Where equipment has been removed, cover plates shall be provided.

The Contractor shall be responsible for any damage that may occur during transit and unloading at site.

The Contractor shall ensure that spare parts, tools etc., are packed separately from the main plant and shall be marked “Spare Parts”, “Tools” etc., as applicable.

The Contractor shall supply spare parts in accordance with the schedule supplied by the Superintendent.

The Contractor shall supply and install control equipment that is compatible with the existing equipment.

(e) Electrical installation

The Contractor shall liaise with the Supply Authority for the electricity supply to the pump station site.

The Contractor shall be responsible for all facilities required by the Supply Authority for revenue metering equipment and the payment of all associated connection, inspection fees and capacity charges.

The Contractor shall supply and install all cabling including consumer mains, motor, control and instrumentation cables, conduits, and electrical pits.

The Contractor shall install all wiring in HD-PVC underground conduits laid in accordance with the Supply Authority’s requirements, with a minimum 500 mm below the finished ground level in non-trafficable areas and 600 mm below the finished ground level in trafficable areas. The trench and backfill material shall be free of rocks and other foreign matter likely to damage the conduits.

The Contractor shall run electrical marker tape 150 mm below the finished ground level directly above the conduits for the entire length of the conduits. Marker tape shall be orange in colour, 150 mm wide and stamped with the words “DANGER – ELECTRIC CABLES BELOW” or similar.

The Contractor shall route all underground cabling with the approval of the Superintendent. Brass marking plates shall be positioned on a concrete surround clearly showing the direction of the incoming consumer mains. Wording and markings shall read “DANGER –

ELECTRICAL CABLES BELOW". The Superintendent's approval of the route of all underground cabling is required prior to the release of the hold point.

The Contractor shall determine the points of attachment on site and the Contractor shall supply and install any consumer's connection poles for the consumer mains required by the Supply Authority.

The consumer mains shall be generally run underground and commence at the point of attachment on a steel consumers pole (if applicable), installed near the property boundary and run-in conduit to the switchboard.

No aerial conductors are to be installed over structures, access road or vehicle manoeuvring areas.

The minimum size of the consumers' mains shall be sized to satisfy the following requirements:

(i) current carrying capacity to suit the maximum demand with an excess current carrying capacity of 30% minimum;

(ii) be sized for a voltage drop less than 1.5% to the maximum demand as calculated;

(iii) be single core PVC/PVC cables. XLPE insulated cable may also be used;

(iv) comply with the requirements of the Supply Authority; and

(v) AS/NZS 3000 and AS/NZS 3008.

In addition to the requirements of the Supply Authority and as specified in Clause SC6.4.11.6 Water and sewerage electrical and mechanical, the main earthing conductor shall be run in conduit to the main earthing electrode. The main earthing connection shall be contained in an earthing electrode connection box similar to ALM type ERB-1 up to 50 mm^2 cable and a Type 4 pit for larger cable.

Earth electrode shall be bonded and suitably labelled with an engraved brass label.

Surge diverters shall be earthed in accordance with manufacturer's instructions.

The Contractor shall bond the pump station metallic pipework to the main earth. Refer also to TCC24 clause 28.1 for installation instruction requirements.

Metering equipment and installation shall comply with the Queensland Electricity Connections and Metering Manual.

The Contractor shall gland cables entering the outdoor SCA compartment using non-ferrous metallic or plastic glands with neoprene compression seals and connect the on-flow switch and pump motor cables to the appropriate terminals. Cables shall not be jointed.

The Contractor shall seal, at the completion of commissioning tests, all conduits into the outdoor SCA with a non-setting sealing compound to prevent the ingress of vermin.

(f) Testing and commissioning of pump station

The Contractor shall test and/or inspect all materials, equipment, installation, and workmanship to prove compliance with this section's requirements. The submission to the Superintendent of satisfactory test results constitutes a hold point. The approval of the Superintendent is required prior to the release of the hold point.

Tests and inspections shall comply with relevant Australian Standards.

Testing shall include pre commissioning, field testing and performance testing of each part of the whole installation.

Pre commissioning is the preparation of plant or equipment so that it is in a safe and proper condition and ready for commissioning and operation. It includes all aspects of plant operation such as safety, electrical, mechanical and instrumentation.

The Contractor shall conduct pre commissioning in a logical sequence in accordance with the programme prepared by the Contractor and approved by the Superintendent.

The Contractor shall prepare pre commissioning record sheets for each item of equipment to ensure results of tests are satisfactorily recorded and that all necessary checks or tests have been performed.

Specific requirements for pre commissioning shall include, but are not limited to:

(i) initial charges of lubricant in addition to any special lubricant requirements for initial flushing or treatment of the system or for “running in”;

(ii) physical checks and tests such as completeness of assembly, rotational tests (including checking that the rotation of electrical motors is in the correct direction), alignment checks, balancing and vibration checks, temperature, pressure and flow measurements, clearances, belt alignment and tension, etc., depending on the type of equipment;

(iii) electrical and instrument installation tests, including motor insulation tests and checking instruments against certified instruments and correcting as necessary;

(iv) tests of the correct functioning of automatic and manual control and protection equipment, including simulating danger conditions, mal-operations or failures, to check that all instruments and controls function correctly. These tests shall also include adjusting instrument set points and alarm settings and proving correct operation of alarms; and

(v) equipment and system operating tests. The Contractor shall certify compliance of each item and submit a signed copy to the Superintendent prior to commissioning.

The Contractor shall carry out pre commissioning tests to the satisfaction of the Superintendent and shall record the results of the tests on the appropriate Pre-commissioning Record Sheet.

Refer to TCC24 clause 28.1.11 for electrical test documentation requirements.

The Contractor shall furnish the Superintendent with one signed copy of each completed Pre-commissioning Record Sheet countersigned by the Superintendent's Representative who witnessed the test.

Commissioning is the running of the plant and equipment to ensure flow through the pumping system, carrying out any necessary testing and adjustments until it is ready and suitable for normal starting and running under service conditions.

The Contractor shall give the Superintendent 5 working days’ notice of the Contractor’s intention to undertake commissioning and supply to the Superintendent the copies of each of the pre-commissioning record sheets and three copies of the operational and maintenance manuals at the time that notice of commissioning is given.

The Contractor shall conduct commissioning in a logical sequence in accordance with a programme prepared by the Contractor and approved by the Superintendent.

Throughout commissioning the Contractor shall be responsible for the test programme.

The Contractor shall provide continuous supervision by personnel experienced in the operation of the equipment and shall have qualified personnel in attendance to carry out all

necessary adjustments and/or remedial work during the commissioning tests.

The Contractor shall prepare schedules, test record sheets and programmes for approval by the Superintendent prior to each stage of the overall commissioning.

The Contractor shall carry out final testing and commissioning (min 1 day duration) of the electrical services in conjunction with the mechanical equipment (e.g. pump, etc.) including setting and adjustment of equipment in accordance with the requirements in Clause SC6.4.11.6 Water and sewerage electrical and mechanical electrical and mechanical.

The Contractor shall arrange for all testing, commissioning, and any adjustments to be carried out by qualified personnel.

(g) Practical completion of pump station

The Contractor shall fulfil the following requirements before the Certificate of Practical Completion is issued:

(i) receipt by the Superintendent of a certificate of approval from the relevant statutory authorities;

(ii) pump station is in working order as demonstrated by the testing and commissioning;

(iii) approval by the Superintendent of Operating and Maintenance Manuals; and

(iv) receipt by the Superintendent of As-built drawings of the pump station.

(h) Telemetry

The Contractor shall make provision for equipment to link the pump station to the existing telemetry network to be provided by Council at the Contractor's expense. Refer to TCC24 clause 17.1, 28.2, Appendix B2 and Appendix C.

The pump station shall operate automatically by control signals from the telemetry system. In addition, either one or any combination of pumps may operate at any one time by control signals from the telemetry system.

(i) Operation and maintenance manuals

(i) Manuals shall contain the following information:

1. contractor's name, address, and telephone number;
2. client's contract number, job name; and
3. pump station general arrangement drawing showing pumps, motors, valves, pipework, switchboard, and electrical installation.

(ii) Manuals for pumps shall contain the following information:

1. manufacturer;
2. type and model number;
3. serial number;
4. dimensioned general arrangement drawing of pump and motor;
5. sectional arrangement drawing with parts and list; and
6. dimensioned sectional arrangements detailing:
    a) maximum and minimum shaft/bearing clearance (radial);
    b) maximum and minimum impeller/bowl clearance (radial);

c) maximum and minimum impeller/bowl clearance (axial);

d) impeller/bowl wear rings;

e) motor/pump coupling - type, make and model number; and

f) mechanical seals where applicable.

(iii) Manual for motors shall contain the following information:

1. manufacturer;
2. type and model number;
3. serial number;
4. dimensioned general arrangement drawing;
5. sectional arrangement drawing for submersible motor power cabling where applicable;
6. gland sealing arrangement drawing for submersible motor power cabling where applicable;
7. cables where applicable; and
8. terminal block arrangement drawing where applicable.

(iv) Manuals for electrical equipment shall comply with TCC24 clause 23 and requirements for electrical drawings are described in TCC24 clause 22.

(v) Manuals for valves shall contain a dimensioned sectional arrangement drawing with parts and material list for all valves.

(vi) Manuals shall contain the following test curves:

1. pump witnessed test curves;
2. motor test curves; and
3. motor torque/speed/efficiency characteristic curves.

(vii) The operating and maintenance manual shall include:

1. safe working procedures: for switching and isolating the supply and distribution system;
2. description of operation;
3. maintenance procedures: recommended maintenance periods and procedures;
4. tools: particulars of maintenance equipment and tools provided, with instructions for their use.
5. equipment: a technical description of the equipment supplied, with diagrams and illustrations where appropriate;
6. dismantling: where necessary, procedures for dismantling and reassembling equipment; and
7. spare parts: a list of the spare parts provided.

(j) Trouble shooting instructions shall be included for pumps, motors, valves and SCA.

(k) Procedures for dismantling pumps, motors, and valves

Step by step procedures for dismantling and reassembly of pumps, motors, and valves using

any special tools shall be detailed together with step-by-step procedures for replacement of wearing parts such as bearing, seals, wear rings, etc.

(7) Construction compliance

(a) Work-as-executed details and operation and maintenance manual

The Contractor shall submit to the Superintendent work-as-executed drawings showing the actual location and alignment of pipelines, and all pump station details together with operating and maintenance manuals.

Details shall include the size, type, levels of pipelines, valve and hydrant chamber types and cover details, easement requirements for maintenance, pump details, switchboard equipment details and station structural details.

The Contractor shall ensure that a Registered Surveyor certifies the plans showing location and alignment.

The Contractor shall provide records, for Council's Asset Register, to the Superintendent at the time of practical completion of the Contract. The records are to be in a form consistent for inputting into the Asset Register as directed by the Superintendent.

SC6.4.11.4 Sewerage planning and design guidelines

(1) Introduction

(a) Scope

The work to be undertaken in Clause SC6.4.11.4 includes the design of a sewerage system either, as a stand- alone project of as part of a development.

(i) Inclusions

Clause SC6.4.11.4 covers the design of sewerage infrastructure elements as per the scope of the *CTM Water Alliance Design and Construction Code*.

(ii) Exclusions

Clause SC6.4.11.4 does not cover requirements for sewage treatment plant design considerations. Bulk sewerage infrastructure will be planned and designed by Council in conjunction with experienced specialist consultants.

(b) Documents

(i) Reference and source documents

Reference and source documents that must be read in conjunction with the section are as follow:

Section SC6.4.3 Standard drawings

Editor's Note - Standard drawings other than water and sewerage (such as road crossings) that also contain information on water and sewerage infrastructure shall also be referred to.
Cairns, Townsville Mackay (*CTM) Water Alliance Design and Construction Code*

Public Health Regulation 2005

Workplace Health and Safety Queensland *Safe Design of Structures – Code of Practice*.

(ii) Document precedence

The order of precedence of documents shall be:

1. This section;

2. Cairns, Townsville, Mackay (*CTM) Water Alliance Design and Construction Code*; and

3. Section SC6.4.3 Standard drawings.

(2) Sewage collection system planning

(a) Scope

Sewage collection system planning covers the requirements of the sewage collection system from service connection to treatment facility. This includes collection sewers, trunk sewers, pump stations, and pressure mains.

(b) Hydraulic loading assessment

(i) General

Refer to Item 11 of the *CTM Water Alliance Design and Construction Code*.

Hydraulic loading shall be determined for all catchments being assessed. Loadings shall be determined in terms of equivalent persons (EP) and developed into flows using the unit loading factors and peaking factors detailed in the following sections.

(ii) Equivalent population estimations

The ultimate equivalent population (EP) used to determine design flows shall be determined from the following:

1. designated value of EP per hectare for each zone type provided in Part 4 of the Townsville City Plan;

2. the location of various zone types as specified in the Townsville City Plan;

3. an assessment of the ultimate population, including the expected peak occupancy ratesand the quantity of undeveloped land for each zone type listed in the Townsville City Plan; and

4. estimation of contributing loads for “Special Purpose” zonings (university, refineries, hospitals, etc.) shall be determined by analysis of historic consumption, and consultationwith the institution regarding future development.

Where staging of the works is necessary, the planner is to consider the expected growth rate for the area to develop loadings for intermediate planning horizons. This shall be based on the Townsville City Council Growth Model which is available from the Infrastructure Planning Unit. This model is based on population projection information available from the Planning Information Forecasting Unit (PIFU), Queensland Government Statistician's Office.

(iii) Design flows

Design sewage flow shall be calculated in accordance with *CTM Water Alliance Design andConstruction Code* Table 10.

(c) Network planning

(i) Purpose

Network planning is to be undertaken to meet the objectives of the *CTM Water Alliance Design and Construction Code* Part A.

Clause (ii) below, details the circumstances under which a network plan should be prepared.

(ii) Network modelling

A sewer network model is required for code and impact assessable material change of use (MCU) and reconfiguring a lot (RAL) applications where:

1. the proposed land use results in an increase in load greater than what is presently allowedfor in the planning scheme; or
2. the development requires trunk infrastructure identified in Council's plans for trunk infrastructure to be constructed ahead of its planned date, or out of sequence identified inmaster planning; or
3. the development requires the construction of new trunk infrastructure not already identified on council's plans for trunk infrastructure; or
4. existing sewer infrastructure is required to be relocated as part of the development, and such relocation may impact the hydraulics or operational functionality of the system. End ofline works are excluded from this requirement.

Council also requires the development of a network model for:

a) the preparation of infrastructure master plans; and

b) Network modelling shall be undertaken in accordance with the *CTM Water Alliance Design and Construction Code* Section 12.

(iii) Levels of assessment

Depending on the type of works in question, simplified or detailed modelling may be required todemonstrate compliance with these guidelines. Simplified or detailed assessments are defined below:

1. Simplified assessment

   An assessment that demonstrates network capacity through manual calculations, or through the use of simplified network models (schematic style models); and

2. Detailed assessment
   An assessment involving the preparation of detailed network models based on proposed design and/or development layouts.

Water and sewer network modelling guidelines outline the process to be followed to obtain Council advice as to what level of assessment is required.

(i) Timeframes

Master Planning and associated whole of life cost analysis shall be undertaken in accordance with timeframes as indicated in the *CTM Water Alliance Design and Construction Code*. In particular, the reporting years shall coincide with the census collection years viz. 2026, 2031, 2036, and ultimate design scenario.

Council may request that master planning consider provision to adjacent developments to enable an efficient trunk network.

(d) Sewerage systems

(i) General

Refer to Section 13 of the *CTM Water Alliance Design and Construction Code*.

Where possible the sewer system shall be designed to use gravity to convey the sewage.

Proposals for systems including pumping stations and rising mains require Council's written approval, including requirements for current electrical and telemetry standards, overflow and emergency arrangements, and compliance with Council's current Licence

conditions.

As such Council may opt for sewage pumping stations and pressure mains to transport wastewater into an adjacent catchment or direct to the WWTP and will be at the approval of Council.

(ii) Alternative sewer systems

Alternative sewer systems (e.g. common effluent drains, vacuum sewerage, pressure sewer systems, etc.) will only be considered with an analysis showing the benefits of such systems using a triple bottom line approach and require Council's written approval.

Alternative sewer systems shall be designed in accordance with the *CTM Water Alliance Design and Construction Code Section 13.*

(iii) Sewers

Sewer layouts, pipe sizing and grading shall be determined in accordance with the *CTM Water Alliance Design and Construction Code Part C* and associated references.

(iv) Sewage pump stations and pressure mains

Sewage pump stations are to be provided where gravity systems cannot be utilised, or sewers become uneconomically deep (usually > 5m).

Sewage pump stations are to be provided where approved in writing by Council.

Pump stations shall be planned and designed to optimise construction, operation, and maintenance costs for the total life cycle of the infrastructure and equipment. This shall include the pump station along with the discharge pressure main.

(v) Pump station and pressure main planning shall be undertaken in accordance with the *CTM Water Alliance Design and Construction Code Section 13.3.*

(3) Sewer network modelling

(a) Scope

A sewer network model is required where listed under the requirements of Clause SC6.4.11.4 (2)(c)(ii) above.

(b) Model requirements – simplified assessment

A simplified assessment involves the use of manual calculations to demonstrate compliance with design standards. A simplified assessment must include:

(i) assessment of design loads in accordance with *CTM WaterAlliance Design and Construction Code;*

(ii) necessary, hydraulic calculations based on fixed boundary conditions for Peak Wet Weather Flow loading;

(iii) calculations can be undertaken manually, using spreadsheets or using network modelling software. Where modelling software is used, the model files shall be provided to council as part of the submission; and

(iv) a brief report covering the requirements of Clause SC6.4.11.4 (3)(d) below. Sketches of results are to be provided where they make it easier to interpret results.

(c) Model requirements – detailed assessment

(i) Format

The current network modelling software must be used to undertake detailed assessments

of sewer networks. This will enable models to be incorporated into Council's existing network models. A map of the available sewer network model areas is provided in Attachment B.

Models shall be set up such that all scenarios, design horizons and options considered for the study are incorporated into a single model file.

(ii) Scenario planning

A scenario must be developed by the modeller prior to commencing modelling such that each scenario required for analysis is identified and that differences between scenarios are clearly understood.

The modeller must utilise parent and child scenarios and alternatives such that common information for each scenario is inherited to child scenarios, and that unique changes are clearly identifiable. A "parent" scenario should be applied for each design horizon or stage and ultimate development. The following provides an example of a model scenario structure.

1000- Existing Average Dry Weather Flow

1100- Existing ADWF Overflow Storage Assessment

1200- Existing Peak Wet Weather Flow

2000- Ultimate Average Dry Weather Flow

1100- Ultimate ADWF Overflow Storage Assessment

1200- Ultimate Peak Wet Weather Flow

1210- Ultimate PWWF Infrastructure Option 1

1220- Ultimate PWWF Infrastructure Option 2 (Preferred)

(iii) Technical specification

Hydraulic modelling shall be undertaken in accordance with Section 12 of *CTM Water Alliance Design and Construction Code.*

(iv) Sewage flow calculations

Design loads are to be calculated in accordance with the *CTM WaterAlliance Design and Construction Code.*

Loads must be applied to the model as an Average Dry Weather Flow (ADWF) base demand. A peaking factor multiplier applied as a fixed pattern on the load must be used to generate Peak Wet Weather Flow (PWWF).

Where a maintenance hole represents demands generated from different land uses, separate demand entries must be applied to the node to enable quick identification of the source of the demand.

(d) Reporting requirements

A sewer network modelling report must be prepared to document the process, assumptions and analysis employed through modelling to develop the infrastructure design and/or master plan.

The following provides details of sections to be incorporated into the modelling report. The modeller may provide further information as needed to justify decisions made through the modelling and design process.

(i) Introduction

1. development locality, lot/plan description, application number (if applicable);
2. objectives of study – design/master plan; and
3. brief methodology – describe level of modelling undertaken (simplified/detailed), software used, reference to model overview in appendix.

(ii) Sewage flow/loading assessment:

1. population assessment based on land use categories, site plan showing layout and land use;
2. load assessment showing calculation of ADWF and PWWF flows; and
3. summary table showing total load, with breakdown for each pump station catchment or network sub catchment, average dry weather flow (L/s), (kL/d), peak wet weather flow (L/s), (kL/d).

Where an existing Council model is being updated, a table comparing previous catchment loads to updated catchment loads must be provided.

(iii) Modelling assessment

1. scenarios analysed, including description or reference to design standards applied;
2. modelling assumptions;
3. existing network description, including proposed connection points;
4. modelling assessment;
5. existing system capacity;
6. existing system + ultimate development;
7. augmentations, new infrastructure options analysis including; and
8. assessment of options at interim stages as specified in the *CTM Water Alliance Code* and shall coincide with the census collection years viz. 2026, 2031, 2036, etc., and ultimate design scenario.

(iv) Summary

Preferred option, justification, capital works program.

(v) RPEQ Certification statement in accordance with Section SC6.4.2 Development application guidelines.

(vi) Appendix

1. model overview to be included in appendix (covering scenario structure, options and clearly outlining which scenario represents the design solution);
2. tabulated results of the manhole, gravity and rising main outputs:

Maintenance holes	Element ID Diameter Node Top and Invert Elevations Design Load

Pipes - gravity and rising mains	Element ID Pipe diameter/material and class, invert levels Grade Upstream maintenance hole, Downstream maintenance hole Pipe flow depth as percentage of diameter PWWF(gravity mains) Flow velocity at PWWF (rising mains) Flow velocity under single pump operation (risingmains)
Pump Stations	Element ID

3. pump stations system resistance curve/s with pump curve/s overlaid. Pump curve/s may be duty point however the designer shall consider the capability of pumps on the market to meet such a duty (i.e. it needs to be physically achievable).

(4) Gravity sewer design

(a) Scope

Clause SC6.4.11.4 (4) covers the design of gravity sewers.

(b) Sewer layout

Sewers shall comply with the requirements of the *CTM Water Alliance Design and Construction Code* and associated references.

(c) Sewers

Sewer Loading, Sizing, and grading. Refer to *CTM Water Alliance Design and Construction Code* Table 10.

(d) Reference and source documents (Restoration)

Reference and source documents that must be read in conjunction with this section are as follow:

For restoration under roadways refer to SEQ-WAT-1204-1.

Refer to *CTM Water Alliance Design and Construction Code* for construction specification.

For state-controlled roads restoration should be designed and constructed in accordance with DTMR standards and requirements.

(5) Sewage pump station design

(a) Scope

This section covers the design of sewage pump stations within the sewerage collection system, and also incorporates the requirements for the sizing of sewage pressure mains.

(b) Pump station design

(i) Pump station types

Refer to Section 13.3 of *CTM Water Alliance Design and Construction Code*.

(ii) Importance level

Where a building is required, buildings shall be designed for Importance Level 3 (minimum) in accordance with the *Building Code of Australia* Table B1.2a.

(c) Pump system design

(i) Design loading

Design loading for the pump station shall be determined in accordance with the *CTM Water Alliance Design and Construction Code Table 10*.

(ii) Design flow

The design flow for the pump station shall be determined in accordance with the *CTM Water Alliance Design and Construction Code Table 10* for both dry weather and wet weather (peak flow) conditions.

(iii) Pump and pressure main sizing

Pump and pressure main sizing shall be performed in accordance with the *CTM Water Alliance Design and Construction Code* Table 10 and Section 13.3.1.

(iv) Pressure main velocity

Refer to *CTM Water Alliance Design and Construction Code* Table 10.

(v) Pressure main hydraulic models

Refer to *CTM Water Alliance Design and Construction Code* Section 12.

(d) Pump station design certification

Concrete pump station shall be designed and certified by a suitably qualified and experienced RPEQ engineer.

FRP pump stations designed and manufactured outside of Queensland shall be certified by a suitably qualified engineer experienced in the design of FRP pump stations;

(e) Pump well sizing

Pump well sizing shall be performed in accordance with *CTM Water Alliance Design and Construction Code*.

(f) Overflow containment

Systems shall be designed in accordance with the *CTM Water Alliance Design and Construction Code* Table 10 and WSA 04 – 2005 Item 5.6.

(g) Vehicular access

(i) Access road

Access requirements shall be in accordance with *CTM Water Alliance Design and Construction Code* with the following additional requirements:

1. sealed asphalt access road;
2. provide access during 1% AEP flood event;
3. minimum road width of 4 m;
4. on-site turn-around for maintenance vehicle; and
5. parking area provided adjacent to all equipment to be lifted for a crane truck maintenance vehicle. Parking is only required for a single vehicle.

Design of access is to be approved by Council.

(ii) Maintenance vehicle reconfiguration

Allowance shall be made for maintenance vehicles that are 10 t (8.8 m long) crane trucks Medium Rigid Vehicles (AS 2890.2 *Parking facilities - Off street commercial vehicle* facilities) with mounted crane positioned centrally on the rear end of the vehicle.

(h) Townsville water and waste sewage pump station equipment schedule (TCC SPS equip schedule)

An equipment schedule is to be prepared for each new pump station and existing equipment schedules are to be revised for any project modifying or upgrading a pump station. The document is referenced by Tag number and lists, in summary, critical design and performance data for mechanical, electrical, radio and telemetry, and instrumentation and control equipment. The schedule is a required document in all O&M manuals.

The schedule is the cross-reference document between the tag number and the actual equipment item delivered. The schedule is a useful tool when selecting equipment as it contains relevant process parameters for each equipment item. The sample Equipment Schedule to be used and can be provided on request.

(6) Pressure main design

(a) Pressure main sizing

Refer to *CTM Water Alliance Design and Construction Code* Table 10.

(b) Services and alignment

Refer to *CTM Water Alliance Design and Construction Code* and associated references for minimum clearance requirements from other services.

(c) Restoration

Refer to *CTM Water Alliance Design and Construction Code* and associated references for restoration requirements.

For restoration under roadways refer to SEQ-WAT-1204-1.

SC6.4.11.5 Sewerage system construction

(1) Introduction

(a) Scope

This section is for the construction of the following:

(i) gravitation sewers up to DN600 nominal size;

(ii) common effluent sewers, both gravity and pressurised;

(iii) vacuum sewerage systems;

(iv) rising mains up to DN600 nominal size;

(v) standard appurtenances such as maintenance holes, maintenance shafts and property connection sewers; and

(vi) small pump stations, usually limited to single wells with submersible pumps.

This section excludes the construction activities for:

(i) treatment plants;

(ii) headworks;

(iii) dosing plant;

(iv) larger pump stations; and

(v) works controlled by others, including overflow management

The Contractor shall carry out the work, and supply materials meeting the requirements of the reference documents and, in particular, in accordance with the requirements of the Water Services Association of Australia publications WSA 02-2014*, Gravity Sewerage Code of Australia*, WSA 07 – 2005*, Sewerage Pumping Station Code of Australia*, and WSA 07-2011*, Pressure Sewerage Code of Australia*, except as otherwise specified herein.

Sewerage works should be designed in accordance with Clause SC6.4.11.4 above in conjunction with the Department of Energy and Water, *Planning Guidelines for Water and Sewerage*.

For the purposes of this section, "access chambers" are referred to as "maintenance holes".

(b) Reference and source documents

Reference and source documents to be read and applied in conjunction with this section are as follow:

Editor's Note - Documents referenced in this section are listed below whilst being cited in the text in the abbreviated form or code indicated. The Contractor shall possess, or have access to, the documents required to comply with this section.

(i) References to the *Sewerage Code of Australia* are made where there are parallel sections or equivalent clauses to those in this section. Where not called up as part of this section, these references are identified by edition, part and section numbers and enclosed in brackets thus (WSA Edition, Part, Section). The latest edition of the documents shall apply.

1. SC6.4 Development manual planning scheme policy sections:

   Section SC6.4.3 Standard drawings

   Section SC6.4.6 Road works and traffic control, control of traffic section

   Section SC6.4.18 Concrete works

   Editor's Note - Where any standard drawing used in conjunction with this section includes technical requirements that conflict with this section, the requirements of this section shall take precedence.

2. Australian standards:

   Editor's Note - References in this section or on the design drawings to Australian Standards are noted by their prefix AS or AS/NZS. Where not otherwise specified in this section or the design drawings, the Contractor shall use the latest Australian Standard, including amendments and supplements, available within two weeks of close of tenders.

AS/NZS 1111	*ISO metric hexagon commercial bolts and screws (Set)*
AS/NZS 1112	*ISO metric hexagon nuts (Set)*
AS/NZS 1260	*PVC-U pipes and fittings for drain, waste and vent applications*
AS 681	*Elastomeric Seals – Material requirements for pipe joint seals used in water and drainage applications*
AS 1289.5.4.1	*Methods of testing soils for engineering purposes – Method 5.4.1: Soil compaction and density tests - Compaction control test – Dry density ratio, moisture variation and moisture ratio*
AS 1289.5.7.1	*Methods of testing soils for engineering purposes – Method 5.7.1:*

	Soil compaction and density tests- Compaction control test – Hilf density ratio and Hilf moisture variation (Rapid Method)
AS 1349	*Bourdon tube pressure and vacuum gauges*
AS 1444	*Wrought alloy steels – Standard, hardenability (H) series and hardened and tempered to designated mechanical properties*
AS/NZS 3678	*Structural steel – hot rolled plates, floorplates and slabs*
AS/NZS 1477	*PVC pipes and fittings for pressure applications*
AS 1565	*Copper and copper alloys – Ingots and castings*
AS 1579	*Arc welded steel pipes and fittings for water and wastewater*
AS/NZS 1594	*Hot-rolled steel flat products*
AS 1627.4	*Metal finishing – Preparation and pre-treatment of surfaces - Part 4: Abrasive blast cleaning of steel*
AS 1646	*Elastomeric seals for waterworks purposes*
AS 1657	*Fixed Platforms, walkways, stairways and ladders – Design, construction and installation*
AS 1741	*Vitrified clay pipes and fittings with flexible joints – sewer quality*
AS 1830	*Grey cast iron*
AS 60529	*Degrees of protection provided by enclosures (IP Code)*
AS/NZS 2032	*Installation of PVC pipe systems.*
AS/NZS 2033	*Design and installation of polyolefin pipe systems*
AS 2129	*Flanges for pipes, valves and fittings*
AS/NZS 2280	*Ductile iron pipes and fittings*
AS 2528	*Bolts, studbolts and nuts for flanges and other high and low temperature applications*
AS/NZS 2566.1	*Buried flexible pipelines – Part 1: Structural design*
AS/NZS 2566.2	*Buried flexible pipelines – Part 2: Installation*
AS 2738	*Copper and copper alloys – compositions and designations of refinery products, wrought products, ignots and castings.*
AS/NZS 3000	*Electrical installations (known as the Australian/New Zealand Wiring Rules)*
AS/NZS 3008	*Electrical installations –Selection of cables (Set)*
AS 3439	*Low voltage switchgear and control gear assemblies (Set)*
AS 3518	*Acrylonitrile butadine styrene (ABS) compounds pipes and fittings for pressure applications*
AS 3571.1	*Plastics piping systems - Glass-reinforced thermoplastics (GRP) systems based on unsaturated polyester (UP) resin - Part 1: Pressure and non-pressure drainage and sewerage which may not be relevant to this section*

AS 3571.2	*Plastics piping systems — Glass reinforced thermoplastics (GRP) systems based on unsaturated polyester (UP) resin - Part 2: Pressure and non-pressure water supply*
AS 1628	*Water supply – Mettalic gate, globe and non-return valves*
AS/NZS 2638.1	*Gate valves for waterworks purposes – Part 1: Metal seated*
AS/NZS 2638.2	*Gate valves for waterworks purposes – Part 2: Resilient seated*
AS 4794	*Non-return valves for waterworks purposes – swing check and tilting disc*
AS 3681	*Application of polyethylene sleeving for ductile iron pipelines and fittings*
AS/NZS 3690	*Installation of ABS pipe systems*
AS 3972	*General purpose and blended cements*
AS 3996	*Access covers and grates*
AS/NZS 4058	*Precast concrete pipes (pressure and non-pressure)*
AS 4060	*Loads on buried vitrified clay pipes*
AS/NZS 4087	*Metallic Flanges for waterworks purposes*
AS/NZS 4129	*Fittings for polyethylene (PE) pipes for pressure applications*
AS/NZS 4130	*Polyethylene (PE) pipes for pressure applications*
AS 4198	*Precast concrete access and maintenance chambers for sewerage applications*

Editor's Note - Read "maintenance hole" for "access chamber"

AS 4321	*Fusion-bonded medium-density polyethylene coating and lining for pipes andfittings*
AS/NZS 4680	*Hot-dip galvanised (zinc) coatings on fabricated ferrous articles*
AS/NZS 4765	*Modified PVC (PVC-M) pipes for pressure applications*
AS 4794	*Non return valves – Swing check and tilting disc*

3. Other:

Department of Energy and Water Supply	*Planning Guidelines for Water Supply and Sewerage*, April 2010 Chapter 6 Amended March 2014

Water Services Association of Australia (WSAA):

WSA 02-2002	*Gravity Sewerage Code of Australia*
WSA 04-2005	*Sewerage Pumping Station Code of Australia*
WSA 05-2013	*Conduit Inspection Reporting Code*
WSA 07-2007	*Pressure Sewerage Code of Australia*

British Standard:

BS 410	*Specification for test sieves*
International Erosion Control Association (IECA)	*Best Practice Erosion and*

Sediment Control.

ISO 3310 *Test sieves – Technical requirements and testing (set)*

(2) Materials

(a) General

The Contractor shall comply with the requirements of the manufacturer's recommendations regarding the handling, transport and storage of materials and as further specified in this section.

Prior to the delivery of products and materials, the Contractor is expected to obtain relevant product or material certification from the manufacturer which shall be presented to the Superintendent if requested.

The Contractor shall not use damaged or defective materials, including coatings and linings, outside the manufacturer's recommended limits.

All gravity reticulation pipes shall be rubber ring (elastomeric), complying with AS 1646, jointed to the type, size and class as shown on the design drawings.

If the Contractor proposes to use alternative products and materials other than the products and materials authorised by Council, the design drawings and this section, an approval from the Council is required prior to delivery and use of alternative products or materials.

(b) PVC pipes

Unplasticised and modified PVC (uPVC and PVC-M) pipe and fittings

Unplasticised PVC (uPVC) pipes and fittings for gravity systems shall comply with AS/NZS 1260, shall be suitable for rubber rings (elastomeric) joints and shall be of the class and size as shown on the design drawings (WSA 02- 2014, Part 2, Section 13.).

Unplasticised PVC (uPVC) pipes and fittings for rising mains and suction pipes shall comply with AS/NZS 1477 and AS/NZS 4765, shall be suitable for rubber ring (elastomeric) joints and shall be of the class and size as shown on the design drawings. Modified PVC (PVC-M) pipes and fittings shall comply with AS/NZS 4765, shall be suitable for rubber ring (elastomeric) joints and shall be of the class and size as shown on the design drawings.

PVC pipes and fittings for mains and suction pipes shall be installed in accordance with AS/NZS 2032 and AS/NZS 2566.1.

Pipes and fittings are to be handled and stored protected from sunlight. The Contractor shall provide protection for the pipes and fittings from ultraviolet light and damage. The Contractor shall take account of the time for storage and type of shelter.

(c) Polyethylene (PE) pipes and fittings

Polyethylene pipe shall comply with AS/NZS 4129 and AS/NZS 4130 and shall be of the class and size shown on the design drawings and installed in accordance with AS/NZS 2033 (WSA 02-2014, Part 2, Section 13.).

Jointing shall be by butt thermal fusion or by electrofusion couplings, or with compression fittings.

The Contractor shall provide pipe of the appropriate external diameter consistent with the required internal diameter shown on the design drawings.

(d) Glass reinforced plastic (GRP) pipes and fittings

Glass filament reinforced thermosetting plastics (GRP) pipes shall comply with AS 3571.1 and shall be of the class and size as shown on the design drawings and installed in accordance with AS/NZS 2566.1 (WSA 02- 2014, Part 2, Section 13.).

Pipes and fittings are to be handled and stored protected from sunlight. The Contractor shall provide protection for the pipes and fittings from ultraviolet light and damage. The Contractor shall take account of the time for storage and type of cover.

(e) Ductile iron (DI) pipes and fittings

Ductile iron (DI) pipes and fittings shall comply with AS/NZS 2280 and shall be of the class, size, and lining, as shown on the design drawings, and installed in accordance with AS/NZS 2566.1. Jointing shall be with rubber rings (elastomeric) to the class and type as shown on the design drawings and in accordance with WSA 02- 2014, Part 2, Section 13.

Flanges shall be to the table shown on the design drawings. Bolts and nuts for flanged joints shall be galvanised, or stainless steel as for the pumps specified herein, unless shown otherwise on the design drawings.

All pipework shall be sleeved externally with polyethylene sleeving in accordance with the requirements of AS 3681 unless specified otherwise to be coated and lined. All fittings shall be thermal bonded polymeric coated, in accordance with AS/NZS 4158, or wrapped. The Contractor shall wrap all unprotected joints in the trench with a petrolatum tape system approved by the Superintendent.

(f) Steel pipeline

Steel pipelines and fittings shall comply with AS 1579 and AS/NZS 1594 and shall be of the class, size, lining and coating as shown on the design drawings or as specified in WSA 02-2014, Part 2, Section 13.

The Contractor shall wrap all unprotected joints in the trench with a petrolatum tape system approved by the Superintendent.

The jointing system shall be rubber ring (elastomeric) unless shown otherwise on the design drawings.

(g) Vitrified clay

Vitrified clay (VC) pipes and fittings shall comply with AS 1741 and shall be of the class of pipe, complying with the loading requirements of AS 4060, and size as shown on the design drawings and suitable for rubber ring (elastomeric) joints (WSA 02-2002, Part 2, Section10).

(h) Precast maintenance holes (MH)

Precast maintenance hole components shall comply with AS/NZS 1477 for PVC, AS/NZS 2033 for PE, AS 3518 for ABS, AS 3571.1 for GRP and AS 4198 for concrete (WSA 02-2014, Part 2, Section 17.2).

If approved by the Council, precast systems, complying with the drawings, may be used in lieu of cast in-situ systems (WSA 02-2014, Part 2, Section 17.2.2). Precast system components shall not be delivered to the site before satisfactory documentary evidence has been submitted to the Superintendent that quality tests have been carried out.

(i) Preformed Maintenance Shafts (MS) and Terminal Maintenance Shafts (TMS Including Covers

Preformed maintenance shaft and terminal maintenance shaft components shall comply with AS/NZS 1477 for PVC, AS/NZS 2033 for PE, AS 3518 for ABS, AS 3571.1 for GRP and AS

4198 for concrete (WSA 02-2014, Part 2, Section 17).

(j) Maintenance hole covers and frames

Cast iron maintenance hole covers and frames shall comply with AS 3996 and shall be of a type that is flush top cast cover, identifiable as SEWER, size, opening and class as shown on the design drawings. Covers and frames shall not be delivered to the site before satisfactory documentary evidence has been submitted to the Superintendent that quality tests have been carried out.

(k) Steelwork

Structural steelwork, including ladders, brackets and covers, complying with AS 1657, shall be abrasive blast cleaned to AS 1627.4, Class 2.5 and hot dip galvanised to AS/NZS 4680.

(3) Pipeline construction

(a) General

The Contractor, employees, or subcontractors, engaged in excavations, including tunnelling, are to be accredited for the work. Proof of accreditation must be provided to the Superintendent prior to the release of the hold point (WSA 02-2014, Part 2, Section 16.).

The Contractor shall not change the pipeline alignment without the prior concurrence of Council. The Contractor shall provide full details, of any proposed changes to the pipeline alignment, to the Superintendent for submission to Council. The Superintendent shall obtain the decision of Council prior to the release of the hold point.

(b) Location

The location of the sewers, maintenance holes, rising mains, and pump stations, sizes and grades of sewers and rising mains, the types of maintenance holes and maintenance hole covers, and the classes of pipes shall be as shown on the design drawings. The Contractor shall commence laying of pipelines at the lower end of the line unless directed otherwise by the Superintendent. The Contractor shall lay pipelines to grades and locations shown on the design drawings unless directed otherwise by the Superintendent (WSA 02-2014, Part 2, Section 16.).

(c) Cover over pipelines

The minimum depth of cover to be provided over pipelines in accordance with SEQ-SEW-1200-2.

Location	Minimum Cover (mm)
Private property non vehicular new developments	600
Private property non vehicular existing developments	450
Private residential property subject to vehicular loading	750
Footpaths, sealed roads (non arterial)	900
Unsealed roads	1200
Arterial roads	1200

Lesser covers may be permitted where special protection of the pipelines has been shown on the design drawings or directed by the Superintendent (WSA 02-2014, Part 1, Section 5.6.3.).

(d) Crossings

Where a pipeline crosses a main or state road, creek or involves features shown on the design drawings, under the control of any Authority, the Contractor shall carry out the work in accordance with the requirements of that Authority. The Contractor shall provide written notification to the Authority of the intention to carry out the work and pay the appropriate fees. The Contractor shall obtain the written approval from the Authority prior to commencement of work. Such written approval shall be supplied to the Superintendent if requested.

Where shown on the design drawings, the Contractor shall use trenchless methods for the installation of the sewer mains. The installation of the sewer main by open trenching shall not be permitted over the lengths designated for trenchless installation (WSA 02-2014, Part 2, Section 14.12).

The Contractor shall address, in its method statement for trenchless conduit installation, the following:

(i) general description of method and sequence of operation;

(ii) size, depth and position of temporary pits required;

(iii) use of specialist subcontractors;

(iv) specialist equipment to be used; and

(v) grout type and method of injection.

The encasement pipe shall be as detailed on the design drawings. The encasement pipe shall extend 1.0 m behind the back of the kerb on either side of the carriageway.

The carrier pipe shall be positioned on support cradles and the carrier pipe shall be centrally located within the encasement pipe.

After installation and pressure testing of the carrier pipe, the Contractor shall fill the annular space between the carrier pipe and the encasement pipe with suitable grout or cementitious grout filler.

Where the carrier pipe is ductile iron cement lined (DICL), any length of pipe which is enclosed within the encasement pipe need not be wrapped in polyethylene tubing.

(e) Earthworks

The Contractor shall carry out all excavations for structures and pipelines to the lines, grades, and forms shown on the design drawings, or as directed by the Superintendent, within the specified tolerances.

Prior to commencement of excavation, the Contractor shall be responsible in obtaining approval from the appropriate Authorities and shall comply with all requirements of the approval including having regard for drainage, dewatering, silt control, noise abatement, proximity to existing buildings and generally for the amenity of adjacent owners.

The Contractor shall leave a clear space of 600 mm minimum between the edge of any excavation and the inner toe of stockpiles. No excavated materials shall be stockpiled against the walls of any building or fence without the written permission of the owner of such building or fence. Topsoil from excavations shall be stockpiled separately and utilised to restore the surface after backfilling.

At the completion of work each day, the Contractor shall install safety fencing to statutory requirements along the edges of open excavations to isolate them from the public. The Contractor shall provide fenced walkways and vehicular crossways across trenches to

maintain access at all times from carriageway to individual properties or within individual properties and advise beforehand all affected residents. All such installations shall be of adequate size and strength and shall be illuminated to prevent accidents.

The Contractor shall locate, protect, and repair, as necessary, all services affected by the Works at the Contractor's expense. The Contractor shall give notice of any interference to the works caused by an existing service and submit a proposed work method statement.

The Contractor shall carry out erosion and sedimentation control at all construction sites in accordance with *Best Practice Erosion and Sediment Control*.

The Contractor shall take account of safety issues and possible wet weather effects to limit the extent of excavation left open.

(f) Minimum trench width for pipelines

The minimum clear width of trench inside internal faces of timbering or sheet piling, if used to a height of 150 mm above the top of the pipe shall be in accordance with SEQ-SEW-1200-2.

Table SC6.4.11.5 – This table has been deleted. The information is captured in the relevant SEQ drawings.

Where the design drawings provide for a trench to be excavated across a paved surface, the width of the trench shall be kept to a minimum. Bitumen and concrete surfaces shall be carefully cut, by saw-cutting, or other means approved by the Superintendent, provide a neat straight line free from broken ragged edges (WSA 02-2014, Part 2, Section 14.7).

The Contractor shall widen the trench where necessary for the installation of valves and fittings and protective coating systems.

(g) Maximum trench width

For gravitation sewers or rising mains of pipe materials other than PVC or PE, no restriction shall be placed on the maximum width of trench due to the structural strength of the pipe provided the depth to invert of the pipe does not exceed the depths shown in column (ii) of Table SC6.4.11.6.

The Superintendent may, however, restrict the width of trench due to local conditions. The Superintendent shall not restrict the width of trench to less than as shown in column (iii) of Table SC6.4.11.6.

Where the depth to invert exceeds that shown in column (ii) of Table SC6.4.11.6 – Maximum trench widths, the maximum width of trench (outside timbering or sheet piling, if used) to a height of 150 mm above the top of the pipe shall be as shown in column (iii) of Table SC6.4.11.6.

Table SC6.4.11.6 – Maximum Trench Widths.

Nominal size of pipe (mm) (i)	Maximum depth to invert, unlimited width trench (m) (ii)	Maximum trench width, depths greater than in column (ii) (mm) (iii)
150	8.0	750
225	6.5	825
300	5.5	900
375	4.5	975
400	4.5	975
450	4.5	1050
525	4.0	1125
600	4.0	1200

For gravitation sewers or rising mains of PVC/PE pipe the maximum width of trench from the trench base to a height of 150 mm above the top of the pipe shall be the outside diameter of the pipe barrel plus 400 mm.

However, in timbered or travelling box excavated trenches, the width of trench when measured to the outside of the support used may be increased to a maximum of 580 mm plus the outside diameter of the pipe barrel.

The Contractor shall supply a method statement of any special construction control, where shown on the design drawings, to the Superintendent's approval.

(h) Excavation depth

The Contractor shall excavate trenches to a minimum of 100 mm below the underside of the pipe barrel and socket or coupling except for rising mains to be laid on other than rock foundations or as otherwise shown on the design drawings (Refer SEQ-SEW-1201-1, SEQ-SEW-1202-1 and SEQ-SEW-1203-1).

The excavation shall be carried out such as to ensure solid and uniform support for each pipe over the whole length of the barrel with chases provided for joints and wrapping.

(i) Support of excavation

The Contractor shall adequately support all excavations to statutory requirements as the works proceed. When withdrawing supports, the Contractor shall exercise every precaution against slips or falls.

The Contractor shall ensure that timber is left in place where its removal may endanger structures in the vicinity of the excavation.

(j) Pipe bedding

When excavation of the trench has been completed the Contractor shall obtain the Superintendent's approval prior to commencing pipe laying, jointing, and bedding. The Superintendent's approval of the excavated trench is required prior to the release of the hold point, or where sewers are to be located in water charged ground (present or predicted to occur) will require specialist geotechnical analysis and design. The Contractor shall inform the Superintendent immediately upon encountering ground water and await further direction.

Crusher screenings may only be used for pipe bedding where sand or other non- cohesive material is not readily available locally or where the Contractor can demonstrate that its use will not impede repair operations.

Pipes for gravitation sewers (excluding PVC/PE pipes), shall be bedded on sand or other

non-cohesive material. Pipe bedding shall consist of a non-cohesive granular material, having a minimum thickness of 75 mm below the barrel and socket of the pipe, and its grading shall generally fall within the following limits shown in Table SC6.4.11.7.

Table SC6.4.11.7 – Grading of Bedding Material for Pipes other than PVC and PE

Sieve size aperture width (ISO 3310)	Equivalent BS sieve size (BS410)	Percentage passing
22.4 mm	1 inch	100
6.7 mm	¼ inch	90 - 100
425 µm	No. 36	40 - 90
75 µm	No. 200	0 - 10

Pipes for rising mains (excluding PVC/PE pipes) may be laid directly on other than rock foundation. The Contractor shall provide non-cohesive granular bedding, having a minimum thickness of 100 mm below the barrel (Refer SEQ-SEW-1201-1) and socket of the pipe, where rock or other hard material occurs in the bottom of the trench or where specified or directed by the Superintendent. The bedding material shall be either loose clean sand and /or medium dense clean sand or as directed by the Superintendent.

For PVC/PE pipes, irrespective of foundation, the material to be used for pipe bedding (underlay a minimum of 100 mm below the underside of the pipe barrel (Refer SEQ-SEW-1201-1) and socket, side support and overlay to a depth of 150 mm above the top of the pipe) as shown in Figure 5.1 in AS 2032 shall be in sand or other non-cohesive granular material, either crushed, natural or blended, and its grading shall fall within limits shown in Table SC6.4.11.8 below. Grading of bedding material for PVC and PE Pipes, except that where the materials cannot be reasonably sourced from within the vicinity, the Contractor may use materials satisfying the classification in the second paragraph above, provided also that the material meets the requirements for passing sieve sizes 9.5 mm and 6.7 mm as shown in Table SC6.4.11.8 below.

Table SC6.4.11.8 – Grading of Bedding Material for PVC and PE Pipes

Sieve size aperture width (ISO 3310)	Equivalent BS sieve size (BS410)	Percentage passing
9.5mm	3/8 inch	100
6.7mm	¼ inch	90 - 100
425µm	No. 36	40 - 90
150µm	No. 100	0 - 10

The Contractor shall bed all gravitation sewers laid on grades of 15 per cent to 50 per cent on 20 Mpa concrete complying with Section SC6.4.18 Concrete works. Such concrete bedding shall have a thickness of at least 75 mm below the underside of the barrel and socket of the pipe and shall extend to a level above the bottom of the pipe of one quarter of the external diameter of the pipe and a width across the trench not less than the minimum width shown in the relevant SEQ drawings.

The Contractor shall encase all gravitation pipelines and rising mains, laid on grades steeper than 50 per cent, in concrete as detailed on the design drawings.

(k) Laying and jointing of pipes

Unless detailed otherwise, the Contractor shall install pipes in accordance with AS 2032, AS/NZS 2033, AS/NZS 2566.1 or AS/NZS 3690 as appropriate (WSA 02-2014, Part 2, Section 16).

Before being laid, all pipes, fittings, valves, and materials to be used shall be cleaned and examined by the Contractor and, if required by the Superintendent, the Contractor shall suspend each one in a sling to enable the Superintendent to inspect it. If directed by the Superintendent, the Contractor shall oil valves and repack valve glands.

The Contractor shall ensure that the interior of the pipeline is clean and free from obstructions. Plugs shall be used to prevent foreign matter entering sections of pipeline which are left uncompleted overnight.

The Contractor shall take all necessary precautions to prevent flotation of pipes during laying, backfilling and initial testing. The Contractor shall remove any temporary supports prior to completion of backfilling.

Except where solvent cement joints are needed to make up or install fittings, joints in pipelines shall be flexible, rubber ring (elastomeric) joints (either roll-on rubber ring (elastomeric) or skid type) or, where shown on the design drawings, mechanical joints (either fixed flange or bolted gland type).

For pipes with roll-on rubber ring (elastomeric) joints, spigots and sockets shall be clean and dry. The Contractor, after making the joint, shall check that the rubber ring (elastomeric) has rolled in evenly, and, if not, the Contractor shall withdraw the pipe and remake the joint.

For pipes with skid type rubber ring (elastomeric) joints, only the lubricant specified in writing by the manufacturer shall be applied in making the joint. The Contractor shall make the joint such that the witness mark shall, at no point, be more than 1 mm from the end of the socket.

Pipes may be cut as needed, or directed by the Superintendent, to suit closing lengths, to remove damaged pipe or fittings or to remove sockets (if necessary) when jointing a socketed fitting.

For field cuts, a mechanical pipe cutter shall be used, except that PVC/PE pipes may be cut using a power saw or a fine-toothed handsaw and mitre box. For field cuts of ductile iron or steel, the Contractor shall ensure that fire-fighting equipment, in working order, is on the site prior to the field cuts being made. If the Contractor proposes to use a petrol-engine pipe cutter in an excavation, the Contractor shall ensure that a safe atmosphere is maintained in the excavation at all times.

The Contractor shall prepare the ends of any pipes cut in the field to the manufacturer’s written instructions, or as directed by the Superintendent.

Where pipes are cut in the field, the Contractor shall make a witness mark on the pipe at the length specified by the manufacturer from the end of the pipe. The Contractor shall not use PVC/PE pipes with scored witness marks. Where the same manufacturer does not make spigots and sockets, the Contractor shall refer to the socket manufacturer for the correct marking depth.

Where PVC pipes are to be joined to pipes of another material, the joints shall be made as follows:

(i) Jointing PVC/PE to VC Pipes

For jointing PVC/PE spigot to VC socket or PVC/PE socket to VC spigot, the Contractor shall use a PVC/PE adaptor. The joints in both instances shall be made using a ring conforming to AS1646.

(ii) Jointing PVC/PE to Ductile Iron Pipes

For jointing PVC/PE to ductile iron, the Contractor shall use a rubber ring (elastomeric) joint with an adaptor coupling.

The Contractor shall conform with the relevant statutory and Work, Health and Safety requirements when cutting and disposing of asbestos cement pipes.

Gravitation pipelines shall be constructed to the following tolerances:

(iii) the maximum horizontal deviations to either side from the design axis of a pipeline shall be 20 mm for all sizes of pipes (WSA 02-2014, Part 2, Section 22.1) ; and

(iv) the invert level shall not deviate from the design grade line by more than 10 mm (WSA 02-2014, Part 2, Section 22.2).

Flexibly jointed pipelines with gradual changes in alignment or grade shall be laid with the joint being deflected after it has been made. The Contractor shall comply with the manufacturer's written recommendations in respect of maximum deflection for each joint provided that no joint shall be deflected to such an extent as to impair its effectiveness.

The maximum angle of deflection between adjacent pipes shall be limited to 2º or 0.035 radian in areas subject to subsidence or slippage.

Unless otherwise directed by the Superintendent, the Contractor shall lay pipes for rising mains on continuously rising grades from scour valve to air release valve, notwithstanding any minor irregularities in the ground surface.

Detectable identification tape to AS/NZS 2648.1 shall be laid along the line of the rising main within 150 mm of the finished surface or as otherwise directed by the Superintendent (Refer WSA 02-2014, Part 2, Section 16.11.2 and SEQ-SEW-1200-2).

(l) Connections to maintenance holes and structures

The Contractor shall connect pipelines to maintenance holes, structures, or embedded concrete by means of 600 mm long pipes such that two flexible joints are provided, the first joint being at or within 150 mm of the face of the structure. The Contractor shall not core any connections into wall sections of precast or cast in-situ manholes <150 mm from any joint to the closest edge of core. Where flexible joints cannot be made with cut pipes, the Contractor shall select pipes from the various lengths provided in order to make the second joint within 300 mm of the position shown on the drawings (Refer SEQ-SEW-1300-1 and SEQ-SEW-1300-2).

The Contractor may vary slightly the positions of maintenance holes shown on the design drawings, subject to final approval by the Superintendent immediately prior to construction, to suit changes, such as erection of structures, growth of flora and installation of services. The positioning of a maintenance hole shall be such as to comply with occupational health and safety requirements for access by maintenance staff, providing a proper working area around the top and access into the hole. Once the final position of a maintenance hole has been established, construction shall be subject to the following requirements:

(i) for deviations from the design levels of maintenance holes as shown on the design drawings or as directed by the Superintendent during construction, the following tolerances shall apply (WSA 02-2014, Part 2, Section 22):

1. where the difference in levels between the inlet pipe and the outlet pipe in a maintenance hole is 100 mm or less:

   Pipe Tolerance

   Inlet - nil; + 10 mm

   Outlet - 10 mm; + nil; and

2. where the difference in levels, as above, is greater than 100 mm:

   Pipe Tolerance

   Inlet - 10 mm; + 10 mm

   Outlet - 10 mm; + 10 mm; and

3. allowable lateral deviations from the final design position of maintenance holes shall be +/- 300 mm.

(m) Junctions and property connection sewers

The Contractor shall provide junctions for dead ends and property connection sewers or risers to properties to serve existing and future dwellings in accordance with this section and the design drawings. Such junctions shall be inserted along pipelines in locations shown on the design drawings or directed by the Superintendent, with the service connection, where not shown on the design drawings, provided at a depth no deeper than 1.5 m provided the property still has service to the sewer, as follows:

(i) for existing dwellings, at the most practical point not outside the property boundary to facilitate the connection, considering existing sewage outlets. Separate connections shall be provided for dual occupancies; and

(ii) for vacant blocks, at the most practical point not outside the property boundary to facilitate the connection, considering topography and likely positioning of sewage outlets.

Where the sewer is intended to serve a large block and/or where the sewer line is located more than 75 m from the premises, the Contractor shall extend the property connection sewer onto that block such that the maximum horizontal measurement in a straight line between the sewer connection point and the premises on the block is not more than 75 m.

Concrete support shall be provided for the full trench width in accordance with SEQ-SEW-1106-2 and Section SC6.4.18 Concrete works.

Except where concrete encasement is ordered by the Superintendent, the Contractor shall sand compact backfill around risers to the top of the socket or coupling on the highest branch off the riser, for the full width of trench and for a minimum distance of 500 mm upstream and downstream of the riser. Compaction density shall be as for the requirements for the trench pipeline.

All property connection sewers and junctions shall have a minimum diameter of 150 mm and have a screwed access cap. Property connection sewers shall have a maximum length of 10 m.

(n) Marking of junctions and property connection sewers

The Contractor shall clearly mark the position of each riser, junction, or end of a property connection sewer on completion of backfilling. The marking shall be made by one of the following methods, but the location of the mark or peg shall be consistent with the method(s) in use by Council and to the approval of the Superintendent (WSA 02-2014, Part 2, Section 16.9).

Where the position of a riser, junction or the end of a property connection sewer is at a substantial boundary fence or structure located on the boundary, a neatly stencilled letter "J" 50 mm high shall be painted thereon. An underground identification tape, as specified hereafter, shall finish flush with the existing ground surface as close to the boundary fence or structure as possible.

Elsewhere, the Contractor shall drive into the ground, a peg, 75 mm x 50 mm x 600 mm long at that position and left flush with the surface of the surrounding ground. The Contractor shall connect the peg to an underground identification tape as specified hereafter.

The Contractor shall tie the identification tape to the junction or end of the property connection sewer, hold the tape in a vertical position during backfilling operations and finish tape flush with finished ground level.

The identification tape shall be 75 mm wide fawn coloured polyethylene tape with the inscription "Caution - buried sewer line", printed in heavy black letters every 200 mm.

(o) Trench stops

Where a sewer or rising main is laid on bedding at a grade of 5 per cent to 14 per cent, the Contractor shall construct, as below, trench stops consisting of bags filled with clay, or sand or cement stabilised sand and sealed. Reference shall be made to SEQ-SEW-1206-1 and SEQ-SEW-1207-1.

(i) At the socket side of the joint nearest to the position of a stop required in accordance with the formula hereinafter, a recess 100 mm deep to suit the width of bag shall be excavated into the bottom of the trench across its full width and into both sidewalls and extend to within 300 mm below finished surface level.

(ii) The bags shall be placed around and above the pipe, as in Clause (i) above, so as to give close contact with the pipe and to fill the entire space between the excavated recess and the pipe. Bags shall not be placed onto sand bedding.

The distance between trench stops shall be determined by the following formula:

$D = \frac{100}{G}$ whereby

D = Distance between stops in m

G = Grade of pipe expressed in per centum.

(p) Concrete bulkheads

Where a gravitation sewer or rising main is installed at a grade of 15 per cent to 29 per cent, the Contractor shall construct concrete bulkheads. Where a gravitation sewer or rising main is installed at a grade 30 percent to 50 percent, the Contractor shall construct concrete bulkheads integral with concrete encasement. Where any sewer line is to be installed with a grade exceeding 50 per cent, the contractor must provide a site-specific design to incorporate all aspects of the site conditions including soil conditions. Bulkheads shall be of 20 Mpa concrete complying with Section SC6.4.18 Concrete works, 150 mm minimum thickness as follows: (Refer SEQ-SEW-1206-1, WSA 02-2014, Part 1, Section 9.10 and WSA

02-2014, Part 2, Section 16.6).

(i) where concrete bedding or encasement to pipe is required, the 150 mm thick bulkhead shall be cast integral with the concrete bedding or encasement across the width of trench and shall be keyed into both sidewalls a minimum of 150 mm. The bulkhead shall extend to 150 mm below finished surface level or such other level as directed by the Superintendent;

(ii) where other bedding, or no bedding, is applicable, the bulkhead shall also be keyed into the bottom of the trench 150 mm for the full width of trench; and

(iii) a 75 mm nominal diameter drain hole shall be provided in the concrete bulkhead immediately above the top of the encasement bedding or foundation and crushed rock or gravel shall be placed in and at the upstream end of the drain hole to act as a filter. The gravel shall be 10 to 20 mm in size within 150 mm in all directions upstream and above the invert of the drain hole beyond which another 150 mm thick surround of gravel 2 to 10 mm in size shall be placed.

The distance between concrete bulkheads shall be determined by the following formula: (WSA 02-2014, Part 1, Section 9.10.)

Concrete bulkhead

$$S = \frac{L_P}{G}$$

Concrete encasement (continuous) and concrete bulkhead S = 100/G, whereby

LP = 80 X Pipe length, m = 450 m max

if LP > 100 m use intermediate trench stops at spacing < 100/G S = Distance between bulkheads in m

G = Grade of pipe expressed in per centum.

(q) Thrust and anchor blocks for rising main

The Contractor shall construct thrust and anchor blocks, where shown on the design drawings to the dimensions depicted therein or as otherwise directed by the Superintendent where it is deemed that the allowable bearing pressure of the ground and the design pressure on the pipeline are different to the actual pressures on site. The blocks shall be provided at valves, flexibly jointed bends, tees, enlargers, and reducers or any other point where unbalanced forces resulting from internal pressures will occur.

The Contractor shall provide permanent thrust blocks of 20 Mpa concrete, complying with Section SC6.4.18 Concrete works, such that the thrust blocks bear against undisturbed material normal to the direction of thrust resulting from internal pressures over the bearing area not less than that directed by the Superintendent.

The Contractor shall provide permanent anchor blocks of 20 Mpa concrete, complying with Section SC6.4.18 Concrete works, of a volume and dimension not less than that directed by the Superintendent.

The Contractor shall provide temporary anchorages adequate to restrain the pipe when under test. The cost of providing such anchorages shall be deemed to be included in the rates tendered for laying and jointing rising mains.

The Contractor shall obtain the consent of Townsville Water and Waste for the type and use of restrained joints, as an alternative to thrust blocks, in the case of congested service corridors and urgent commissioning.

(r) Rising main fittings

The Contractor shall install rising mains, air release valves, and inspection pipes, where shown on the design drawings or directed by the Superintendent. All rising mains shall be topped with an appropriate identification tape.

The Contractor shall provide marking plates bearing the letters “DAV” for double air valves, “SCOUR” for scour pipes and “SRM” for sewage rising main at changes of direction and at such chainages that the location of the main is marked, at least once each 100 metres, as specified hereinafter. In urban areas, the kerb adjacent to each fitting is to be painted with 2 coats of non-slip paint coloured black.

Where, in the opinion of the Superintendent, a valve or fitting is at too great a distance from any existing wall, fence or post to which the notice plate could be conveniently fixed, the Contractor shall provide and set in the ground a post with the relevant marking plate fixed at the top of the post, facing the fitting. The distance to the fitting in metres, to an accuracy of 0.1 m, shall be permanently marked on the plate with legible numbers a minimum 80 mm high. Wooden posts are not to be used where there is evidence, by rotting or termite activity, that the integrity of the posts will be affected.

The post shall conform to the following requirements:

(i) the post shall be of sufficient length to be set firmly in place under saturated ground conditions;

(ii) when installed, the post shall project 1000 mm above the ground, provided that where tall grass or crops are likely to obscure the post, or, where directed by the Superintendent, its height above the ground shall be increased to 1500 mm; and

(iii) the post shall be painted with 2 coats of white enamel for exterior use.

The Contractor shall encase in concrete, pipes in gravity sewers or rising mains, as shown on the design drawings, with less than the specified cover above the top of the pipe barrel, or where directed by the Superintendent. Concrete shall be 20 Mpa complying with Section SC6.4.18 Concrete works and have the following minimum dimensions (WSA 02-2014, Part 1, Section 9.7 and SEQ-SEW-1207-1):

(i) for trenches in other than rock: 150 mm minimum under, on both sides and on top of the pipe barrel; and

(ii) for trenches in rock: 100 mm minimum under the pipe barrel, 150 mm on top of the pipe barrel and for the full width of trench excavated.

In trenches of other than rock or fissured rock, a contraction joint consisting of a layer of bituminous felt 12 mm thick shall be formed in the concrete encasement at the face of each socket or at one face of each coupling.

Reinforcement in concrete encasement shall be as shown on the design drawings.

(s) Wrapping of pipelines

Where shown on the design drawings or directed by the Superintendent, the Contractor shall enclose a pipeline or a section thereof, in lay flat polyethylene sleeving (WSA 02-2014, Part 2, Section 16.10).

The materials to be used shall be high impact resistance polyethylene sleeving of minimum thickness 0.2 mm polyethylene film, approved by the Superintendent, and 50 mm wide plastic adhesive tape.

The width of the sleeving when flat shall be in accordance with the pipe manufacturer's written recommendations for the size and type of the pipeline which is to be encased. Precautions shall be taken so that exposure to direct sunlight does not exceed 48 hours.

Where necessary to distinguish pipes within close proximity, pipelines shall be identified by colour sleeving or an appropriate identification tape.

Application of the polyethylene sleeving and plastic adhesive tape shall be in accordance with the pipe manufacturer's written instructions or as directed by the Superintendent. The Contractor shall take due care not to damage the sleeving during its application or during the backfilling of the trench. Each pipe shall be encased in a length of sleeving overlapped for a minimum of 250 mm at each field joint, and the ends of each length of sleeving shall be held in position with at least three circumferential turns of adhesive tape. As the polyethylene sleeve material covering the pipe will be loose, excess material shall be neatly drawn up around the pipe barrel, folded into an overlap on top of the pipe and held in place by means of strips of plastic tape at approximately 1 metre intervals. Bends, tapers, and similar fittings shall be covered by polyethylene sleeving as specified for the pipes. The Contractor shall hand wrap valves, hydrants and irregular shaped fittings and joints using flat polyethylene sheets secured with plastic adhesive tape, or other suitable material, to provide an adequate seal. The flat polyethylene sheets may be obtained by splitting suitable lengths of sleeving.

The Contractor shall rectify any damage done to the polyethylene tubing before, during or after backfilling of the trench. The Contractor shall present the wrapped pipeline for inspection by the Superintendent prior to commencing backfilling operations.

(t) Corrosion protection of steel bolts and nuts

The Contractor shall wrap all galvanised steel bolts and nuts, used for installation below ground, of flanges, bolted gland joints, mechanical joints, tapping bands using a tape, approved by the Superintendent consisting of synthetic fibre open weave cloth impregnated with saturated hydrocarbons applied in accordance with the manufacturer's recommendations. Bolts and nuts shall be dry, clean, and free from rust immediately before wrapping.

(u) Cast in-situ maintenance holes

For all maintenance holes concrete work, the Contractor shall comply with Section SC6.4.18 Concrete works in relation to the supply and placement of concrete and steel reinforcement, formwork, tolerances, construction joints, curing and protection except as specified below (Refer WSA 02-2014, Part 2, Section 17.2.3 and SEQ-SEW-1301-5 and SEQ-SEW-1309-1).

Cement used in all concrete shall be Type SR to AS 3972. The Contractor may use fly ash additive to a maximum 20 per cent. Cement used shall be no older than 3 months since manufacture.

The minimum cement content shall be 360 kg/m^3 of concrete and the water/cement ratio of the mix shall not be greater than 0.50 by mass.

(v) Covers and frames

Covers and frames shall not be warped or twisted. Surfaces shall be finished such that there are no abrupt irregularities and gradual irregularities shall not exceed 3 mm. Unformed surfaces shall be finished to produce a surface that is dense, uniform, and free from blemishes. Exposed edges shall have a minimum 4 mm radius.

Tolerances for the dimensions on the COVER shall be – 3 mm + NIL. Tolerances for the dimensions on the FRAME shall be -3 mm +3mm.

Maintenance hole covers shall be seated on a layer of bitumen impregnated fibre board, having a cross section of 25 x 25 mm. Alternatively another seating material of a cross section and composition approved by the Superintendent may be used.

Maintenance hole covers shall be finished flush with the surface in roadways, footpaths, and paved surfaces of any type. Elsewhere, covers shall be finished 25 mm above the surface of the ground where not shown otherwise on the design drawings, or such other level as directed by the Superintendent, in a manner designed to avoid as far as possible, the entry of surface water. Covers shall finish 150 mm above finished surface levels in new subdivisions.

In locations, where shown on the design drawings or directed by the Superintendent, the Contractor shall install a cast iron cover and frame. Where it is evident, or otherwise shown on the design drawings, the Contractor shall install bolt down frames and covers in areas subjected to flooding. Cast iron covers and frames shall be manufactured in accordance with AS 3996, and shall be installed and filled with concrete, as necessary, in accordance with the manufacturer's written requirements.

(w) Preformed maintenance hole and maintenance shaft systems

The Contractor shall supply components that make a watertight system and have a satisfactory surface finish.

Generally, preformed maintenance holes shall be made up in accordance with the design drawings, with components consisting of a base section, shaft sections, converter, cover, and frame. Make-up Rings (1 only) of 100-150 mm may be used between converter section and cover to make up height differentials. The wall thickness of any reinforced component below the frame shall not be less than 84 mm.

Preformed maintenance shafts shall be made with section lengths that once constructed comprise the least number of joints as required to satisfy height parameters and unit joint/wall penetration coring clearances.

The installation of all preformed components shall be in accordance with the manufacturers' recommended procedures and requirements.

Backfill for all preformed maintenance holes and maintenance shafts shall be placed and compacted evenly around the maintenance hole to the required finished surface level according to location requirements. If necessary, the Contractor shall import and compact non-cohesive granular material.

(x) Bedding and backfilling compaction requirements

After laying and jointing of a pipeline has been completed the Contractor shall present the laid and jointed pipes for inspection by the Superintendent prior to commencement of trench backfilling (WSA 02-2014, Part 2, Section 19). Backfill shall not be placed until the Superintendent has given approval.

Material for the bedding, side support and overlay of the pipe shall be as for pipe bedding specified in Clause SC6.4.11.5 (3)(j) Pipe bedding above. The material shall be compacted in layers of not more than 150 mm to a Density Index of 70 for the material used when determined in accordance with AS 1289.5.6.1.

The Contractor shall backfill the remainder of the excavation and compact the backfill in layers of not more than 150 mm thick as follows:

(i) Where the trench is within a roadway, proposed roadway, the remainder of the trench shall be:

1. backfilled with a non-cohesive granular material, with a grading falling generally within the limits shown in Table SC6.4.11.7 and compacted to Density Index of 70 when determined in accordance with AS 1289.5.6.1:

    a) below 0.3 m of the subgrade road surface; and

    b) in the road reserve, up to top of overlay zone;

2. backfilled with selected material and compacted to 100 per cent of the standard maximum dry density of the material when determined in accordance with AS 1289.5.4.1, to top of subgrade level of the road surface, but excluding the pavement layers;

3. backfilled with selected material and compacted to 95 per cent of the standard maximum dry density of the material when determined in accordance with AS 1289.5.4.1, to finish surface level of the areas of trench outside of roadways; and

4. backfilled with road base and sub-base material as per existing or proposed pavement layers and compacted to 100 per cent of the standard maximum dry density of the material when determined in accordance with AS 1289.5.4.1.

(ii) Elsewhere, unless stated otherwise, the remainder of the trench shall be backfilled with ordinary excavated backfill material. Where suitable material is not available, granular material may be used for the full depth of backfilling. The material shall be compacted to a density Index of 70 when determined in accordance with AS 1289.5.6.1 for cohesionless materials or 98 per cent of the standard maximum dry density of the material when determined in accordance with AS 1289.5.4.1 for cohesive materials.

The Contractor shall carry out backfilling and compaction without damaging the pipe or its external coating or wrapping or producing any movement of the pipe.

The Contractor is to submit to the Superintendent for approval any proposal for construction of embankments in conformance with the drawings, including the method of placement and compaction and any limitations to the placement/compaction over the top of any pipeline.

Where a roadway is to be sited over existing infrastructure, excavation of trench material down to overlay zone and subsequent backfilling with appropriate select material to the underside of sub-base to the compaction requirements stated above must be undertaken by the contractor.

The Contractor may compact backfill by trench flooding only where:

1. the ground and backfill material is cohesionless sand;

2. water for flooding has been sourced at the site;

3. the process will not create mud which would be moved off site by vehicles or constructionplant; and

4. additives are not used.

The contractor shall carry out compaction tests to the full depth of zone being tested and present NATA certified test results to the Superintendent.

(4) Pipeline testing and restoration

(a) General

The Contractor shall subject all sewers and maintenance holes to an initial test as soon as practicable after construction and backfilling is completed (WSA 02-2014, Part 2, Section 21).

All lines shall be clear and free from soil, slurry, liquids and other foreign substances at the time of initial and acceptance testing.

Where a vacuum system has been specified, the Contractor shall test the system in accordance with the testing schedule as shown on the design drawings.

(b) Initial test of gravitational sewers

The Contractor shall make the initial testing of gravitation sewers with compressed air. Before the initial test is performed, all pipe laying on the section shall be completed, and backfill shall be compacted to at least the level of the top of overlay section of trench filling. The Superintendent shall advise at the time of notification by the Contractor whether the option to inspect the initial testing is required.

The initial test shall not be carried out before risers and/or property connection sewers are constructed.

Where the Superintendent approves the construction of pipelines in other than full lengths between maintenance holes, each length of pipeline shall be tested before backfilling together with the downstream portion of the maintenance hole length under construction.

The Contractor shall rectify any fault detected and obtain a satisfactory test before the remainder of backfill is placed.

(c) Initial test of maintenance holes

The Contractor shall test each maintenance hole for leakage, as soon as practicable after the maintenance hole is constructed and the maintenance hole cover surround fitted.

Maintenance holes may be tested in conjunction with both upstream and downstream sections of mains using the low-pressure vacuum method for the initial testing only in accordance with WSA 02-2014, Part 2, Section 21.4.2.2. It is advised that a pressure relief valve be installed in line with a maximum setting release of 50 kPa.

Alternatively, the Contractor may request to test manholes initially using hydrostatic means. The test shall be made by plugging all pipe openings in the walls and by filling the maintenance hole with water to the lowest point on the top of the maintenance hole cover surround. The plugs shall be positioned in the pipes as near as practicable to the internal face of the maintenance hole. The Contractor shall provide details of the alternative method proposed, for approval by the Superintendent, prior to its use.

(d) Ovality test and CCTV inspection

The Contractor shall carry out deflection (ovality) testing in conformance with WSA 02-2014 Part 2, Section 21.6.2 upon completion of placement and compaction of trench and embankment fill. Submit proposal for deflection testing to the Superintendent for acceptance. Carry out a CCTV inspection of the sewer system and maintenance structures to WSA 05-2013 Attachment E and WSA 02-2014 Part 2, Section 21.7 and Clause SC6.4.14.5 Conduit assessment.

The Contractor shall undertake ovality testing as follows:

(i) all sewers to DN 300 shall be tested to determine any excessive ovality using either a proving tool approved by the council or by CCTV light ring and approved measurement software. Ovality testing shall be undertaken after all earthworks on the subdivision are complete and no sooner than 14 days after backfilling of trenches has been completed. Sewer pipes having excessive ovality shall be replaced and the line retested (WSA 02-2014, Part 2, Section 21.6.2 & WSA 05-2013);

(ii) the proving tool shall be rigid and non-adjustable having an effective length of not less than its nominal diameter. The minimum diameter at any point along the length shall be as specified in WSA 02-2014, Appendix K;

(iii) the proving tool shall be fabricated from steel and have pulling rings at each end. The prover shall be marked to indicate the nominal pipe size and the prover outside diameter;

(iv) Maximum Allowable Deflection = 3% of Mean Outside Diameter; and

(v) the testing shall require a “prover” to be pulled through each section of the pipeline by hand winching to demonstrate that the maximum allowable deflection is not exceeded.

(e) Acceptance test of gravitational sewers and maintenance holes

Acceptance testing shall be carried out before the issue of the Certificate of Practical Completion. Sewers or maintenance holes failing any test, shall be repaired and the test repeated. The process of testing, repair of defects and retesting shall continue until a satisfactory test is obtained. (WSA 02-2014, Part 2, Section 21.) The Contractor shall make the acceptance test on all components in the section of the sewer in the same manner and to the same methods as the initial test. The Contractor shall submit to the Superintendent satisfactory test results from the acceptance testing.

The Superintendent may permit hydrostatic testing as an alternative to air testing for acceptance of gravitation pipelines and maintenance holes after approval from council.

Where the project contains a combination of precast and cast in-situ maintenance holes, then each group must be regarded as a separate population and testing frequencies shall be in accordance with WSA 02-2014, Part 2, Table 21.5.

The Superintendent may reject any pipeline or maintenance hole in which there is visible or detectable leakage.

(f) Testing with compressed air

The Contractor shall supply and keep all necessary equipment in a condition acceptable to the Superintendent.

All test gauges must have a current calibration certificate and have a range that is suitable to be able to read decimal increments. The minimum diameter of readable face shall be 100 mm.

Sewer lines may be tested by either vacuum (negative pressure) or by positive pressure. The use of inline manhole through connectors can be utilised for ease of testing multiple lines. Manholes and sewer lines shall be tested separately.

Compressed air shall be supplied by a compressor of the rotary vane type capable of supplying at least 1 m^3/minute at 35 kPa. The air shall be fed through a pressure reducing valve capable of reducing pressure from that supplied to 28 kPa ± 4 kPa. The air shall then pass through an airtight line fitted with a pressure gauge reading from 0 to 50 kPa, a pressure relief valve that shall be set to blow off at 28 kPa ± 4 kPa and a gate valve to the pipeline to be tested.

The method of setting up and carrying out the test shall be as specified in WSA 02-2014, Part 2, Section 21.4.2.

(g) Allowable pressure drop

The time taken for the pressure to drop from 25 kPa to 18 kPa shall be greater than that specified in WSA 02- 2014, Part 2, Table 21.3.

Pressure-drop times which are less than these may indicate leakage or excessive air permeability through unsaturated pipe walls with some materials. Vitrified clay pipes, in particular, suffer from excessive air permeability under dry summer conditions. When this occurs, pipes shall be thoroughly saturated with water before testing or a hydrostatic test applied.

In any case, where the allowable pressure drop time cannot be attained and there are no visible leaks, the Contractor shall apply a hydrostatic test.

(h) Hydrostatic testing

The Contractor shall not carry out hydrostatic testing unless prior approved by the superintendent.

The pipeline under test, and the pipe or hose with container, shall be filled with water until the free surface is level with the top of the container, when that container is suspended in accordance with the requirements set out below.

The test container shall be suspended at a level such that the test head applied to the pipeline is as follows:

(i) for initial test:

1. when no property connection sewers or risers are constructed – a minimum head of 2 metres above the pipe invert at the upstream end of the line under test; or
2. where property connection sewers and/or risers are constructed – a minimum head of 2 metres above the highest invert in the line under test, including its risers and property connection sewers;

(ii) for acceptance test, a minimum head of 2 metres above the highest invert in the line under test, including its risers and property connection sewers, or above the free-standing level of ground-water in the vicinity whichever is the higher; and

(iii) such other lesser head as the Superintendent, at the Superintendent's discretion, may direct.

The Contractor shall determine, at the Contractor's expense, the free-standing level of groundwater, by a method acceptable to the Superintendent.

After allowing an interval for absorption, to be determined by the Superintendent, any fall of the free water surface shall be made good by adding extra water to the container. The Contractor shall measure the fall in water level during the ten minutes thereafter.

The pipeline will be regarded as satisfactory if there are no visible leaks, and if the fall in water level is not more than 25 mm for each standard test length of the pipeline under test including property connection sewers and/or risers.

A standard test length in metres is defined as 1370 m divided by the effective diameter of the pipeline in millimetres. Where the pipeline under test is all of the same size, the effective diameter shall be the nominal size of that pipeline. Where the pipeline under test has property connection sewers and/or risers of smaller nominal size than the main sewer line, then the effective diameter shall be calculated as the product of the length and the nominal size of the larger pipe added to the product of the length and the nominal size of the smaller pipe; this sum shall be divided by the total length of pipeline under test; the result shall be

the effective diameter.

(i) Visual inspection and measurement of infiltration

Whenever, in the case of acceptance testing, the pipeline is subjected to a significant head of groundwater (I.e., 1500 mm or more above the soffit of the sewer main provided that groundwater is at least 150 mm above any property connection sewer included in the test), the tests previously prescribed may be dispensed with in favour of visual inspection and measurement of infiltration upon request to the Superintendent.

In such circumstances, the Contractor shall propose full details of the method by which the infiltration is to be measured (WSA 02-2014, Part 2, Section 21.5).

If the Superintendent, at the Superintendent's discretion, approves of an inspection and infiltration test being performed for the purposes of acceptance, the Superintendent shall determine the duration over which infiltration is to be measured. The rate of infiltration shall not exceed that determined by the following formula:

Rate of Infiltration

$Q.I. = 0.65 (L^1d^1h^1 + L^2d^2h^2 + \quad L^nd^nh^n) + Ha$

Where:

Q.I. = rate of infiltration in litres/hour L = length of pipe in metres

d = nominal size of pipe in metres

h = average head of groundwater over the invert level of the pipe in the section under test

Ha = head of groundwater above the invert level of the outlet pipe of the maintenance hole when the maintenance hole is included in the infiltration test.

The Contractor shall determine the head of groundwater, by a method approved by the Superintendent.

(j) Testing of rising mains

The Contractor shall pressure test rising mains to detect leakage and defects in the pipeline including joints, thrust and anchor blocks. Acceptance testing shall be carried out before the issue of the Certificate of Practical Completion. Rising mains failing any test, shall be repaired and the test repeated. The process of testing, repair of defects and retesting shall continue until a satisfactory test is obtained (WSA 07-2007, Part 3, Section 21). The Contractor shall submit to the Superintendent satisfactory test results from the acceptance testing.

Pipelines shall be tested in sections approved by the Superintendent as soon as practicable after each section has been laid, jointed, and backfilled, provided that:

(i) if so specified or if the Contractor so desires, some or all of the pipe joints shall be left uncovered until the whole of the section has been successfully pressure tested to the satisfaction of the Superintendent; and

(ii) the pressure testing shall not be commenced earlier than 7 days after the last concrete thrust or anchor block in the section has been cast.

For the purpose of this clause, a section shall be defined as a length of pipeline which can be effectively isolated for testing e.g. by means of main stop valves. A maximum length of 1000 m can be tested in one continuous section unless otherwise approved by the Superintendent.

Pressure testing shall not be carried out during wet weather unless otherwise approved by the Superintendent.

During pressure testing, all field joints which have not been backfilled shall be clean, dry, and accessible.

During the pressure testing of a pipeline, each stop valve shall sustain at least once, the full test pressure on one side of the valve in closed position with no pressure on the other side for at least 15 minutes.

Before testing a pipeline section, the Contractor shall clean it to the satisfaction of the Superintendent and fill it slowly with water, taking care that all air is expelled. Purging of air from rising mains shall be promoted by opening air valves to achieve conditions as stable as possible for testing by allowing for absorption, movement of the pipeline and escape of entrapped air, the section shall be kept full of water for a period of not less than 24 hours prior to the commencement of the pressure testing.

The hydrostatic test pressure which shall be applied to each section of the pipeline shall be equivalent to 1.25 times the maximum operating pressure of the pipeline but do not exceed 1.25 times the maximum operating pressure rating of the lowest rated pipe/fitting. The test procedure shall be in accordance with WSA 07-2007*,* Part 3, Section 21.4.

The Contractor shall maintain the specified test pressure for as long as required by the Superintendent, while the Contractor examines the whole section. In any case, the specified test pressure shall be maintained for not less than 4 hours. For the purpose of determining the actual leakage losses, the Contractor shall carefully measure and record the quantity of water added in order to maintain the pressure during the period of testing.

The pressure testing (pipes other than PE) of a section shall be considered to be satisfactory if:

(i) there is no failure of any thrust block, anchor block, pipe, fitting, valve, joint or any other pipeline component;

(ii) there is no visible leakage; and

(iii) the measured leakage rate does not exceed the permissible leakage rate as determined by the following formula:

Q1 = (0.14xDxLxH)

where

Q1 = permissible leakage rate (litres per hour)

D = nominal internal diameter of pipe (m)

L = length of section tested (km) H = average test head (m)

Any failure, defect, visible leakage and/or excessive leakage rate, which is detected during the pressure testing of the pipeline or during the defects liability period shall be rectified by the Contractor at the Contractor’s expense.

For PE rising mains, testing shall be in accordance with WSA 07-2007, Part 3, Section 21.5.

Alternatively, the rising main may be tested by the use of compressed air. In this case, the Contractor shall provide details of the alternative method proposed, for approval by the Superintendent, prior to its use.

(k) Connection to existing sewers

The Contractor must request approval (request for private works quotation) for connection to existing sewers from Townsville Water and Waste. Works shall be either performed by Council or delegated to the Contractor at the discretion of Council. Approval must only be requested upon satisfactory completion of all backfilling and testing. All necessary works required in completing connections to “live” maintenance holes (that is, accesses to sewer system that is currently in service), including all works undertaken by Council at “live” maintenance holes in delivering the works shall be the responsibility of the Contractor (WSA 02-2014, Part 2, Section 23).

(l) Restoration of surfaces

The Contractor shall clean pavements, lawns, and other improved areas and leave them in the same order as they were at the commencement of the Works. The Contractor shall restore any fencing removed during construction and shall restore lawns with turf cut and set aside from the original surface and with imported turf from a source approved by the Superintendent. (WSA 02-2014, Part 2, Section 24.) The restoration works shall be done progressively and as soon as possible after the section of works is completed.

The Contractor shall maintain all restored surfaces in the condition to which they are restored until the expiry of the defects-liability period applicable to those surfaces, notwithstanding that any deterioration of the restored surfaces, and the need for their maintenance may or may not be due to defects which become apparent or arise from events which occur during the defects-liability period. The Contractor shall maintain pavements with crushed igneous rock, gravel or other suitable material allowing for consolidation and shall then restore them to a condition equivalent to that of the original pavement.

Immediately the backfilling of a trench excavated through a pavement has been completed, the Contractor shall temporarily restore the pavement. Where the trench crosses bitumen or concrete pavement, the surface is to be protected from deterioration. A pre-mixed asphaltic material may be used for such temporary restoration.

The Contractor shall maintain the temporary restoration until final restoration is carried out. Final restoration of the pavement shall be carried out in accordance with SEQ-SEW-1205-1 to restore the pavement and its sub-base to no less than the original condition. Final restoration may include, if required by the Superintendent, the removal of temporary restoration.

In other than roadways, the Contractor shall place the backfill sufficiently high to compensate for expected settlement and further backfilling shall be carried out or the original backfill trimmed at the end of the defects-liability period in order that the surface of the completed trench may then conform with the adjacent surface. Surplus material shall be removed and disposed of to areas arranged by the Contractor. Where dry weather conditions have persisted after the original backfilling, including during the defects-liability period, the Contractor shall take all necessary steps to consolidate the trench before removing surplus materials from the site.

In locations where, in the opinion of the Superintendent, surplus material left in the vicinity of the trench would not be objectionable, the surplus material may be disposed by spreading neatly in the vicinity of the trench to the satisfaction of the Superintendent in such a way as to avoid future erosion of the backfill and adjacent ground surfaces. The Contractor shall maintain the backfill and adjacent ground until the expiry of the defects-liability period.

Where, within public or private property, the reasonable convenience of persons will require such, the Superintendent may order the Contractor to level trenches at the time of backfilling. The Contractor shall make good any subsequent settlement, as required by placing additional fill.

The Contractor shall immediately restore any damaged or disturbed private property and services.

Should the Contractor elect to tunnel under paving, kerb and channel or other improved surfaces in lieu of trenching, backfilling shall be so carried out as to restore full support to those surfaces. The Contractor shall remain responsible for the repair of the improved surfaces, if subsequently damaged due to subsidence of the backfill, until the end of the defects-liability period.

The Contractor shall provide notice to affected property owners of any pending works.

(5) Pump stations

(a) General

Provide only products and materials authorised by Council, the drawings, and the Planning Scheme Policy. The Contractor shall submit for approval any alternative or not authorised products and materials.

The Contractor must conform to manufacturer's recommendations for handling, transport, and storage of materials and in a manner to prevent damage or deterioration or excessive distortion. Inspect all products and materials at the time of delivery and reject products and materials not in conformance with Council requirements and the manufacturers' recommendations. Maintain protective crating or packaging until immediately before use.

Damaged or defective materials are not to be installed or used, including coatings and linings, outside the manufacturer's recommended limits.

(b) Certification of FRP manufacture pump station

The manufacture of the FRP pump station shall be certified by a suitably qualified independent engineer experienced in the manufacture of FRP pump stations.

(c) Pumps

Pump construction materials for centrifugal end suction pumps shall comply with the following:

Description	Material
Pump	
Casing and suction bend	Cast iron AS1830 Gr T200
Wear rings	Cast iron AS1830 Gr T200
Impeller	316 Stainless steel AS/NZS 3678
Impeller nut	Gunmetal AS 1565-905C
Shaft	316 Stainless steel AS 2837
Shaft sleeve	Phosphor bronze AS 1565-9060/316
Neck bush, lantern ring	Phosphor bronze AS 1565-9060
Gland	Cast Iron AS1830 Gr T200

Gland studs	316 Stainless steel AS 2837
Gland nuts	316 Stainless steel AS 2837
Fixing nuts and bolts handhold	316 Stainless steel AS 2837
Covers	316 Stainless steel AS/NZS 3678
Fitted bolts and nuts, casing and dowels	316 Stainless steel AS 2837
Forcing screws	316 Stainless steel AS 2837
Water thrower and drip tray	316 Stainless steel AS/NZS 3678
Pump set base plate	Cast iron AS1830 Gr T200/ Fabricated steel
Motor	
Motor frame and end shield	Cast iron/ mild steel
Motor terminal box	Cast iron/ mild steel
Motor fan cover	Mild steel
Motor fan	Metal
Holding Down Bolts	316 Stainless steel AS 2837
Mechanical Seals	
Seal faces	Tungsten carbide or equal
Springs	Nickel chrome steel
Secondary seal	Fluoro carbon or nitrite rubber

The Contractor shall provide a written warranty from the manufacturer of the equipment. This action constitutes a hold point. The Superintendent's approval of the warranty is required prior to the release of the hold point.

The manufacturer's warranty shall require the manufacturer to accept liability for any defect in materials or workmanship which becomes apparent at any time within 2 years after the date of delivery of any piece of equipment used in work under the contract.

All nuts and bolts shall be manufactured in accordance with AS/NZS 1111 and AS/NZS 1112, 150 metric series and fitted with washers beneath bolts heads and nuts. Requirements are:

(i) all bolts, nuts and washers shall be stainless steel to AS/NZS 3678and AS 2837, minimum grade 316. All bolts, nuts and washers are to be of the same grade and supplied passivated;

(ii) all threads are to be rolled;

(iii) all bolt heads and nuts shall be hexagonal;

(iv) all bolts, studs, set screws and nuts for bolting flanges and other pressure containing purposes shall conform to AS 2528;

(v) all nuts and bolts subjected to vibration shall be fitted with lock washers or lock nuts;

(vi) all concrete anchor bolts, nuts, locking nuts and large series washers required for the bolting down of pump set discharge bends shall be provided. These anchor bolts shall be as recommended by the equipment designer with a minimum diameter of 16 mm;

and

(vii) concrete anchor bolts shall be chemical masonry anchor type, set to their full depth, suitable for the required duty.

Bolts on all flanges will protrude no more than 10 mm past the nut when tightened.

The Contractor shall apply sufficient anti-seize/anti-galling material to the threads of all stainless-steel fasteners. The material shall be Polytetrafluroethylene (PTFE), either tape to AS 1272, dipped or sprayed, or molybdenum disulphide.

(d) Preformed pump stations and package pump stations

Preformed components or systems, complying with the design drawings, if any, otherwise complying with AS 3518, AS 3571.1 or AS 4198 may be used in lieu of in-situ construction provided:

(i) preformed concrete wall units are to be manufactured to AS 4058 except as modified as for the requirements for precast maintenance hole units;

(ii) joints shall be internal flush; and

(iii) the Contractor shall supply components that make a watertight system and have a satisfactory surface finish.

Package pump stations may be supplied and installed provided:

(i) the proposed packaged system has been appraised and recommended by Water Services Association of Australia (WSAA);

(ii) all components comply with the requirements of this section; and

(iii) the units are at least equivalent to the requirements of this section and the design drawings.

(e) Electrical compliance

The Works shall be in accordance with the requirements contained in Clause SC6.4.11.6 Water and sewerage electrical and mechanical below, except where this section or the design drawings indicate otherwise. The technical requirements detailed on the design drawings shall take precedence over the requirements of this section should clauses be in disagreement.

Except where Clause SC6.4.11.6 Water and sewerage electrical and mechanical requires a higher standard, works shall be carried out in accordance with AS 3000, the Service Rules of the Supply Authority and all relevant statutory authorities.

The Contractor shall supply proof of compliance with a standard or specified test. Such proof shall comprise a test certificate from an approved independent testing authority.

The Contractor shall submit all designs and material, to each Authority having jurisdiction for approval. The Contractor shall arrange for each Authority having jurisdiction to inspect the Works. The Superintendent shall be advised a minimum of 7 working days in advance of the date of any inspection by an Authority. The Superintendent shall advise at the time of notification by the Contractor whether the option to attend the inspections is to be exercised.

(f) Switchgear and Control Gear Assembly (SCA) controls

The Contractor shall supply and install the SCA designed and assembled by a manufacturer approved by the Superintendent.

The SCA shall be of outdoor, stationary, free standing, metal-enclosed, cubicle type series with a minimum degree of protection of IP56D as specified in AS 60529.

All equipment shall be securely mounted on suitable mounting panels and comprise individual compartments. A hot dipped galvanised steel channel base shall be provided.

The Contractor shall provide an effective barrier to prevent gases from the wet well entering the SCA.

Starter contactors shall have appropriate ratings for the proposed pumps to AC3.

All necessary terminals with terminal and cable numbers shall be supplied and installed in accordance with the design drawings.

The Contractor shall liaise with the electricity supply authority to supply padlocks for the metering equipment, at the Contractor's expense. The Council shall supply padlocks for use on the SCA at no cost to the Contractor.

The electrical characteristics of the SCA shall be:

Main Circuit: 415/240 V, 50 Hz, 3-phase, 4-wire. Motor Control Circuit: 240 V, 50 Hz.

Common Control Circuit: 240 & 24 V, A.C.

Prospective short circuit current:14kA for 1 second. Peak Factor: 2.2

Power Factor Correction (determined in consultation with the Superintendent) Earthing (M.E.N. system) Characteristics.

All cables shall enter the SCA from below.

The Contractor shall supply data from the switchgear supplier confirming Type "2" co-ordination between contactors, motor protection relays and corresponding circuit breakers, to the Superintendent.

Refer to Council's Standard Specification TCC24 clause 18 for starter selection requirements and functional specification for the project.

The Contractor shall carry out of factory tests in the presence of the Superintendent's Representative and in accordance with Clause SC6.4.11.6 Water and sewerage electrical and mechanical and the results shall comprise all routine Tests specified in AS 3439. The Superintendent shall be given 7 days' notice of the proposed date of such tests.

Inspections and functional tests shall be in accordance with TCC24 clause 21.

The Contractor shall pack the equipment for transport after satisfactory final factory inspection and tests, and after approval has been given by the Superintendent. The Contractor shall ensure that any relays, programmable logic controllers, and fittings likely to be adversely affected during delivery shall be adequately protected or shall be removed and packed separately in protected containers. Where equipment has been removed, cover plates shall be provided.

The Contractor shall be responsible for any damage that may occur during transit and unloading at site.

The Contractor shall ensure that spare parts, tools etc., are packed separately from the main plant and shall be marked "Spare Parts", "Tools" etc., as applicable.

The Contractor shall supply spare parts in accordance with the schedule supplied by the Superintendent.

Automatic control of the pump station pumping equipment shall be by way of hydrostatic level sensor providing single pump duty operation unless shown otherwise on the drawings. The level sensor will be compatible with those in use in the system. A float switch shall be used to provide a HIGH (overflow) level alarm. Refer to TCC24 clauses18.2, 18.2, 19.1 and 19.2.

The following wet well levels shall be used in the automatic control of the pump operation system:

(i) STOP level;

(ii) Duty Start level;

(iii) Standby Start level; and

(iv) High level.

Pump operation requirements are described in TCC24 clause 18.

The Contractor shall supply and install control equipment that is compatible with the existing equipment.

(g) Electrical installation

The Contractor shall liaise with the Supply Authority for the electricity supply to the pump station site.

The Contractor shall be responsible for all facilities required by the Supply Authority for revenue metering equipment and the payment of all associated connection, inspection fees and capacity charges.

The Contractor shall supply and install all cabling including consumer mains, motor, control and instrumentation cables, conduits, and electrical pits.

The Contractor shall install all wiring in HD-PVC underground conduits laid in accordance with the Supply Authority's requirements, with a minimum 500 mm below the finished ground level in non-trafficable areas and 600 mm below the finished ground level in trafficable areas. The trench and backfill material shall be free of rocks and other foreign matter likely to damage the conduits.

The Contractor shall run electrical marker tape 150 mm below the finished ground level directly above the conduits for the entire length of the conduits. Marker tape shall be orange in colour, 150 mm wide and stamped with the words "DANGER – ELECTRIC CABLES BELOW" or similar.

The Contractor shall route all underground cabling with the approval of the Superintendent. Brass marking plates shall be positioned on a concrete surround clearly showing the direction of the incoming consumer mains. Wording and markings shall read "DANGER – ELECTRICAL CABLES BELOW". The Superintendent's approval of the route of all underground cabling is required prior to the release of the hold point.

The Contractor shall determine the points of attachment on site and the Contractor shall supply and install any consumer's connection poles for the consumer mains required by the Supply Authority.

The consumer mains shall be generally run underground and commence at the point of attachment on a steel consumers pole or Ergon pillar (if applicable), installed near the property boundary and run-in conduit to the switchboard.

No aerial conductors are to be installed over structures, access road or vehicle manoeuvring areas.

The minimum size of the consumers mains shall be sized to satisfy the following:

(i) current carrying capacity to suit the maximum demand with an excess current carrying capacity of 30 percent minimum;

(ii) be sized for a voltage drop less than 1.5 percent to the maximum demand as calculated;

(iii) be single core PVC/PVC cables. XLPE insulated cable may also be used;

(iv) comply with the requirements of the Supply Authority; and

(v) AS 3000 and AS 3008.

In addition to the requirements of the Supply Authority and Clause SC6.4.11.6 Water and sewerage electrical and mechanical, the Contractor shall run the main earthing conductor in conduit to the main earthing electrode. The main earthing connection shall be contained in an earthing electrode connection box similar to ALM type ERB-1 up to 50 mm2 cable and a Type 4 pit for larger cable.

Earth electrode shall be bonded and suitably labelled with an engraved brass label.

Surge diverters shall be earthed in accordance with manufacturer's instructions.

The Contractor shall bond the pump station metallic pipework to the main earth.

Refer also to TCC24 clause 28.1 for installation instruction requirements.

Metering equipment and installation shall comply with the *Queensland Electricity Connections and Metering Manual*.

The Contractor shall gland cables entering the outdoor SCA compartment using non-ferrous metallic or plastic glands with neoprene compression seals and connect the on-flow switch and pump motor cables to the appropriate terminals. Cables shall not be jointed.

The Contractor shall seal, at the completion of commissioning tests, all conduits into the outdoor switchgear and control gear assembly with a non-setting sealing compound to prevent the ingress of vermin.

(h) Pressure gauges

The Contractor shall install one diaphragm protected, glycerine oil filled, direct mounting, bottom connection pressure gauge complying with AS 1349 per centrifugal pump installation. Cases shall be fabricated from stainless steel complying with AS/NZS 3678 or bronze. The protective diaphragm shall be suitable for dismantling for cleaning without affecting the accuracy of the gauge.

The gauge face shall be 100 mm in diameter and calibrated in metres head of water. The gauge shall accurately indicate the pump operating head and the pump no flow head.

Each gauge shall be supplied with the nominally sized metric equivalent of three of the following bronze fittings: gate valve, union, nipple and reducing nipple.

Gauges and fittings shall be screwed into the pipe wall of ductile iron pipes, or pipe fittings, 150 mm and larger. In pipework less than 150 mm, gauges and fittings shall be screwed into a tapping band. On rising mains, where shown on the design drawings, the Contractor shall install a ball valve to allow removal of the gauge.

The pressure gauge range for single or parallel pumps duty shall be 0 to 1.7 times the closed valve head of the pumps.

(i) Valves

The Contractor shall ensure that the valves supplied are compatible with the pipework such that proper sealing is provided between the pipe flanges and the valve. The concrete lining in pipework shall not be chipped away or reduced to provide clearance from the working parts of valves.

The Contractor shall ensure that valves are installed to facilitate maintenance. The Contractor shall take into account the manufacturer's recommendations, the requirements shown on the design drawings, the type of connection, and lubrication of connecting bolts.

Flanges shall comply with AS 2129 to the class shown on the design drawings.

Unless shown otherwise on the design drawings, all valves shall be anti-clockwise closing.

The Contractor shall size "Tee" Key valve operators and hand wheels to operate the valves under all operating conditions throughout their full range with no greater than 180 Newtons applied to the ends of the key bar or the rim of the wheel.

Hand wheels shall display an embossed or engraved arrow, together with "open" and/or "close" corresponding to the valve operation.

One "Tee" key operator per pump station, of suitable length for operating the respective valve from the surface level, shall be provided for each size of valve installed in each pump station.

Non-return valves shall be of the swing check type to AS 3578 of cast iron or steel body, cover and disc with bronze body and disc seat rings. The leaf shall swing clear and provide an unobstructed waterway.

The body cover shall be located and sized to allow the valve flap to be removed and the seat to be inspected without removing the valve.

Each non-return valve shall have an extended spindle, minimum grade 316 stainless steel, fitted with an adjustable counterweight.

The knife gate valve shall be constructed in accordance with the following:

(i) the design shall include an enclosed bonnet;

(ii) the spindle shall be of the non-rising type;

(iii) valves shall be anti-clockwise closing;

(iv) the gland around the spindle shall be adjustable or formed by a double O-ring;

(v) flange jointing shall be rubber O-rings; and

(vi) seating shall be achieved by flexible seats which shall be designed in a manner that will allow easy replacement. The material of the seat is to be nominated.

All assembly bolts and nuts shall be fitted with fibre or nylon isolating washers to prevent bimetallic corrosion where required.

Each valve spindle shall be fitted with a cast steel or forged steel spindle guard secured to the valve spindle with a gun metal set screw or a handwheel secured to the spindle with gun metal set screw and washer.

Valves shall be drilled and threaded, where required, in accordance with AS 2129.

(j) Testing and commissioning of pump station

The Contractor shall test and/or inspect all materials, equipment, installation, and workmanship to prove compliance with the section requirements. The submission to the Superintendent of satisfactory test results constitutes a hold point. The approval of the Superintendent is required prior to the release of the hold point.

Tests and inspections shall comply with relevant Australian Standards.

Testing shall include pre commissioning, field testing and performance testing of each part of the whole installation.

Pre commissioning is the preparation of plant or equipment so that it is in a safe and proper condition and ready for commissioning and operation. It includes all aspects of plant operation such as safety, electrical, mechanical and instrumentation.

The Contractor shall conduct pre commissioning in a logical sequence in accordance with the programme prepared by the Contractor and approved by the Superintendent.

The Contractor shall prepare pre commissioning record sheets for each item of equipment to ensure results of tests are satisfactorily recorded and that all necessary checks or tests have been performed.

Specific requirements for pre commissioning shall include, but are not limited to:

(i) initial charges of lubricant in addition to any special lubricant requirements for initial flushing or treatment of the system or for “running in”;

(ii) physical checks and tests such as completeness of assembly, rotational tests (including checking that the rotation of electrical motors is in the correct direction), alignment checks, balancing and vibration checks, temperature, pressure and flow measurements, clearances, belt alignment and tension, etc., depending on the type of equipment;

(iii) electrical and instrument installation tests, including motor insulation tests and checking instruments against certified instruments and correcting as necessary;

(iv) tests of the correct functioning of automatic and manual control and protection equipment, including simulating danger conditions, mal-operations or failures, to check that all instruments and controls function correctly. These tests shall also include adjusting instrument set points and alarm settings and proving correct operation of alarms; and

(v) equipment and system operating tests. The Contractor shall certify compliance of each item and submit a signed copy to the Superintendent prior to commissioning.

The Contractor shall carry out pre commissioning tests to the satisfaction of the Superintendent and shall record the results of the tests on the appropriate Pre commissioning Record Sheet.

Refer to TCC24 Clause 28.1.11 for electrical test documentation requirements.

The Contractor shall furnish the Superintendent with one signed copy of each completed Pre commissioning Record Sheet countersigned by the Superintendent's Representative who witnessed the test.

Commissioning is the running of the plant and equipment to ensure flow through the pumping system, carrying out any necessary testing and adjustments until it is ready and suitable for normal starting and running under service conditions.

The Contractor shall give the Superintendent 5 working days' notice of the Contractor's intention to undertake commissioning and supply to the Superintendent the copies of each of the pre commissioning record sheets and three copies of the operational and maintenance manuals at the time that notice of commissioning is given.

The Contractor shall conduct commissioning in a logical sequence in accordance with a programme prepared by the Contractor and approved by the Superintendent.

Throughout commissioning the Contractor shall be responsible for the test programme.

The Contractor shall provide continuous supervision by personnel experienced in the operation of the equipment and shall have qualified personnel in attendance to carry out all necessary adjustments and/or remedial work during the commissioning tests.

The Contractor shall prepare, schedules, test record sheets and programmes for approval by the Superintendent prior to each stage of the overall commissioning.

The Contractor shall carry out final testing and commissioning (min 1 day duration) of the electrical services in conjunction with the mechanical equipment (e.g. pump, etc) including setting and adjustment of equipment in accordance with these water and sewerage planning design guidelines.

The Contractor shall arrange for all testing, commissioning, and any adjustments.

(k) Practical completion of pump station

The Contractor shall fulfill the following requirements before the Certificate of Practical Completion:

(i) receipt by the Superintendent of a certificate of approval from the relevant statutory authorities;

(ii) pump station is in working order as demonstrated by the testing and commissioning;

(iii) approval by the Superintendent of operating and maintenance manuals; and

(iv) receipt by the Superintendent of as-built drawings of the pump station.

(l) Telemetry

The Contractor shall make provision for equipment to link the pump station to the existing telemetry network to be provided by Council at the Contractor's expense. Refer to TCC24 clause 17.1, 28.2, Appendix B2 and Appendix C.

The pump station shall be capable of being operated automatically by control signals from the existing or proposed telemetry system. In addition, either one or any combination of pumps may operate at any one time by control signals from the telemetry system.

(m) Operation and maintenance manuals

(i) Manuals shall contain the following information:

1. contractor's name, address, and telephone number;
2. client's contract number, job name; and
3. pump station general arrangement drawing showing pumps, motors, valves, pipework, switchboard and, electrical installation.

(ii) Manuals for pumps shall contain the following information:

1. manufacturer;
2. type and model number;

3. serial number;
4. dimensioned general arrangement drawing of pump and motor;
5. sectional arrangement drawing with parts and list; and
6. dimensioned sectional arrangements detailing:
    a) maximum and minimum shaft/bearing clearance (radial);
    b) maximum and minimum impeller/bowl clearance (radial);
    c) maximum and minimum impeller/bowl clearance (axial);
    d) impeller/bowl wear rings;
    e) motor/pump coupling – type, make and model number; and
    f) mechanical seals where applicable.

(iii) Manual for motors shall contain the following information:

1. manufacturer;
2. type and model number;
3. serial number;
4. dimensioned general arrangement drawing;
5. sectional arrangement drawing for submersible motor power cabling where applicable;
6. gland sealing arrangement drawing for submersible motor power cabling where applicable;
7. cables where applicable; and
8. terminal block arrangement drawing where applicable.

(iv) Manuals for electrical equipment shall comply with TCC24 clause 23 and requirements for electrical drawings are described in TCC24 clause 22.

(v) Manuals for valves shall contain a dimensioned sectional arrangement drawing with parts and material list for all valves.

(vi) Manuals shall contain the following test curves:

1. pump witnessed test curves;
2. motor test curves; and
3. motor torque/speed/efficiency characteristic curves.

(vii) The operating and maintenance manual shall include:

1. safe working procedures - for switching and isolating the supply and distribution system;
2. comprehensive description of operation, including flow charts detailing each operational activity (e.g. manual pump operation, routine test procedures) ;
3. maintenance procedures - recommended maintenance periods and procedures;
4. tools - particulars of maintenance equipment and tools provided, with instructions for their use;

5. equipment - a technical description of the equipment supplied, with diagrams and illustrations where appropriate;

6. dismantling - where necessary, procedures for dismantling and reassembling equipment; and

7. spare parts - a list of the spare parts provided.

Trouble shooting instructions shall be included for pumps, motors, valves and SCA.

Step by step procedures for dismantling and reassembly of pumps, motors and valves using any special tools shall be detailed together with step-by-step procedures for replacement of wearing parts such as bearing, seals, wear rings, etc.

(6) Construction compliance

(a) As constructed details and operation and maintenance manuals

The Contractor shall submit as-constructed drawings showing the actual location and alignment of pipelines, maintenance holes and junctions, all pump station details together with operating and maintenance manuals in accordance with Section SC6.4.24, Clause SC6.4.24.3 (3)(a).

Details shall include the size, type, levels, grade of pipelines, maintenance hole, and maintenance shaft location, types and cover details, easement requirements for maintenance, pump details, switchboard equipment details and station structural details. The Contractor shall record on as-constructed drawings the area of side fill which should not be disturbed in future without special precautionary measures where side fill construction is part of the structural integrity of a constructed pipeline of a diameter more than 225 mm.

The Contractor shall ensure that a registered surveyor certifies the plans showing location and alignment.

The Contractor shall provide records, for Council's Asset Register, to the Superintendent at the time of practical completion of the Contract. The records are to be in a form consistent for inputting into the Asset Register as directed by the Superintendent.

(b) Video records

Unless advised otherwise by the Superintendent, the Contractor shall provide a video recording of the internal condition of all mains. The video recording shall be undertaken at the time of practical completion of the Contract.

SC6.4.11.6 Water and sewerage electrical and mechanical

(1) Introduction

(a) Scope

Clause SC6.4.11.6 addresses the electrical and mechanical design considerations applicable generally to water and sewerage pump stations but can extend to treatment plants.

(b) Treatment plants

New treatment plants and plant upgrades are typically undertaken as one-off projects and performed by experienced treatment plant designers/consultants with the necessary qualifications, specialist skills and experience to carry out the planning, assessment, design, and delivery processes for the project.

Generally, Council will prepare a detailed design brief and requirements for the engagement of specialist consultants suitable to carry out the electrical aspects of the project including issues of supply, transformers, HV, plant and motor control and monitoring.

(c) Legislative requirements

Electrical designs and works shall consider relevant legislative requirements including:

(i) *Electrical Safety Act 2002* including associated regulations and Codes of Practice;

(ii) *Electricity Act 1994* and associated regulations;

(iii) *Electricity National Scheme (Queensland) Act 1997;*

(iv) *Building Act 1975* and associated regulations; and

(v) *National Electricity Rules.*

(d) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

TCC 24 *Townsville City Council Standard Specification for Electrical Switchboards*

Townsville City Council Standard Specification for Standby Generators

WSA 02 – 2002 *Sewerage Code of Australia*

WSA 03 - 2011 *Water Code of Australia*

WSA 04 - 2005 *Sewerage Pump Station Code of Australia*

(e) Standards:

In general, the following standards, codes and manuals are applicable to the design and documentation of typical pumping stations.

(i) Workmanship and Design.

Standard	**Name**
Australian Standards	All relevant Australian Standards
IEC and British Standards	Relevant International Electrotechnical Commission (IEC) and British Standards where no Australian Standard exist.
BCA	Building Code of Australia
NER	National Electricity Rules
ECMM	Queensland Electrical Connection and Metering Manual

(ii) Preparation of Electrical Drawings

Standard	**Name**
AS 1100	Technical Drawings
AS 1102	Graphical Symbols for Electro-technology
AS 3702	Item Designation in Electro-technology
TCC24	Townsville City Council Standard Specification for Electrical Switchboards

(2) Electrical supply requirements

(a) General

(i) Provision for power supply

Energy Queensland is the electrical distribution entity responsible for the connection of power supplies to all Council infrastructure assets.

The designer shall where possible, commence discussions with the electrical distribution entity at an early stage as part of the overall planning process for the proposed construction of new water and sewerage infrastructure or for the augmentation of existing water and sewerage infrastructure. Early involvement of the distribution entity shall be sought in order to resolve network considerations and availability to meet the anticipated electrical loads. Budget costs where possible shall be obtained from the distribution entity for any required upgrading of the existing power supply network and provided to Council for inclusion in project budgets, however the current distribution entity's policy is that no cost estimates are provided unless the full application process is completed with a detailed design. This shall be considered in the design program.

The designer shall obtain plans of existing infrastructure in the vicinity from the Dial Before You Dig service of the existing and proposed electricity supply network in the vicinity of the proposed infrastructure. The location of the existing network will have a bearing on the proposed locations of the infrastructure, and electrical "point of supply". The optimum location for the electrical "point of supply" should be as near as practicable to either the largest electrical loads or the proposed location of the electrical main switchboard and/or motor control centre.

The designer shall seek advice from suitably experienced people where information from the distribution entity is not forthcoming as to potential electrical supply issues.

Electrical power supply connections shall comply with the requirements of the *Queensland Electrical Connection and Metering Manual* available from their web site.

(ii) Energy retailer

The energy retailer may not necessarily be the energy supplier to the infrastructure asset. As the Queensland electricity market is a contestable market, Council may decide to obtain electrical energy from another energy retailer. The designer shall consult with Council to determine current Council commercial agreements in regard to energy retailer contracts to be applied to the new infrastructure.

(iii) Clearances

The location of water and sewerage structures such as treatment plant and pump station buildings shall be such that minimum clearances are maintained from overhead and underground electrical cables. These clearance distances are contained within the *Electrical Safety Act 2002* and AS/NZS 3000 *Electrical installations (Australian and New Zealand Wiring Rules)* and are dependent upon variables including the voltage of the overhead power lines. Guidance shall be sought from the distribution entity regarding the voltages of overhead power lines to ensure adequate clearance distances are maintained. The supply authority normally prohibits the construction of structures beneath overhead power lines. The designer shall also consider clearance distances for cranage during construction maintenance and demolition of these structures.

(iv) Ownership of HV infrastructure

Council's preference is for ownership and on-going maintenance of high voltage transformers and switchgear to remain with the distribution entity.

Where the designer seeks to have Council retains ownership and on-going maintenance of the high voltage supply assets, a detailed financial breakdown of the cost of ownership including initial capital cost and on-going maintenance costs shall be undertaken.

(v) Connection of power supply

It is Council's practice that costs associated with the connection of the required power supply to each location (including the distribution entity capital contribution) is normally included in the contract price by the Contractor performing the works. Tender documentation shall state this requirement.

All forms required to be submitted for the connection of the power supply shall be completed by the Contractor and forwarded to Council for signature. Submission of the forms shall be by the Contractor. However, circumstances may arise where the arrangements for power connection may be excluded from the contract and undertaken by Council directly with the distribution entity, including:

1. requirements for a capital contribution by the distribution entity; and
2. extended application timeframes within Energy Queensland and design program requirements where costs may not be known at the time of tendering the works.

(b) Submission of application to distribution entity

The designer shall be responsible for the calculation of the electrical loads for the proposed infrastructure or the additional electrical loads where existing infrastructure is proposed for augmentation. These shall be submitted with the application in the format required by the distribution entity.

(c) Fault levels

In order to determine the applicable fault level for the installation, particularly for HV connections, advice will be required from the distribution entity as to the applicable fault levels at the site connection. This information can then be used during the design process to calculate the fault levels throughout the site and to enable equipment selection.

In practice, this information, particularly for LV connections, is generally not forth coming from the distribution entity within typical project design time frames. To enable design progression, suitable experienced designers shall by site inspection determine as far as possible the existing LV network's configuration and based on anticipated works determine the most likely fault level for the site.

Suitable allowance for future augmentation of the proposed infrastructure shall be taken into account when calculating the prospective fault levels. The designer shall seek advice from Council to determine any proposed future upgrading at the facility.

(d) Retail energy metering

All retailer energy metering shall be designed, installed, and connected in accordance with the relevant retailer requirements.

Metering locations shall be accessible to the retailer's meter reading personnel during normal working hours. Typically for new installations, the metering panel is not located within a building or locked compound. Where old facilities are being refurbished, the designer shall relocate the meters to an accessible location.

Phone line connections etc. should be provided at each metering location in accordance with the requirements of the distribution entity. Where the installation of GSM modems for remote downloading of energy readings is required, the location of the meter panel shall be such that adequate mobile telephone coverage is achieved.

(e) Energy tariff

(i) Tariff selection

Should it be determined that the site will be connected as a regulated energy tariff connection rather than as a contestable site then:

1. the designer shall provide a detailed analysis of energy consumption at the site, taking account of equipment run times and hours of operation. The analysis shall provide indicative comparison; and
2. submit details of the energy consumption along with monthly metering charges and all other additional costs payable by Council and seek Council approval prior to the installation and connection of energy meeting.

(ii) Energy cost minimisation

The electrical design shall encompass all energy cost savings applicable due to off peak electrical consumption. Where pumps and other large electric motors are installed, control systems shall be configured to only operate pumps within high energy cost periods to maintain minimum levels in reservoirs and pump stations where possible. Major pumping shall occur during periods of off-peak low energy costs. These tariff control measures shall be provided with manual override facilities both locally and as part of any SCADA based control system.

Other constraints particularly in the sewerage network (e.g. pump station storage, or peak flows into sewerage treatment plants) may prevent the use of “off peak”, for example the storage then delivery of large quantities of raw sewerage to biological treatment plant processes.

Retailer energy charges are in Queensland presently based on real energy measurement with regulated limits on the amount of reactive power that may be produced or consumed at each site.

Some other states in Australia also charge for reactive power consumption, the rate for reactive power is generally higher than real power providing ability to determine a return on investment for power factor correction devices (other than by simple regulatory compliance).

Given potential for Queensland to alter present charging strategies in regard to reactive power, design consideration should be given to provision of space for future ability to retrofit power factor correction equipment to the site. This provision may include space, switchgear, and busbar extension, and so on as required.

(3) Emergency power supply

(a) General

(i) Generator requirements

Each water and sewerage site shall have provision for either the permanent connection of a standby diesel generating set, or as a minimum be provided with facilities for the connection of a portable generating set as required by TCC24.

A formal risk assessment of the criticality of a particular infrastructure asset shall be made by the designer in order to assess whether the standby generating set shall be permanently located and connected, or provision made for connection of a portable generating set.

For sewerage pump stations the following general guidelines apply for the provision of standbygenerating sets:

1. where a sewerage pump station has inter-area overflow capabilities, the installation of a manual transfer switching arrangement and plug-in type connection socket as a minimum is required; and
2. where the sewerage pump station does not have inter-area overflow capability, a permanently connected standby generating set with automatic changeover facilities mounted within the electrical switchboard is required.

For water pump stations, it is not normal practice to provide permanent standby generators as water is normally continued to be supplied by gravity from reservoirs during power failures. The exception is where supply to consumers will fail during power outages. In such cases permanent generators are required.

Standby generating sets shall be sized to ensure that the largest pump load combination required at the site can be successfully started and run. Manual transfer switching arrangements shall also be sized for the largest electrical pump load combination required at the site.

Generators shall be fitted with protective circuit breakers on the supply cables.

Technical requirements for the generator are provided in the council's *Standard Specification for Standby Generators*. Site Location

The generator set shall be located on the site to allow for easy and safe access for servicing and maintenance (including removal from the site where necessary). This may require a suitable hardstand area.

Access shall allow all panels on the generating set to be easily opened without hindering access to the electrical switchboard or pump station.

Vandal proofing shall be to TCC24 minimum requirements.

(ii) Fuel storage requirements and alarms

The generator set shall have a fuel capacity for a minimum of 24 hours operation based on 100% of the rated load of the generating set.

The designer shall also take into account the reliability of fuel supplies to specific locations after severe storm and cyclone events which may prevent access to the sites for re-fuelling. Where the designer determines unacceptable risk to the supply of fuel to a critical site, additional fuel storage shall be provided to Council's satisfaction.

Remote locations (e.g. Magnetic Island, rural areas) shall be considered as special cases and the availability of fuel supplies at the site after severe weather events shall be a consideration in resolving the quantity of fuel stored on-site.

A low fuel alarm from fuel storage tanks shall be connected to the telemetry and SCADA systems.The alarm shall operate when the fuel level in the tank has fallen to a level which only provides two hours of remaining operation of the standby generating set at full load.

(iii) Environmental considerations – generating sets

Fuel containmentThe generating set shall be located within a bunded area which provides drainage to a low point. A lockable draw off valve shall be provided for discharge of liquid from the bunded area. Alternatively, suitable fuel containment and drip trays shall be provided within the emergency generator set base frame.

Noise- The generator shall be fitted with sound attenuation systems to meet the environmentalrequirements for allowable noise emissions.

(iv) Battery charging

Each generating set shall have a battery charger powered from a dedicated circuit from the main site switchboard or distribution board.

(b) Indoor standby generating sets

Where the electrical main switchboard and/or motor control centre are contained within a building structure, the standby generating set shall also be located within the same building structure.

The generating set shall be contained within a fire rated sound attenuated room that provides adequate airflow for cooling purposes. Airflow requirements shall be based upon the individual generating set manufacturer's recommendations.

Bulk fuel storage shall be located externally to the building. The bulk fuel storage shall have a lockable fuel cap.

A smaller day storage tank may be provided within the room. Automatic transfer of fuel between the external bulk fuel storage tank and the smaller day tank shall be provided.

The location of the refuelling point and ability to access safely shall be considered for each site such that it allows accessibility for the delivery of fuel by the selected method.

(c) External standby generating sets

Where the electrical switchboard is either plinth or pole mounted externally, the generating set shall also be located externally provided requirements such as noise attenuation can be met.

Permanently connected standby diesel generating sets shall be fully enclosed and sound attenuated. Generating set enclosures shall offer easy access to all maintainable parts for maintenance personnel.

Externally installed generator installations shall be vandal resistant. No glass or plastic panels are to be provided on the generator exterior housing. All covers (including radiator and fuel caps) are to be pad- lockable. No controls (e.g. emergency stop) are to be external or accessible without opening a locked door or cover.

There should be no exposed "hot" parts, such as exhausts. It should not be possible to drop items down the exhaust pipe.

Surface treatment of the generator and acoustic enclosure and other exposed parts shall be selected for the environment at the site, and to provide a 15-year minimum design life.

(4) Determining electrical site loads

(a) General

The designer shall determine the site loading in accordance with AS/NZS 3000 *Electrical installations* requirements, and with consideration of the proposed pump/equipment operation combinations and sequencing. Load calculations shall be approved by Council

prior to being forwarded to the electrical distribution entity.

The designer shall be responsible for the early submission of electrical load calculations to the electrical distribution entity to minimise delays with electrical connection works.

The designer shall ensure that the calculated motor drive sizing can be achieved by a recognised pump manufacturer selected from Council's preferred equipment lists.

The electrical load calculations shall take into account Council's planned future augmentation of the infrastructure. Where no future augmentation is planned, the electrical loads shall be calculated on the anticipated connected loads plus 25% extra.

(b) Pump stations

Electrical load calculations shall be based on the method of operation of the pumps to be supplied and installed e.g., Duty-Duty, Duty-Standby, Duty1-Duty2-Standby, etc. The proposed method of operation shall also be discussed with the distribution entity to determine any potential network issues with the proposed arrangements. The design for motor starting shall meet the requirements of the distribution entity and TCC24.

(5) Electricity point of supply

The preferred method for the connection to the point of supply shall be by underground cabling.

The final location for the point of supply shall be agreed between the distribution entity and Council and shall be compatible with access to the site. Parts of the overall area serviced by Council are prone to flooding. All electrical infrastructure susceptible to flood damage shall be located above the design inundation levels adopted for the proposed site. Flood inundation level information is available from Council to assist in the location of electrical infrastructure above predicted inundation levels.

The point of supply within residential locations shall be via a galvanised steel property pole or underground URD pillar. Where galvanised steel property poles are used, the pole location shall be such that the final consumer's mains cabling length is kept to a minimum. No aerial cables are permitted to cross over infrastructure or vehicle working areas.

All connectivity at points of supply shall be accessible for maintenance purposes.

(6) Cabling

(a) Consumer's mains cabling

The consumer's mains cabling shall be sized by the designer in accordance with the calculated electrical load at the site and the requirements of AS/NZS 3000 *Electrical Installations*.

Cabling shall generally be Cu PVC/PVC/XLPE installed underground in HD uPVC conduits run between the nominated point of supply and the site electrical Main Switchboard.

Where external cabling enters a building, the cabling may be installed on cable ladder or cable tray with mechanical protection as required under AS/NZS 3000.

Where underground HD uPVC electrical conduits are installed, the designer shall provide for spare conduits, generally in the ratio of one spare conduit of the same diameter of the conduit installed for each conduit containing electrical cables.

(b) Sub-mains cabling

Sub-mains cabling shall be sized by the designer in accordance with the calculated electrical load at the particular location and the requirements of AS/NZS 3000.

Cabling shall consist of single or multi-core copper PVC/PVC or PVC/XLPE conductors generally installed underground where run external of structures in suitably sized cable ducts, or within cable trays where run internally of building structures.

(c) Power and control cables

Power and control cables shall be circular type cabling to facilitate ease of waterproofing cable entries. Consideration shall be given to use of flexible type cabling to pumps to facilitate ease of removal and installation.

Power cables shall be a minimum of 2.5 mm^2. Control cables shall be a minimum of 1.5 mm^2. A minimum of two spare cores shall be provided for all control cables following installation. Only one control voltage shall be contained within any control cable.

Where the designer has deemed a higher risk of further mechanical damage, Steel Wired Armoured (SWA) cabling or other protection method shall be provided.

(d) Variable frequency drive cables

Cables run to motors driven by VFDs shall be flexible type cabling to facilitate ease of termination and removal from pumping equipment. Cabling type, length and installation method shall be selected to meet the applicable Electromagnetic Compliance (EMC) requirements. Typically, a screened cable would be used with screen continuous from the motor terminal box to the VFD terminals.

(e) Instrumentation cables

Instrumentation wiring and cabling required to carry signals to the PLC or process instrumentation shall be selected to suit the intended application.

Generally, overall screened cables shall be used for digital signal while overall and individually screened pairs shall be used for analogue signals. Analogue and digital signals shall not be provided within the same cable.

Cables shall generally be Dekoron or approved equivalent of minimum conductor size of 0.75 mm^2. Adequate separation shall be provided between instrumentation cables and other cabling to ensure non-interference from AC power and control cables. As a minimum, cable trays shall have adequate partitions and instrumentation cabling not in trays shall be run in separate conduits.

Provision of surge suppressing transient barriers shall be provided for all instrumentation cabling run external of buildings.

(f) Control systems networks

Control system networks shall be designed to suit specific application by a control system specialist.

(g) Pump power cable connection

Power cable termination for pump units shall be determined in consultation with Council. The following applies:

(i) typical all electrical equipment shall be hardwired; and

(ii) remote sites or high maintenance sites shall be connected by decontactor style plug and socket connections.

Where plug-in connections are used, the designer shall ensure that cableways from the plug to the motor are sized to permit plugs to be withdrawn with all other cables in place.

(h) Lighting and power sub-circuits

Cabling for lighting and power circuits shall be sized in accordance with the requirements of AS/NZS 3000 *Electrical installations*.

Generally, sub-circuit cabling shall be circular multiple stranded 0.6/1kV Copper PVC/PVC insulated and sheathed conductors where not enclosed in ducting and single insulated where enclosed by ducting.

The following minimum cable cross sectional areas shall apply:

Lighting sub circuit cabling	1.5 mm²
Power sub circuit cabling	2.5 mm²

(i) Cable identification

All cables shall have an identification number engraved on a non-corrodible metallic tag secured by a non-corrodible metallic tie. Tags shall be fitted to both ends of every cable.

(7) Wiring enclosures

(a) General

Cables shall be installed within wiring enclosures to provide the required degree of mechanical protection in accordance with AS/NZS 3013 *Electrical installations - Classification of the fire and mechanical performance of wiring system elements*. The wiring enclosures shall typically consist of cable ladder or conduits.

Wiring System Classification (AS 3013)	Conduit Type
WSX1	Light Duty uPVC or equivalent
WSX2	Heavy Duty uPVC or equivalent
WSX3	Metallic Rigid Conduit or equivalent

(b) Cable ladder

Cable ladders shall typically be a heavy-duty aluminium type conforming to NEMA20B. In wet or corrosive areas stainless steel ladders may be required. Cable ladders shall be the primary method of support for surface run cables. Ladder support systems shall be designed such that loadings on ladders shall not cause deflection in excess of 1:200 of span length. Typically supports for horizontal ladders shall not exceed 3000 mm spacing and for vertical ladders, 1500 mm. In no case shall manufactures guidelines be exceeded. Ladders installed external to buildings shall be fitted with covers – horizontal ladders shall have peaked covers; vertical ladders shall have flat covers. Cables on ladders shall not be exposed to direct sunlight. It may be necessary to fit covers to the underside of some ladders. Bends, Tees and other fittings shall be of the same manufacture as the cable ladder. All fixings shall be stainless steel. Cables shall be secured in ladders utilising ties or clamps. Where external to a building, the ties/clamps shall be a non-corrodible metallic type.

(c) Conduit

Conduits shall have a minimum diameter of 20 mm and shall be run as directly as practical with a minimum number of bends or sets. Surface run conduits are to be as inconspicuous as possible and shall be run parallel to walls, floors, and ceilings wherever practical. Conduit fittings shall be of the same manufacture and be compatible with the conduit. Elbows and Tee type fittings shall not be used. Long radius bends/sets or suitably sized junction boxes shall be used. Metallic conduits installed in wet or corrosive environments shall be stainless steel or aluminium. Corrugated PVC conduit shall not be acceptable.

Underground conduits shall typically be installed to a Category A system as classified in AS 3000. The depth of burial shall be selected to suit the site environment. Sand shall be used as a bedding material – the type and grade selected to provide the required thermal properties for the installation.

Underground cable systems shall use cable pits at each change of direction and every 50 m on straight runs. The pits, lids and method of installation shall be suitable for the maximum wheel loads that may occur in the area in which they are installed. Typically, “plastic” pits shall never be used where they might be subject to vehicle traffic. The pits shall be sized to suit the number of conduit entries and size/type of cables to be installed. Ensure that cable manufacturer’s minimum bending radius is never compromised. All conduit entries shall be bell mouthed.

Underground cable routes shall be identified at each end, each change of direction, each pit entry and every 30 m along straight runs by a non-corrodible metallic plates with direction arrows, set in a concrete block.

(d) Flexible conduits

Flexible conduit shall be used to make the final connection to an item of plant. The flexible conduit shall typically be a PVC sheathed metallic liquid tight type, though in certain environments other materials may be more suitable, e.g. in wet, chemical, or hazardous area environments. The flexible conduit shall be terminated with correct fittings from the same manufacturer as the conduit. The length of flexible conduit shall be kept to the minimum required to make a final termination to an item of plant. Corrugated PVC conduit shall not be acceptable.

(8) Switchboard design guidelines

(a) General

The following applies:

(i) Electrical switchboards including motor control centres, distribution boards, etc. shall be constructed in accordance with the requirements of the TCC specification TCC24 and accompanying standard drawings.

(ii) These typical drawings shall be adapted to suit the application and the proposed switchboard general arrangement.

(iii) The switchboard main switch shall be rated for 125% of the current rating of the consumer mains cabling.

(iv) Generator control and/or connectivity shall be included.

(v) Switchboard design shall include shrouding of live terminals to prevent inadvertent contact.

(vi) Sections of switchboards required to be accessed by non-electrical personnel shall be physically segregated from other sections of the switchboard and be supplied by extra low voltage 24V DC power supplies. Where this requirement is not achievable, lockable hinged escutcheons shall be provided to prevent access to electrical equipment by unauthorised persons.

(vii) Where the electrical energy metering is included in the overall switchboard design, a separate compartment with padlockable access door shall be provided where required by the energy retailer.

(viii) Switchboards located adjacent to sewerage pump stations shall be mounted on a concrete plinth to the side of the well.

(ix) Sufficient concrete hardstand area shall be provided for maintenance personnel servicing the switchboard. Switchboards shall be located such that the access doors do not open towards an access road or the actual pump well, and

(x) Galvanised steel bollards filled with concrete shall be erected in the vicinity of external electrical switchboards to minimise accidental vehicular damage to the switchboard and to protect maintenance personnel.

(b) Design documentation

The following list contains the minimum design documentation required for switchboard and electrical design to be submitted to Council for approval:

(i) Detailed electrical drawings including but not limited to the following:

1. power single line diagrams;
2. control circuit drawings;
3. PLC control and network drawings;
4. switchboard general arrangement drawings; and
5. layout drawings.

(ii) Detailed electrical calculations including but not limited to the following:

1. electrical maximum demand calculations;
2. fault level calculations;
3. cable calculations; and
4. earth fault loop impedance.

(iii) Detailed electrical schedules including but not limited to the following:

1. cable schedules;
2. I/O schedules;
3. single line diagrams;
4. electrical equipment lists; and
5. technical data sheets.

(c) Switchboard construction

Switchboard construction and equipment shall be in accordance with TCC24 specification, including:

(i) construction from 316 grade brushed stainless steel (the use of zinc anneal switchboard enclosures may be considered in internal locations with air-conditioned switch room);

(ii) all switchboard hardware, including, but not limited to, hinges, locking devices etc. shall also be manufactured from 316 grade stainless steel;

(iii) padlockable, vandal resistant swing handle type locking mechanisms are preferred for enclosures to suit the standard keying system. The overall number of lockable compartments shall be kept to a minimum; and

(iv) ventilation/cooling requirements to ensure internal temperatures do not exceed manufacturer's recommendations for any equipment contained in the switchboard.

External switchboards shall be painted colours that provide reflection of direct sunlight to minimise heat build-up within the switchboards and shall be orientated to minimise risks of direct sunlight affecting internal electronic components.

Externally mounted switchboards and control panels shall be provided with sunhoods to minimise heat build-up within the control panels and to provide cover to maintenance personnel when working on the switchboards in rain.

1. separate compartments to locate electronic soft starters > 22kW;
2. separate compartments for PLC and telemetry hardware, with associated cabling terminated on suitably rated terminal strips; and
3. VFD equipment in external boards may require suitable mechanical refrigeration/cooling systems to extend equipment life.

Motor starters, motor protection, and switchboard instrumentation shall be in accordance with the requirements of TCC specification TCC 24.

Major main switchboards and distribution boards shall include arc detection and VESDA protection.

(d) Electrical switchrooms

Dedicated electrical switchrooms shall be provided for large scale pump stations, treatment plants or where required to suit equipment types or the application.

Switchrooms shall conform to the requirements of AS/NZS 3000, the Building Code of Australia (BCA), and Council's operational requirements. Emergency lighting and fire extinguishers shall be provided at each Main Switchboard located within a dedicated switchroom as a minimum.

(e) Lightning and surge protection measures

Transient and surge protection devices shall be provided as recommended by the relevant Australian Standards including:

(i) AS 1768 *Lightning protection; and*

(ii) AS 4070 Recommended practices for protection of low voltage electrical installations and equipment in MEN systems from transient over voltages.

(9) Monitoring/control guidelines

(a) Design outputs

Control loop and P and ID drawings shall be provided for all major infrastructure including treatment plants and large pump stations.

Functional specifications shall be produced for proposed PLC and SCADA based control systems. Integration works are to be approved by Council.

For design and construct works, control loop and P and ID drawings shall be provided as part of the evaluation phase.

(b) Monitoring/control methodology - pump stations

Pump stations shall generally be controlled as per TCC24 including local automatic / local manual and system control mechanisms.

All pump stations are to be remotely monitored by the telemetry and SCADA system.

(c) Monitoring methodology - reservoirs

Reservoir level monitoring shall be performed using submersible pressure transducers or external differential pressure transmitters.

Where flow to the reservoir is controlled by a pump or control valves, the pressure transducer shall be used for pump and/or valve control.

(d) Monitoring/control methodology - treatment plants

Treatment plants shall be controlled by PLC and SCADA based control systems, utilising optical fibre communication cabling.

Systems shall be to Council's current requirements, and systems for plant augmentations shall be compatible with existing systems. SCADA system shall be Citect or ClearSCADA (Council to confirm). PLC equipment shall be Siemens S7 series.

A functional specification for the monitoring/control of treatment plant systems including design and redundancy is to be included in the detailed design brief for each project.

(e) Float switches

Encapsulated float switches are to be provided in sewerage pump stations to indicate high level alarms. The installation of float switches must allow for the float to be accessed from the top of the pump well without the need to enter the well.

(10) Field equipment installation, wiring and terminations

(a) General

Field equipment installation, wiring and terminations shall generally encompass all electrical works external to the switchboards and motor control centres, including but not limited to the installation of field cabling and cable support systems, local control stations, marshalling boxes, motor and equipment isolation and field instrumentation.

Important considerations include:

(i) preferred method of support and environmental conditions - includes consideration of flood levels, UV, and damage by insects or vermin;

(ii) segregation of cabling - separation of differing cable types;

(iii) cable carrier capacity - capacity for present and planned expansion;

(iv) cable bend limitations;

(v) cable labelling requirements; and

(vi) cable mechanical protection.

(b) Field instrumentation and installation

(i) General

Field instrumentation shall be supplied and installed in accordance with the process requirements and the manufacturers' recommendations. The location and height of each instrument shall be shown on the relevant "Layout" drawings.

Field instruments shall be located as close to their primary connection to ensure instrument accessibility while still facilitating ease of access for operation, inspection, and maintenance.

An optimum working and/or viewing height for each instrument shall be 1500 mm above grade or finished surface level.

No LCD screens for instrumentation or other plastic components that may be susceptible to damage from UV radiation shall be exposed to direct sunlight and potential vandalism shall be considered when locating equipment.

Where process instrumentation is installed on process pipework, suitable isolation devices shall be provided to allow for instrument removal.

All power supplies to instrumentation shall be surge protected and filtered.

(ii) Installation

Instrument enclosures suitable for the prevailing environment and any potential hazardous classification of the area shall be provided for all field instrumentation and shall be installed in safe accessible locations.

Transmitters shall be enclosed in their own weatherproof enclosure and in addition, those mounted outdoors shall be shaded by 316 stainless steel covers with sides, drip hood and back as a minimum. All brackets and mounting bolts etc. for sensors and transmitters shall be 316 grade stainless steel.

Instrumentation shall not be supported from handrails or from steel work or plant which may be subject to vibration. All brackets and supports shall be constructed of 316 grade stainless steel and be constructed so that vibration from wind, operation of surrounding equipment, etc. is negligible.

(iii) Specific instrument requirements

Pressure transmitters where installed shall be fitted with valve manifold blocks.

Hydrostatic type level sensors shall be installed such that they are not affected by turbulence by the use of either stainless steel weighted cables or stilling tubes.

Impulse lines shall be fitted with valves and strainers. Lines shall be constructed of either copper or stainless steel and be provided with draining facilities for cleaning and maintenance. Cables shall be identified by an engraved metallic tag with stainless steel fixings.

(c) Labelling of equipment

Equipment labels in the form of "traffolyte" labels shall be provided at each field mounted instrument to identify the instrument and at each local isolator or stop/start station to identify the item of plant that the isolator or control stations controls. Labels shall be fixed to equipment with stainless steel screws.

(11) Radio telemetry and SCADA system

(a) General

Council operates a telemetry system to monitor and/or control sewage pump stations, water supply pump stations, and reservoirs. The system is based on Schneider Scadapack Hardware Controls (previously Serck/Hunter Watertech) PDS and Enet hardware connected by narrow band analogue and digital UHF radio networks. Human/machine interface is provided by various SCADA software.

Automated and manual alarm dial outs are provided from SCADA alarms.

(b) New facilities

All new sewerage pump stations, water supply pump stations, and reservoirs are required to be connected to the telemetry system for the purposes of monitoring and control as required in TCC 24.

Functional system requirements such as network and repeater interfaces for the site and frequency details shall be determined during the design in consultation with council's electrical systems engineer.

(12) Mechanical services

(a) Pump design - general guidelines

(i) Pump selection

Pump selection shall be based on the following criteria:

1. Council's preferred equipment lists;
2. system resistance curves (refer Clause SC6.4.11.2 Water supply planning and design guidelines; and Clause SC6.4.11.4 Sewerage planning and design guidelines, Clause SC6.4.11.4 (5) Sewage pump station design). Pump selection shall achieve all expected duties as per the system resistance curves;
3. redundant (standby) pump capacity shall always be provided. Standby pump capacity should be at least equal to the capacity of the largest pump unit;
4. availability of local product support for maintenance purposes; and
5. whole of life costs.

For all pumps supplied as part of contracted works, the NPV shall be based on a 15-year design life and 8% real discount rate.

(ii) Motors

All pump motors shall be afforded a minimum of IP56 and be tropic proofed.

(iii) Water void protection

Water void protection shall be provided for all water pumping applications. Water void protection on large installations shall typically consist of limit switches mounted on an extended shaft of the non-return valve.

On smaller applications, flow switches may be used for water void protection.

(iv) Document requirements

The following documentation shall be provided as a minimum by the Contractor and/or pump supplier:

1. details of all recommended spare parts and servicing tools including a priced list of thecosts for each individual item;
2. operations and maintenance manuals which adequately detail servicing intervals and requirements, dismantling instructions, itemised parts lists;
3. pump performance – pump/motor factory test curves;
4. the results of specific pump/motor performance testing to AS 2417, showing flow rate,pressure, current, efficiency, and NPSH as a minimum; and
5. pump/motor specification plates – shall be fixed to the pump and motor. Two additional sets of specification plates shall be supplied, one for inclusion into the switchboard.

(b) Pumping applications

Types of pumps for typical applications shall generally be as follows:

(i) sewage pump stations shall be provided with wet well submersible centrifugal pumps for all new locations. Existing pump stations that are planned for upgrades shall be converted to dry well mounted submersible centrifugal type pumps. Grinder style pumps may also be offered where conditions exist that may prevent an 80 mm sphere being passed through the pump and discharge pipework;

(ii) water pumping stations shall generally be centrifugal pumps, with the number of pump stages to suit the duty point required;

(iii) RAS and WAS pumps at Sewage Treatment Plants shall generally be centrifugal submersible type controlled by VVVF Drives; and

(iv) positive displacement type pumps shall generally be installed for sludge handling applications.

Where sand infiltration causes excessive abrasion at pump stations, wear rings with increased hardness shall be fitted to the pumps and consideration given to ceramic coatings on the wearing surfaces.

Where pumps are provided with a double mechanical seal, a barrier fluid conductivity probe shall also be provided. This type of system shall be capable of producing an alarm which will be registered in the pump's switchboard and possibly the telemetry system when a change in conductivity is sensed. It is assumed that this will alarm due to a mechanical seal fault.

(c) Chemical dosing pumps

Dosing pumps shall generally be small diaphragm type pumps with either electronic or manual stroke adjustment depending on the application. Pump type and material is to be suitable for the chemical to be dosed.

Critical dosing pumps may require installation with automatic alarm considerations and feedback signals to the telemetry or PLC. These dosing pumps will generally be installed with means of electronically recording/confirming the flow in the dosing line and a means by which the flow in the dosing lines can be diverted back to the dosed fluid reservoir.

Dosing pumps may be required to be flow paced. Flow pace settings shall be manually adjustable.

Larger dosing pumps for dosing rates of between 5 and 50 L/hr shall generally consist of centrifugal pumps with magnetic drive. In this instance fluid void protection is to be provided.

Mass balance dosing systems are not desirable.

Generally, Sodium Hypochlorite tank levels shall only be monitored in treatment plant applications.

Council's standard P and ID control and pipework drawing shall be used for all dosing pump installations.

(d) Pumping equipment

(i) Motor cable

The designer is to consider the future application of the pump, including if future conversion to VVVFD operation is required. Pumps with present or future VVVF Drive requirements shall be fitted with screened flexible cable.

(ii) Guide rails

Guide rails for removal of submersible pumps shall generally be stainless steel pipe, SCH 40 or better and shall be a minimum of 40 mm diameter.

(iii) Lifting chains

Lifting chains shall be provided at each submersible sewage pump station. Lifting chains shall be selected to be suitable tensile strength to lift the attached pump and shall be manufactured from coated or galvanised steel.

(iv) Pressure gauges

Pumps for water pumping applications shall be supplied with suction and discharge pressure gauges.

(e) Vibration monitoring

Pumps shall generally be provided with the following vibration monitoring devices in three axis locations.

Motor Size	**Vibration Monitoring Requirements**
10 kW and under	No requirement for vibration monitoring devices
Over 10 kW and up to 99 kW	Vibration monitoring pads
100 kW and above	Inbuilt vibration monitoring devices

Inbuilt vibration monitoring devices shall have all alarms connected to the telemetry and/or SCADA based monitoring system.

(f) Pump works testing

Works testing of pumps shall be performed for units rated at 5 kW and above. All other pumps shall be provided with a Type Test Certification from the pump manufacturer.

Works testing shall be performed to AS 2417 *Rotodynamic pumps - Hydraulic performance acceptance tests - Grades 1 and 2:*

(i) Class 1 for water supply pumps greater than 20 kW; and

(ii) Class 2 otherwise.

The pump supplier shall provide copies of all test certification prior to the pump being dispatched from the manufacturer's factory.

Works testing will normally negate the requirement for a draw-down test to be conducted at each individual site. Where specified draw-down tests may be used to judge the

performance of the pumps installed.

(g) Mixers

Mixers shall be either of the submerged type or stool mixers.

(h) Manual valves

Pressure reducing valves shall generally be Derot 300 series (or approved equivalent) with throttling plugs.

Vee Port valves shall only be used with the permission of Council.

(i) Actuated valves

Actuated valves shall generally be installed with AUMA or Rotork electric actuators (or approved equivalent), in accordance with Council's preferred equipment lists.

Electrically actuated valves shall be three phase 415 V rated.

Pneumatically actuated valves shall generally be installed with Tyco Keystone pneumatic actuators, limit switches and/or positioners. In general, "spring close" is required for this type of installation.

All actuated control valves shall have analogue 4-20 mA signal position feedback into PLC and SCADA based monitoring and control systems. Where the actuated valve is not a control valve, limit switches may suffice for positioning.

(j) Air supply blowers

Air supply blowers for treatment plant applications shall generally be lobe type or roots blowers. Council's preference is for Robuschi manufactured blowers (or approved equivalent) of the positive displacement rotary type.

Blowers shall be provided with sound attenuation devices to limit the operating noise to levels that are within the limits that provide a safe working environment without the need for ear protection and are in accordance with the relevant local laws and environmental requirements.

(13) Equipment manuals

When purchasing equipment, the designer shall specify that, detailed operations and maintenance manuals are to be provided.

As a minimum operation and maintenance manuals shall contain details of:

(a) general description of systems and equipment;

(b) operation and maintenance of systems and equipment instructions which adequately detail servicing intervals and requirements, dismantling instructions, itemised parts lists Maintenance of Systems and Equipment Instructions;

(c) equipment schedules;

(d) manufacturer's literature;

(e) as constructed equipment drawings; and

(f) commissioning and test data.

The following copies of the manual shall be provided:

(a) three hard copies of the manuals; and

(b) one PDF copy of all documentation.

Specific requirements for sewerage Pump Stations shall refer to *CTM Water Alliance Design and Construction Code.*

SC6.4.11.7 On-site water supply

(1) Introduction

(a) Objectives

(i) The objective of this section is to outline the requirements for the design and supply of potable water and non-potable water where development is located outside of a reticulated water supply area.

(ii) Specifically, the following overall objectives are sought to be achieved as identified by the Townsville City Plan:

1. to ensure adequate water supplies are available for people and fire-fighters to defend buildings from bushfires and to suppress other property fire;

2. ensure that development is provided with a reliable and safe supply of on-site water supply when located outside of a reticulated water supply area;

3. ensure that on-site water supply facilities are efficient;

4. ensure that on-site water supply facilities do not compromise environmental values;

5. ensure that on-site water supply facilities are not subject to sources of contamination; and

6. ensure the safety and wellbeing of residents and the protection of water quality and other environmental values.

(b) Scope

(i) This section sets out the requirements for development located outside of reticulated water supply area for the provision of potable and non-potable water supply facilities.

(ii) This section contains guidelines and statements for the design of potable water supply facilities and non-potable supply, including for fire protection.

(iii) This section may be applied to areas where a reticulated water supply exists, and an alternative supply is sought to supplement the reticulated supply.

(c) Applicability

(i) This section is to be used for assessment against the following codes where development is required to provide water supply outside of a reticulated water supply area:

Part 6.6.1 Rural zone code (Cungulla Precinct);

Part 8.2.2 Bushfire hazard overlay code;

Part 8.2.9 Water resource catchment overlay code;

Part 9.3.4 Reconfiguring a lot code; and

Part 9.3.6 Works code.

(d) Terminology

Available roof area	means the whole of the roof area of every building on the lot included in a development application
Blackwater	is defined as:

	- the waste discharged from the human body into a toilet; and - the waste used for discharge.
Drinking water or Potable water	water of a quality suitable for drinking, cooking, and personal bathing. The standards that define potable water are described in the Australian Drinking Water Guidelines.
Drinking water supply System (water supply system)	all aspects from the point of collection of water to the consumer (can include catchments, groundwater systems, source water, storge reservoirs, and intakes, treatment systems, services reservoirs and distribution systems, and consumers.
Greywater	means wastewater from a bath, basin, kitchen, laundry, or shower, whether or not that wastewater is contaminated with human waste.
Greywater treatment plant	a treatment plant, approved and installed under the *Plumbing and Drainage Act 2002*.
Hazard	a biological, chemical, physical, or radiological agent that has the potential to cause harm.
Non-potable water	water that is not of drinking water quality, but which may still be used for other purposes, depending on its quality.
On-site water supply	is defined as a private, non-mains supply, such as water that is not provided as a reticulated council supply.
Required fire-fighting Capacity	the volume of water required to comply with Part E of the *Building Code of Australia*.
Service reservoir/tank	a storage for drinking water, generally within the distribution system, used to meet fluctuating demands, accommodate emergency requirements and/or equalise operating pressures.

(e) Reference and source documents

(i) Legislation:

Food Act 2006

Plumbing and Drainage Act 2018 (and associated Regulations)

Public Health Act 2005

Water Act 2000

Water Supply (Safety and Reliability) Act 2008

Public Health Regulation 2005

Plumbing and Drainage Regulation 2019

(ii) National Codes and Standards:

Australia New Zealand Food Standards Code

Building Code of Australia

National Construction Code Volume 3 – Plumbing Code of Australia

(iii) Queensland Government:

Queensland Development Code

Queensland Plumbing and Wastewater Code

Department of Health	*Guidance on use of Rainwater tanks*
Department of Housing and Public Works	*Rainwater tanks. A Guide to keeping your tank safe*

(iv) Australian Standards:

AS/NZS 5667.1	*Water quality - Sampling - Part 1: Guidance on the design of sampling programs,sampling techniques and the preservation and handling of samples.*
AS/NZS 3500	*Plumbing and drainage (Set)*
AS/NZS 4766	*Rotationally moulded buried, partially buried and non-buried storage tanks for water and chemicals*
AS/NZS 3735	*Concrete structures retaining liquids*

(v) Standard Australia:

NHMRC, NRMMC (2011) *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy. National Health and Medical Research Council,* National Resource ManagementMinisterial Council, Commonwealth of Australia, Canberra.

Water made clear: A consumer guide to accompany the Australian Drinking Water Guidelines 2004. National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra.

HB230-2008 *Rainwater tank design and installation handbook, S*tandards Australia.

(2) On-site water supply general requirements

(a) This section outlines the on-site water supply systems suitable for use in the Townsville local government area.

(b) The on-site systems may be used in combination with one another to deliver a reliable supply of potable and non-potable water.

(c) Any on-site water supply should use water efficiently and minimise the whole of lifecycle cost for that infrastructure.

(d) Any on-site water supply should not adversely affect environmental values.

(e) Unless water is known to be of potable quality (e.g. from a drinking water supply system) it should be regarded as non-potable and used appropriately (firefighting, irrigation of landscaping).

(f) On-site water supplies must not be subject to hazards and hazards must be managed appropriately to ensure a safe supply is available at all times for potable use in addition to fire-fighting requirements.

(g) Water supplied to the public must not constitute a public health risk:

(i) Under the *Food Act 2006*, food businesses must ensure water used in their business (which may include roof harvested rainwater) complies with the requirements of the *Australia New Zealand Food Standards Code*, Standard 3.2.3.

(ii) The *Australia New Zealand Food Standards Code*, Food Safety Standard 3.2.3 – *Food Premises and Equipment*, requires food businesses to use potable water for activities conducted on the premises. Where businesses do not have access to a potable water source, they must be able to demonstrate that the water is safe to use. Non potable water may only be used when it will not affect food safety I.e. , the washing of non-food contact surfaces such as floors.

(iii) The water must be of a potable quality unless the food business can demonstrate that the non-potable water will not adversely affect the safety of the food handled by the business.

(iv) Food businesses must ensure the water they use for food related activities conducted at their premises is potable (safe for human consumption).

These activities include:

1. washing food or ingredients;
2. cooking;
3. adding to food and drinks;
4. making ice;
5. cleaning of food contact surfaces;
6. cleaning of food containers and utensils; and
7. personal hygiene.

(h) Council may set conditions of approval dealing with the following matters (but not limited to):

(i) a maximum volume of ground water extraction for the development based on the findings of the groundwater resource assessment study;

(ii) annual review of the effect of the authorised level of extraction in light of regional ground water level data collected from all relevant observation bores in the district. If regional ground water levels are declining, council may limit the previously authorised level of extraction, in terms of pumping rate or duration or both;

(iii) maintenance of safe access to bores for inspections by council staff; and

(iv) on-going monitoring, including:

1. provision of a report recording ground water levels each month for 6 months; and
2. regular testing of ground water quality (e.g. for nitrates and bacteria) if the ground water is to be used for potable purposes. If levels are found to be above the relevant drinking water quality standard, provision for an alternative potable source of water will be required.

(i) The following on-site water supplies are permitted (Refer Water Resource Catchment Overlay):

(i) rainwater harvesting (tanks);

(ii) groundwater (bore water);

(iii) surface water;

(iv) carted drinking water;

(v) recycled water (reclaimed water); and

(vi) greywater (non-portable from manual supply service).

(j) The following on-site water supplies are not considered appropriate for supply:

(i) recycled carted water; and

(ii) greywater – (potable supply from permanent structure).

(3) Water quality for on-site supplies generally

(a) The *Australian Drinking Water Guidelines* (ADWG) are the standards for potable water for use in the Townsville area. Clause SC6.4.11.7 Attachment A sets out the potable drinking water requirements to be achieved.

Editor's Note - The current *Australian Drinking Water Guidelines* cover a range of topics, including management of water supply systems, water quality (microbiological, physical, chemical, and radiological) and monitoring.

(b) The following information should be used in undertaking testing of water quality.

References:

AS 5667.1.

Editor's Note - Physical and chemical samples:

Use a bottle supplied by the laboratory or thoroughly clean a plastic bottle about one litre in volume (i.e., Soft drink bottle), then rinse several times with the sample before filling.

Transport the sample directly to the laboratory on the day of sampling, if possible, otherwise refrigerate and deliver within 24 hours of collection.

DO NOT FREEZE SAMPLE.

Editor's Note - Microbiological samples

Collect sample in sterile bottle provided by the laboratory, or in a 250 ml sterile container which can be bought from a Pharmacy. Do not rinse out the bottle with sample.

Remove cap, fill bottle leaving a small air space, then replace cap without touching the insides of the cap or bottle.

Transport the sample directly to the laboratory on the day of sampling, if possible, otherwise refrigerate and deliver within 24 hours of collection.

DO NOT FREEZE SAMPLE.

Editor's Note - Pumped supply:

Pump for four hours to remove stagnant water from the bore hole and pipes before sampling.

If the bore runs dry before four hours are up, let it stand until it can be pumped again, then pump again until dry, repeat this process once more, then sample.

Note pumping time, type of pump, type of casing, depth, age of bore, etc. (this information can be useful to the laboratory for interpretation of results).

(4) Rainwater harvesting (tanks)

Editor's Note - HB 230:2008 Rainwater tank design and installation handbook—provides practical information for the collection, use and storage of rainwater.

(a) A tank installed for a building must have sufficient collection and storage capacity to provide an acceptable contribution for its external and/or internal connections and their associated water use, having regard to the following:

(i) the local rainfall pattern;

(ii) the roof catchment area; and

(iii) the area available for the location of the rainwater tank.

(b) Installed tanks must ensure they comply with the requirements of the *Public Health Regulation 2018*. The legislation stipulates a “relevant tank”— a tank or other receptacle that is used or intended to be used for holding or storing water — must have at every opening:

(i) Mosquito proof screens that:

1. are made of brass, copper, aluminium, or stainless-steel gauze;

2. have a mesh size of not more than 1 mm;

3. are installed in a way that does not cause or accelerate corrosion; and

4. stop mosquitos passing through the openings; or

(ii) Flap valves that, when closed, stop mosquitoes passing through the openings.

(c) A tank must have suitable measures to prevent:

(i) insects (mosquitoes) and other fauna from breeding inside the tank;

(ii) if a wet system supplies the tank— insect (mosquito) and fauna proofing for each pipe opening that supplies the tank, with screen mesh with an aperture of no greater than 1 mm; and

(iii) vermin from entering the tank.

(d) A tank must have suitable measures to prevent contaminants from entering the tank especially having regard to the potential nature and level of contaminants within the locality and on-site uses.

A tank must have a minimum of 20 litres of first flush from the roof catchment area so that potentially contaminated rainwater is diverted and discarded before entering the tank where the tank is connected to:

(i) a shower or wash basin; or

(ii) a swimming pool; or

(iii) kitchen or hot water service; or

(iv) another fixture required by a local government in a local planning instrument.

Editor’s Note - For those with a rainwater supply, it is important to check regularly to ensure that first flush devices are working properly. It is also important to keep the roof catchment clean — bird droppings, peeling paint and dirt on the roof are the biggest sources of contamination. Guttering should be cleared regularly, and overhanging branches should be kept to a minimum, because they can be a source of debris and allow birds and small animals access to the roof.

Editor’s Note - HB 230:2008 Rainwater tank design and installation handbook—provides practical information for the collection, use and storage of rainwater.

(e) The occupier of a place where a rainwater tank is installed (or if there is no occupier, the owner of the premises) must ensure that the tank is maintained at all times to ensure a reliable supply.

(f) Where in a reticulated water supply area, water from a tank must not contaminate the potable water within a reticulated town water supply system. Where tank/s are installed, the reticulated town water supply system is protected from the potential of back-flow by the installation of:

(i) a back-flow prevention device that complies with AS/NZS 3500; or

(ii) for a tank, a dual check valve with an atmospheric port.

(g) A tank stand and the support base of a tank must be capable of withstanding loads likely to be imposed. The base of the tank is well supported by a ground treatment in accordance with the manufacturer's specifications and standard drawings for that tank.

(h) Where a premises is providing tank water supply and required to also install a static water supply for firefighting purposes, applicants will need to also comply with Clause SC6.4.11.7 (11) Requirements for firefighting supply.

(i) Where a tank is installed to supply water to the plumbing fixtures, the tank must have appropriate and clear signage to warn that the water in the tank is suitable for drinking.

(j) All water tank overflows are to be connected to or able to discharge to a lawful point of discharge.

(k) Development proposing to utilise a rainwater tank must determine that adequate rainwater volume can be collected to meet the annual water demand.

Editor's Note - calculating the maximum amount of rainwater that can be collected from the available roof area can be completed using the following formula.

Run-off (litres) = A x (Rainfall – B) x roof area

"A" is the efficiency of collection and values of 0.80-0.85 (that is, 80-85% efficiency).

"B" is the loss associated with absorption and wetting of surfaces and a typical value of 2 mm per month (24 mm per year) can be used.

"Rainfall" should be expressed in mm and "roof area" in square metres (m2).

For example, the runoff from a 200 m^2 roof which receives 750 mm of rain per year, with an efficiency of collection of 80% (A = 0.80)and loss of 2 mm per month (B = 24) would be: Run-off = 0.8 x (750-24) x 200 = 116,160 Litres (or 116.2 kL).

(l) If the maximum volumes are less than the annual water demand, then either the catchment area will need to be increased or water demand will need to be reduced or an alternative and supplementary source will need to be nominated.

(5) Groundwater (bore water)

(a) In Queensland, the Department of Resources manages access to and use of underground water.

The right to take underground water is either established under the *Water Act 2000* (the *Water Act*) or granted under a "licence" or "water allocation". The drillers' licensing arrangements under the *Water Act 2000* ensure all water bore drillers are properly skilled and that their work meets minimum standards.

Editor's Note - Information on water bore drillers and bore drilling requirements can be found on the Department of Resources website.

(b) Each lot created or use proposed is to be provided with a proven and available long term sustainable resource of potable groundwater, properly licensed as required, supplemented where practical, with an alternative supply such as rainwater.

Editor's Note - Water from a deep, encased, and well-maintained bore and/or from a confined aquifer will generally not need treatment after addition to a rainwater tank, but the chemical quality of some groundwater is not suitable for drinking.

(c) Only groundwater that is compliant with values cited in the *Australian Drinking Water Guidelines* (ADWG) should be used.

Editor's Note - Key health parameters for groundwater are arsenic, nitrate, fluoride, and health related heavy metals. Salinity is an important aesthetic parameter.

Editor's Note - Groundwater from shallow or unconfined aquifers is readily contaminated by agricultural, industrial, or urban activities and generally should not be used as a source of drinking water unless it has been recently tested for microbial and chemical quality and is compliant with guideline values cited in the ADWG.

(d) Water treatment devices/technologies to improve the aesthetic values, microbial and chemical quality of water are to be installed to ensure that all ground water achieves the guideline values cited in the ADWG. Methods used to treat groundwater must be certified by a registered professional in the field of ground water quality and must be installed and commissioned prior to occupation of the use (except where water supply is combined with firefighting water).

(e) Any proposed ground water extraction, when combined with existing levels of extraction in the area, is to be sustainable on both a local and regional level. The average annual demand for ground water must not exceed the average long-term recharge in the area.

To demonstrate compliance with the above criteria, council may request that a Groundwater resource assessment be undertaken by a qualified hydro-geologist.

A Groundwater resource assessment should include, at a minimum:

(i) consideration of information available from previous studies and new information collected as part of the investigation;

(ii) consideration of the maximum ground water extraction rate attainable, proposed pumping rates, land slope, flooding, drainage, geology, ground water recharge potential, local experience, proximity to and protection from potential contaminants, soil characteristics (colour, texture, structure, permeability, and presence of rock), percolation testing, direction of ground water flow, seasonal fluctuation in ground water levels, and the current degree of district and local extraction;

(iii) a comparison between the average annual ground water demand and the average annual ground water recharge, on a local and a district level;

(iv) the results of drilling and testing of an adequate number of bores, supplemented with ground water modelling where necessary, to ensure a thorough and accurate investigation of the ground water resources available. Bores are required for two purposes, namely, for interference testing and for regional ground water level observation;

(v) results of independent and simultaneous pumping of test bores, and measurement of water levels t0 check for localised pumping interference with any existing and proposed neighbouring bores. Pumping tests should be undertaken for a minimum of 8 hours duration and pumped at the rate the pump is intended to be operated in the proposed development. The available draw down in neighbouring bores during the test must not be reduced by greater than 20% when compared to available draw down in these bores prior to pumping;

(vi) if bore interference is found to be greater than 20% of the available draw down, supplementary pumping tests must be undertaken to measure the effect of reducing either the pumping rate, the duration of pumping, or both, until the resulting interference is within this level;

(vii) water quality testing to determine whether extracted water will be of a potable quality, including where relevant, written advice from a registered professional in the field of ground water quality. Table SC6.4.11.9 outlines appropriate standards for bore water testing (potable uses);

(viii) investigation of previous land uses and the possibility of contamination of aquifers to determine the quality of ground water;

(ix) details of the pump type, capacity and pumping curve for bores; and

(x) preparation of a report detailing all the studies and works undertaken, the resource assessment findings and assumptions made.

(f) Methods used to treat groundwater to meet health and aesthetic guidelines must be certified by a registered professional in the field of ground water quality.

(g) For licensing and construction requirements for underground water the local Department of Resources office should be consulted.

Editor's Note - Before considering sinking a water bore refer to fact sheet Drilling for Water on the Department of Resources website.

(h) The bore shall be constructed to ensure that contamination of the groundwater source does not occur, either during construction or operation.

(i) The bore head shall be mounded to prevent ponding and stagnation of water around the bore to eliminate the possibility of mosquitoes breeding and problems caused by flies or odour.

(j) All drainage shall be directed away from the bore.

(k) Bores nominated to supply potable water supply are to be appropriately site away from sources of contamination, including on-site sewerage facilities. For further details relating to on-site sewerage facilities, refer to Clause SC6.4.11.8 Onsite sewerage facilities for non-sewered properties.

(i) On-site sewerage treatment facilities shall be placed as far away as possible from ground water bores used for potable groundwater supply. Minimum allowable distances are to be in accordance with the *Plumbing and Drainage Act 2002* and relevant codes and regulations established pursuant to the *Plumbing and Drainage Act 2018*, which are applicable at the time of making application for development approval.

(ii) New land parcels or existing land within non-sewered areas must provide evidence prior to the sealing of the plan of survey or the commencement of the use that an appropriate on-site sewerage treatment facility can be designed and accommodated within each proposed lot in addition to the potable supply of ground water.

(6) Surface water

(a) Surface water includes water derived from dams, creeks, rivers, and streams.

(b) The use of surface water is generally considered permissible only when in a non-urban zone (excluding rural residential).

(c) Surface water supplies are more prone to contamination from sources such as animal and human waste and algal blooms.

(d) Due to the potential for contamination, surface water is not recommended as a source of drinking water unless additional treatment processes such as filtration and disinfection are in place.

(e) Unless drinking water quality can be assured through disinfection and routine testing, surface water should be utilised for purposes other than drinking such as irrigation and toilet flushing and firefighting. Treatment may still be necessary for non-drinking uses.

(f) Water subject to potential contamination from human or livestock waste, such as dams, rivers, and creeks, can contain a wide range of pathogenic organisms including chlorine resistant Cryptosporidium. Water of this type may not be suitable for drinking even after disinfection.

(g) Surface water that is protected from human and livestock waste can be used and should be demonstrated.

(h) Surface water must be able to provide a reliable year-round supply of water for both potable and fire-fighting purposes and should be demonstrated.

(i) Potable water quality:

(i) When used, pumped, or captured surface water should be added to a storage tank in one action, then treated and allowed to stand for at least one hour before use.

(ii) Where surface water is to be the primary source of a potable water supply, the quality of water extracted is to be of a potable quality and meet aesthetic, chemical and microbial requirements.

(iii) Water treatment devices/technologies to improve the aesthetic values, microbial and chemical quality of water are to be installed to ensure that all surface water achieves the guideline values cited in the ADWG.

(iv) Methods used to treat surface water must be certified by a registered professional in the field of water quality and must be installed and commissioned prior to occupation of the use (except where water supply is combined with firefighting water).

(j) Each surface water pump point must be metered (or where there are multiple meters, collectively recorded), with the meter maintained, read and the volume pumped recorded on a quarterly basis.

(k) Any proposed surface water use is to be sustainable on both a local and regional level. The average annual demand for surface water must not exceed the average long-term recharge in the area to ensure ground water supplies are maintained.

(l) To demonstrate compliance with the above criteria, council may request that a groundwater resource assessment be undertaken by a qualified hydro-geologist.

(7) Carted drinking water

(a) The use of carted drinking water supply is only used as a supplementary/secondary supply measure to ensure a long term and sustainable supply of water to a premises.

(b) Water cartage is necessary in some instances to supplement existing rainwater supplies.

Editor's Note: If rainwater collection is limited by the size of storage tanks or roof catchment areas or a lack of rain, drinking water supplies may need to be augmented with carted water.

(c) Carted water is not to be used as a sole source of supply except as a temporary use.

(d) Carted water is to be stored in water tanks as outlined in Clause SC6.4.11.7 (4) Rainwater harvesting (tanks).

(e) Drinking water is recognised as a food. Water carters/carriers may need to be registered as a food business if the supply of additional potable water is needed.

(f) When using carted water, it is advisable to ensure the water carter can provide evidence that water supplied will be safe to drink. This evidence could include: any authorisations issued for the purpose of supplying drinking water; the identity and quality of the source water; proof that tankers used are suitable for the purpose of carrying drinking water (for example, not likely to have carried other materials that would contaminate drinking water).

(g) Ensure that carted water supplied for drinking is disinfected at the point of supply (such as the rainwater tank) as this provides protection against contamination introduced during filling of the water tanker and during transport to the point of supply.

(8) Recycled water

(a) Recycled water is any water that has been used at least once and then supplied for reuse, either treated or untreated. Without appropriate treatment, recycled water may contain a range of contaminants.

Editor's Note - For example, water used for the final rinse in a commercial laundry is only lightly contaminated and thus may be used again, untreated, for the first wash cycle. On the other hand, sewage must be treated at a sewerage treatment plant before it can be recycled for any purpose.

Recycled water from sewerage treatment plants is put into different classes depending on its microbiological quality. These classes range from Class A+ (the highest) to Class D (the lowest).

(b) The use of recycled water can reduce the demand on alternative supplies that are potable.

(c) Recycled water can be used where it is demonstrated that it is safe to do so and does not adversely affect the environment, adjoining properties or constitute a public health risk.

(d) Recycled water is not to be used for potable water, food preparation or topping up of pools or spas, but may be appropriate for private and commercial purposes such as irrigation and possibly toilet flushing, car washing and dust suppression (or similar), including for fire-fighting.

(e) Recycled water when used for watering plants and lawns (source of irrigation) can be an effective means of saving water provided some sensible precautions are undertaken, including watering several locations to prevent salts and other contaminants from accumulating in the soil and rotation of irrigation using mains or rainwater to help flush salts from the soil.

(f) Signage must be erected at sources of recycled water use to advise that the water is not suitable for drinking.

(g) The static storage of recycled water must be separately stored from other sources of potable water.

(h) The quality of the water will determine the permitted uses and businesses using recycled water are required to obtain approval and adhere to any specified conditions.

(i) The storage of untreated water for more than 24 hours (bacteria and organic contaminants in water will cause it to turn septic and produce strong and offensive odours).

(j) Recycled or untreated water is not allowed to pool or run-off onto other properties, into watercourses, public space or the stormwater system.

(9) Non-restricted water supply risks

(a) Selecting an alternative supply, consideration must be given to the potential health concerns, sensible practices, and disinfection options available as well as the location, rainfall patterns, supply required and overall cost (initial and maintenance).

Editor's Note - Advice on the use of on-site water supply:

(i) ensure water is collected from the most suitable and safest source available;

(ii) determine what microbial or chemical contaminants are in the surrounding environments and what effects they may have on the water used;

(iii) treat water if necessary to make it safe. This could involve the removal of solids, chemicals, and microorganisms;

(iv) ensure collection sources for rainwater such as roofs and gutters are kept free of extraneous matter such as leaves and bird droppings;

(v) ensure a first flush system is used for all rainwater collection to ensure that the first water collected during a rain fall event is discarded thereby reducing the amount of microorganisms entering the tank;

(vi) ensure tanks which are used to store water are cleaned out regularly to remove any build-up of sludge or debris. This reduces the potential risks of chemical or microbiological contamination of the water;

(vii) where water is supplied by a water carrier, it should be sourced from a potable water supply. The carrier should have hoses which are in good operating condition and are capable of being effectively cleaned and sanitised. The water carriers should only be used for the purpose of carrying potable water, the operator should be able to provide documentation showing this;

(viii) ensure all equipment that is used to collect and store the water is suitable and well maintained;

(ix) ensure all equipment used in the collection and storage of water is well positioned to minimise the risk of contamination; ensure all water storage equipment is vermin proof; and

(x) monitor the water regularly to ensure that the conditions of the water have not changed, and any treatments being undertaken are appropriate to ensure its safety. It is important to remember that some water sources such as bore water may have a very high mineral load. While this may not affect the safety of the water, it may affect the quality, flavour and hardness and have an undesirable effect on the equipment that is used. It is recommended that water is tested by an accredited laboratory on a regular basis to ensure the steps that have been put in place are still adequate to maintain the safety of the water.

For advice on what constitutes good quality water see the *Australian Drinking Water Guidelines 2011* available from the National Health and Medical Research Council's website.

(10) Requirements for non-potable water supply

(a) The *Plumbing Code of Australia* requires that a non-drinking water supply:

(i) must only be connected to outlets clearly identified for non-drinking use and must be limited to the uses specified in the Code; and

(ii) is not to have a cross connection with a drinking water service.

Editor's Note: If non-potable water is adequately treated, its quality will improve, and it can be used for a wider range of purposes. Some examples of non-potable water used are:

1. class A recycled water from a sewage treatment plant used for dust suppression, car washing, landscape irrigation or irrigation of sporting ovals;
2. quarry water used for dust suppression and landscape irrigation;
3. swimming pool backwash water used for toilet flushing;
4. agricultural wastewater used for crop irrigation; and
5. creek, dam, and river water used for dust suppression.

(11) Requirements for fire-fighting supply

Editor's Note - Firefighting uses large amounts of water. If fire fighters need to leave a site to obtain more water, that site will be undefended and may be damaged or lost. If fire fighters don't have access to adequate water supplies at a site, they may not even attempt to defend the site because it will be unsafe.

Editor's Note - Where the *Building Code of Australia* and applicable Queensland Building Codes provide standards for the installation of firefighting appliances, the provisions of those standards shall prevail.

The purpose of this section is to outline adequate and accessible water supplies required for fire-fighting purpose and to ensure that they are available for people and fire-fighters to defend from fires. Suitable water supplies and appliances shall be provided, and easily accessible at all times.

(a) The minimum dedicated amount of water for fire-fighting purposes is 10,000L of stored (static water) for a property less than 2500 square metres in area and at least 20,000L of stored (static water) for property greater than 2500 square metres. The amount of stored static water must be available, and accessible at all times.

Editor's Note - Some development may require more water to comply with the *Building Code of Australia* or to ensure that an adequate supply to available to service a particular development where that development is likely to require increased firefighting capacity.

(b) Firefighting water supply needs to be provided, and always accessible, although it does not need to be drinkable (potable).

(c) A dedicated water tank for the storage of fire-fighting water is the accepted standard. Where alternatives are provided, it should be demonstrated that the water supply will be available and accessible at all times.

(d) Where not using a dedicated firefighting storage tank, the outlet for the internal fixtures is located above the point at which the tank will contains the dedicated amount for fire-fighting purposes.

(e) Firefighting water supplies (including pipelines, hydrants, fittings, and storages) are:

(i) provided before building construction commences;

(ii) designed, located, and fitted to ensure reliability during a fire (e.g. polyethylene pipes are buried or shielded - refer to the National Plumbing and Drainage Code AS 3500);

(iii) properly maintained and accessible at all times by emergency vehicles;

(iv) tanks must be located so that a vertical clearance of 4 m to overhanging obstructions is achieved (vegetation, power lines) ;

(v) a cleared area on either side of the tanks, a minimum of 6 m, to allow firefighting vehicles and crews access to the tanks; and

(vi) tanks should avoid be located on slopes, including access to, greater than 12 per cent.

Editor's Note - A fire truck has to be within about 3 metres from a water supply to be able to pump from it.

Editor's Note - Plastic tanks dedicated for fighting purposes are not recommended, however if they are submerged, they may be acceptable.

(f) At least one tank is within 100 m of the building which has fire brigade tank fittings. If the tank is underground, it has an access hole of 200 mm (minimum) to allow access for suction lines.

(g) A water supply for firefighting purposes must be clearly marked and identified by emergency services and others. Where a dedicated tank for storage of firefighting water is used, the tank must have appropriate signage to warn that the water in the tank is not suitable for drinking.

Editor's Note - The following is applicable for development within the Water resource catchment overlay map OM-09 (Schedule 2 of Townsville City Plan) and where development is to address the assessment criteria of the Water resource catchment overlay code found in Part 8.2.9 of the Townsville City Plan.

(12) Water resource catchment overlay

(a) To demonstrate the protection of water quality, ecological values and other environmental values, applicants may be asked to provide groundwater resource assessment where the proposed development is to use any ground resource as outlined in Clause SC6.4.11.7 (5) above.

(b) No on-site water supply infrastructure, including underground pipe, is to be located such that it will not change the physical integrity of waterways, wetlands, lakes, springs, and riparian areas.

(c) On-site water supplies may only be from harvested rainwater (tanks) or ground water (where undertaken and demonstrated sustainable by a ground water assessment) and may be supplemented by carted water.

(d) Recycled water or greywater is not to be used, to protect the water catchment from potential contamination.

(e) The capture of ground surface water is not permitted.

(f) A ground water level observation bore is to be installed adjacent to the site. The observation bore must be installed remote from all production bores to ensure there is no local interference to ground water levels at the observation bore.

(g) Council may set conditions of approval dealing with the following matters:

(i) a maximum volume of ground water extraction for the development based on the findings of the groundwater resource assessment study;

(ii) annual review of the effect of the authorised level of extraction in light of regional ground water level data collected from all relevant observation bores in the district. If regional ground water levels are declining, council may limit the previously authorised level of extraction, in terms of pumping rate or duration or both;

(iii) maintenance of safe access to bores for inspections by council staff; and

(iv) on-going monitoring, including:

1. provision of a report recording ground water levels each month for 6 months; and

2. regular testing of ground water quality (e.g. for nitrates and bacteria) if the ground water is to be used for potable purposes. If levels are found to be above the relevant drinking water quality standard, provision for an alternative potable source of water will be required.

Table SC6.4.11.9 – Guideline Values for Physical and Chemical Characteristics

Physical and chemical tests	Health	Aesthetic
pH	n/a	6.5 - 8.5
TDS (mg/L)	n/a	<600
Hardness (mg/LCCO^3) (incl Ca and Mg)	n/a	200
Aluminium (mg/L)	0.1 (dialysis patients)	0.2
Cadmium (mg/L)	0.002	n/a
Copper (mg/L)	2.0	1.0
Iron (mg/L)	n/a	0.3

Lead (mg/L)	0.01	n/a
Manganese (mg/L)	0.5	0.1
Zinc (mg/L)	n/a	3.0
Sodium (mg/L)	n/a	180
Chloride (mg/L)	n/a	250
Fluoride (mg/L)	1.5	n/a
Nitrate (mg/L)	50	n/a
Sulphate (mg/L)	500	250

(Source) NHMRC *Australian Drinking Water Guidelines 2011*

SC6.4.11.8 On-site sewerage facilities

(1) Introduction

This section provides standards, advice, and guidelines for applicants in the design, installation and siting of wastewater treatment and disposal systems.

The principle underpinning the use of on-site wastewater treatment and disposal is that all design, installation, and construction will meet the demands of a development, whilst having full consideration of the effects to public health and ensuring that adverse impacts on environmental values are avoided.

Council will apply these guidelines when processing applications involving on-site sewerage facilities or servicing of development outside of reticulated sewerage supply areas, or applications incorporating the use of an on-site sewerage facility.

Editor's Note - Development within SC2.5 Natural resources overlay map - Water resource catchments (OM-09) or Natural assets environmental importance overlay map (OM-08) will need to consider additional setback requirements, including requirements for exclusions of infrastructure in some instances when applying the standards of this policy.

Editor's Note - Before an on-site sewerage facility can be installed on a property, the applicant is required to apply for a permit to install the treatment facility on that property. Applications to install an onsite sewerage facility are to be lodged with the Hydraulic and Building Services Unit of council as part of the plumbing/drainage application. Applicants should also refer to the On-site sewerage facilities for non-sewered properties guidelines, which provides details on the application and installation stages of an on-site sewerage facility. This document may be found on council's website.

(a) Terminology

Unless noted otherwise all terms have the same meaning as given in the *Plumbing and Drainage Act 2018* (the PD Act), the *Plumbing and Drainage Regulation 2019*and the relevant Australian/New Zealand Standard or Australian Standard. If a definition given in the relevant Australian/New Zealand Standard or Australian Standard is inconsistent with the PD Act or Regulation, the PD Act or Regulation prevails to the extent of the inconsistency.

Intermittent water course	A natural or artificial channel, identifiable by recognisable bed and banks, along which rainwater or storm water usually or occasionally flows. The term does not include a closed conduit for conveying storm water.
Top bank	The same meaning as outer bank as defined in the *Water Act 2000.*

(b) Reference and source documents

Reference and source documents that are to be read and applied in conjunction with this policy section areas follow:

AS/NZS 1546.1 *On-site domestic wastewater treatment units – Part 1: Septic tanks*

AS/NZS 1547 *On-site domestic wastewater management*

AS/NZS 3500.2 *Plumbing and drainage – Part 2: Sanitary plumbing and drainage*

Environmental Protection Act and all subordinate legislation, in particular the *Environmental Protection (Waste Management) Regulation 2000* (Design Rules)

National Construction Code Volume 3 – Plumbing Code of Australia

Plumbing and Drainage Act 2018 (and associated Regulations)

Queensland Plumbing and Wastewater Code

Editor's Note - Council has specifically referred to AS/NZS 1547 *On-site domestic wastewater management* and is, for the purpose of this policy, the adopted standard to be read and applied in conjunction with this policy section.

(2) Application guidelines

(a) The following section details the design standards and reporting requirements for wastewater treatment systems generally, to assist applicants in demonstrating they have met the requirements of the Townsville City Plan.

(b) Development which is not connected to council's sewerage system and is not within a reticulated service area will require an on-site sewerage disposal report to demonstrate the effective and safe disposal of sewerage on- site, having regard to the nature of the development proposed, demands the development will place on a system, the land and surrounding environment and known hydro-geologic, public health, or otherwise constrained concerns.

The report should be prepared by a professional engineer or hydraulic consultant, to document a site and soil evaluation and design of disposal facility as per procedures, reporting requirements and standards outlined AS/NZS1547.

(c) As a minimum, the on-site sewerage disposal report submitted in support of an application should provide detailed information on the following; the report should:

(i) provide sufficient information for deciding whether or not a development area, subdivision, or lot is suitable for on-site system(s);

(ii) provide detailed site-specific information identifying the site and soil characteristics to be taken into account when selecting and designing an on-site system;

(iii) identify, analyse, and evaluate any risks posed by site and soil characteristics which might compromise the long-term effectiveness of the on-site system(s);

(iv) identify, analyse, and evaluate any risks of contamination of groundwater or surface water and of associated health risks; and

(v) specify measures required to reduce and monitor such risks.

Editor's Note - The flow rates should be determined using Appendix 4.2D (H in 2012 standard) *Typical Domestic* Wastewater Flow Design Allowances in AS/NZS 1547.

(d) The designer's report/design, at a minimum, must comply with the requirements of the AS/NZS 1547. For the purposes of reporting, Table 3.1 of AS/NZS 1547 Part B; Unsewered subdivision proposals, Sections 2 (Subdivision design) and Section 3 (System Design) as well as Section 4 of AS/NZS 1547 are considered relevant and should be used as a primary guide for preparing reports as it outlines the essential stages and implementation processes required. To the extent relevant, reporting should also consider the requirements of the *Queensland Plumbing and Wastewater Code*.

(e) The designer must undertake (or have undertaken) soil testing as necessary to enable an appropriate design to be completed. This may include but not be limited to the following: soil percolation tests; bore holes; test pits and soil textural analysis. The report should consider the following points when carrying out a site and soil evaluation:

(i) the determination of potential effluent disposal problems. These may include gullies, rock formations, hollows, or inconsistent soil texture, both on and off the property;

(ii) the consideration of previous and current weather conditions in the determination of the site's suitability for effluent disposal;

(iii) the demonstration that the disposal area is located above the 5 per cent AEP;

(iv) the site plan showing the setback requirements (for buildings, pools, bores, permanent and intermittent water courses, vehicular traffic areas and drains etcetera) both on and off the property, which may influence the location of the disposal area;

(v) a proposed land application area that shall not be cut, filled, or modified in any way after the site evaluation has been carried out. If this does occur the designer must be informed so that appropriate amendments can be made to the design; and

(vi) the designer is to make their recommendation based on the site and soil evaluation carried out.

In addition to the above, the following must also be reported on:

(i) topography and drainage;

(ii) climate data and statistics;

(iii) groundwater information (extractive bores, uses and quality);

(iv) infrastructure (existing and proposed) ;

(v) potential for cumulative effects on receiving environments;

(vi) off-site impacts;

(vii) presence of any fill material;

(viii) geotechnical hazards;

(ix) setback distances;

(x) potential for environmental or public health impacts; and

(xi) site plans (individual or multiple lots).

Much of the Townsville coastal plain is derived from Quaternary alluvium which in many places has been transported and reworked as a result of changes in drainage patterns over time. This has resulted in varying soil texture types occurring in both top and sub-soil zones with a variety of geometries that cannot be assumed on a broad-scale. In recognition of this fact, site soils assessments should form part of all reports. This approach provides for a representative assessment of the respective area's soils and enables the determination of the

land capability and hydraulic loading required for the development (e.g. LTAR, DIR/DLR).

The soil assessment should be able to provide information on the suitability of different methods of wastewater disposal based on soil textures and hydraulic properties of the actual soils in the area of interest. In order to develop an appropriate level of confidence in the results presented, the details, locations and results of soil sampling and hydraulic property testing should accompany any report submitted.

Site specific data relating to soil properties must be utilised for any method employed as this is the media through which any potential impacts or mitigation caused by wastewater disposal must pass through. Any assessment that does not include this data collection and input carries with it an inherent risk of inaccurate prediction of effluent transport and behaviour and may even accentuate the utilisation of inappropriate system and disposal methods.

(f) Water tables in tidal areas are to be determined to the minimum accepted tidal water table in seaside areas that experience tidal influence (for example Cungulla, Magnetic Island, Cleveland Palms). The minimum water table level is taken to be the contour level of 2.25 m (Australian Height Datum). This allows for an astronomical tide of 4.1 m. Therefore, to determine vertical separation distances, this level must be taken into consideration. A site and soil evaluation may indicate the presence of a higher water table. This, along with wet weather water tables, shall be taken into consideration.

To assist applicants, the following report structure can be used in preparing an On-site sewerage disposal report, when read and applied in conjunction with relevant provisions found in AS/NZS1547, including procedures outlined in sections 4.1.3.4 and 4.2.3.2 of AS/NZS1547.

(i) Site and soil evaluation report (all references are to AS/NZS1547)

1. details of the site and soil evaluation personnel confirming:
    a) past experience of site and soil evaluation assessments;
    b) successful completion of an accredited training program (if applicable);
    c) knowledge of the regulatory assessment requirements; and
    d) professional liability for the interpretation of, conclusions drawn, and recommendations made as a result of the site evaluation;
2. desk top study as per relevant section of 4.1A2;
3. site and soil check as per relevant section of 4.1A3;
4. soil assessment items as per relevant section of 4.1A4; and
5. evaluation of results as per relevant section of 4.1.4; and

(ii) Design report

1. Details of land application facility designer confirming:
    a) past experience designing on-site sewerage disposal facilities;
    b) successful completion of an accredited training program;
    c) knowledge of the regulatory design requirements; and
    d) professional liability for the interpretation of, conclusions drawn from, and recommendations made, as a result of the design; and
2. Documentation of the design process, including:
    a) system selection as per section 4.2A4;

b) soils and LTAR/DLR values as per section 4.2A5; and

c) design flows as per section 4.2A6; and

3. Reserve area as per section 4.2.3.4;
4. Distribution system as per section 4.2.3.6;
5. Nutrients as per section 4.2.3.6;
6. Rainfall surface flow control as per section 4.2.3.7;
7. Land use activity as per section 4.2.3.8;
8. Site plan:

a) north point;

b) full property description;

c) name of person who evaluated the site;

d) scales of 1:200 or 1:500;

e) predominant wind direction;

f) location, height, density, and type of vegetation;

g) access roads, tracks, vehicle manoeuvring areas, storage areas;

h) test boreholes/pits;

i) fall of land;

j) setbacks;

k) water supply bores, top banks of water courses, lakes, ponds, unlined stormwater drainage channels, dams;

l) buildings, fences, property boundaries, pedestrian paths, walkways, recreation areas, retaining walls, in-ground swimming pools, in-ground potable water tanks; and

m) primary and reserve land application areas.

It is the designer's responsibility to carry out their duties in accordance with the AS/NZS 1547, the Queensland Plumbing and Wastewater Code (where relevant), and any other relevant legislation and supported by good engineering practice.

(g) Design flows

Any consideration of design flow should utilise guideline appendices of AS/NZS 1547 and incorporate allowance for peak usage and occupancy.

(h) System selection and land application design

The selection of the appropriate wastewater treatment system and disposal method should be based on the individual characteristics of the lot in question and any reporting recommendations based on investigation (as outlined in this policy section). The assumption of a single type, wastewater system being utilised across all lots in any subdivision application is not recommended.

Any system proposed for a lot should comply with all relevant Codes and Standards such as AS/NZS 1546.1 and the *Queensland Plumbing and Wastewater Code*. Water balance and nutrient loadings need to be considered prior to the determination of appropriate lot sizes.

The assessment of soil properties (texture and hydraulic) assists in determining ideal rates of application, and also, the suitability of proposed methods of disposal. The *Queensland Water Recycling Guidelines* (2005) provide indicative concentrations of total nitrogen (TN), total phosphorous (TP) and total dissolved solids (TDS).

It is recommended that a two-stage approach be undertaken for supporting the final determination of lot sizes in a subdivision and which is based on the suitability of the soils to certain methods of wastewater disposal,as well as any requirements of the Townsville City Plan, including any applicable overlay provisions. The results of the site and soil assessment inform the selection of an appropriate system and subsequent land application design.

(3) Design considerations

(a) Set back distances

Set back distances are to comply with the requirements of the *Queensland Plumbing and Wastewater Code*, and AS/NZS 1547.

Council may consider viral die off and nutrient decay calculations as a means of justifying a reduced set back distance from the following features:

(i) top bank of an intermittent water course; or

(ii) easement boundary of an unlined open stormwater drainage channel or drain.

The consideration of reduced setback distances are subject to the requirements of the Townsville City Plan, which may require increased setback distances to watercourses or in some instances, development to be placed outside of riparian or wetland buffer areas as detailed in the Water resources catchment overlay code or the Natural assets overlay code. Furthermore, it will be necessary for applications to demonstrate that there will be no adverse environmental impacts, taking into consideration cumulative impacts from other development, to place infrastructure near a watercourse, wetland, or open stormwater drainage channel/drain.

SC6.4.11.9 Attachments, forms and checklists

Attachments, forms and checklists	To obtain a copy the document
Attachment A - Applicant's Network Model Needs Consultation Process	Click here
Attachment B - Map of Available Sewer Network Model Areas (ex Toomulla)	Click here
Online Form A - Form M1: Request for network modelling information	Click here Please note that this form requests for either simple or detailed network modelling requirements.
Checklist A - Model Submission Checklist (Water and Sewer)	Refer Section SC6.4.2, Checklist 14 (Click here to view the document)

Development manual planning scheme policy (PSP)
SC6.4.12 Landscaping and open space

Index

SC6.4.12.1 Policy intent

(1) Introduction
(2) Design principles
(3) Management and maintenance

SC6.4.12.2 Private landscaping and open space

(1) Introduction
(2) Residential communal areas
(3) Commercial and industrial development

SC6.4.12.3 Public open space

(1) Introduction
(2) Public open space hierarchy
(3) Public open space management framework
(4) Streetscapes
(5) Other public open space
(6) Open space embellishments

SC6.4.12.4 Hardscape embellishments

(1) Introduction
(2) Surface treatments
(3) Fencing barriers and screening
(4) Shelters and shading devices
(5) Structures and buildings, lookout platforms, and fishing pontoons
(6) Furniture (and park signage)
(7) Electrical / Lighting / CCTV
(8) Activity elements (incl. playgrounds, water play, etc.)
(9) Dog off leash facilities
(10) Transport and access infrastructure
(11) Landscape entry statements
(12) Public art and water features

SC6.4.12.5 Softscape embellishments

(1) Introduction
(2) Plant species selection
(3) Planting design principles
(4) Streetscape treatment provision
(5) Open drains
(6) Car park planting
(7) Irrigation Profile Level (IPL) Hierarchy definition and matrix

SC6.4.12.6 Landscaping construction standards

(1) Introduction
(2) Works management
(3) Supply of materials
(4) Earthworks
(5) Vegetation of slopes and drains
(6) Garden construction
(7) Planting
(8) Staking, ties and guying
(9) Sub soil drains construction
(10) Garden edging
(11) Planter boxes
(12) Grass area construction
(13) Hydro seeding/mulching
(14) Paving construction
(15) Concrete kerbs
(16) Concrete works
(17) Masonry work
(18) Stormwater drainage
(19) Infrastructure items
(20) Landscaping materials

SC6.4.12.7 Attachments

Attachment A - Public Open Space Embellishment Framework
Attachment B - Permeable Paving Colour Guide
Attachment C1 - Preferred Plant Species List for Street Trees for Road Reserve
Attachment C2 - Preferred Plant Species List for Trees for Parks and Open Spaces
Attachment C3 - Preferred Plant Species List for Trees for Private Open Spaces
Attachment C4 - Preferred Plant Species List for Understorey Plants
Attachment D - Parks and Open Space Maintenance Service Level
Attachment E - Parks and Open Space Maintenance Costing Table

SC6.4.12.1 Policy intent

(1) Introduction

(a) Overview

The landscaping and open space section of this planning scheme policy provides advice and guidance relating to the sustainable landscape values and preferred landscape design outcomes for Townsville.

This policy applies to development requiring assessment against Part 9.3.3 Landscape code and other landscaping requirements of the Townsville City Plan and this planning scheme policy. Landscaping must therefore exemplify this landscaping and open space section to achieve the strategic intent of the Townsville City Plan.

Development must design landscaping and open space with climate in mind and shape works to specifically address features of Townsville's dry tropic climate. The consideration for climate transverses the design principles of this section, which articulate the policy intent of this landscaping and open space section.

(b) Scope

(i) Landscaping and open space requirements that align with design principles of this section are structured in the following categories:

1. Private open space;
2. Public open space;
3. Hardscape embellishments; and
4. Softscape embellishments.

(ii) The functions and development objectives for these categories of open space are outlined in this sub-section along with design and embellishment guidelines. The design principles and requirements of these sections should be addressed in the statement of landscape intent as detailed in Section SC6.4.2 Development application guidelines. This section identifies overarching design, sustainability and management principles that should be applied to open space development including:

1. general design principles, master plans and identified design outcomes;
2. principles of economic, environmental, and social sustainability; and
3. management frameworks for public open space Public Open Space (POS) Hierarchy, Public Open Space Management (POSM) Framework and Irrigation Profile Level (IPL) Framework (Refer to SC6.4.13.1 (6)).

(c) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(i) Townsville City Plan sections:

Part 4 – Priority infrastructure plan

Part 8.2.5 – Natural assets code

Part 9.3.3 – Landscape code

Part 9.3.4 – Reconfiguring a lot code

Section SC6.9 – Natural assets planning scheme policy

Section SC6.4.20 – Footpath treatment and outdoor dining design

Clause SC6.4.6.1 – Geometric road design

Section SC6.4.4 – Active transport infrastructure

Section SC6.4.14 – Public utilities and building over/near services

(ii) Australian Standards:

AS/NZS 1158.3.1	*Road lighting Part 3.1: Pedestrian area (Category P) lighting- Performance and installation design requirements*
AS 1170	*Structural design actions (set)*
AS 1428	*Design for access and mobility (set)*
AS 1926.1	*Swimming pool safety – safety barriers for swimming pools*
AS 2156	*Walking tracks (Set)*
AS 2890.3	*Parking facilities – Bicycle parking facilities*
AS 3996	*Access covers and grates*
AS 4373	*Pruning of amenity trees*
AS 4422	*Playground surfacing – Specifications, requirements and test methods*
AS/NZS 4486.1	*Playgrounds and playground equipment – Development, installation, inspection, maintenance and operation*
AS 4685.1	*Playground equipment and surfacing – Part 1: General safety requirements and test methods (Refer to current version)*
AS 4685.2	*Playground equipment and surfacing – Part 2: Additional safety requirements and test methods for swings (Refer to current version)*
AS 4685.3	*Playground equipment and surfacing – Part 3: Additional safety requirements and test methods for slides (Refer to current version)*
AS 4685.4	*Playground equipment and surfacing – Part 4: Additional safety requirements and test methods for cableways (Refer to current version)*
AS 4685.5	*Playground equipment and surfacing – Part 5: Additional safety requirements and test methods for carousels (Refer to current version)*
AS 4685.6	*Playground equipment and surfacing – Part 6: Additional safety requirements and test methods for rocking equipment (Refer to current version)*
AS 4685.11	*Playground equipment and surfacing – Part 11: Additional safety requirements and test methods for spatial network (Refer to current version)*
AS/NZS 4456.9	*Masonry units and segmental pavers and flags – Methods of test – Determining abrasion resistance*

AS/NZS 4586	*Slip resistance classification of new pedestrian surface materials*
AS 4970	*Protection of Trees on Development Sites*

(iii) Other:

Austroads	*Guide to Road Design* (Set)
Department of Transport and Main Roads Queensland	*Road Landscape Manual*
Department of Transport and Main Roads Queensland	*Manual of Uniform Traffic Control Devices* (MUTCD)
Department of Transport and Main Roads Queensland	*Queensland Guide to Traffic Management* (QGTM) - *Part 6: Intersection, Interchanges and Crossings Management*
Queensland Government	*Crime Prevention Through Environmental Design*, *Guidelines for Queensland*, Parts A and B (refer most current version).
Queensland Government	*Census of the Queensland Flora*, 2013, edited by Peter D.Bostock and Alisa E.Holland.
Western Australian Department of Sport and Recreation,	*Sports Dimensions Guide for Playing Areas*
Australia Building Codes Boards	Building Code of Australia

(d) Terminology

Crime Prevention Through Environmental Design – Crime Prevention Through Environmental Design (CPTED) provides a common-sense approach to designing environments (new or redevelopment) in ways that help to create safer spaces and reduce crime. CPTED may be applied to any built environment or facility.

Editor's Note – further guidance on implementing CPTED principles can be found in the following locations: Queensland Government, *Crime Prevention through Environmental Design, Guidelines for Queensland, Parts A and B*, (Refer to most current version), and CPTED Association website.

(2) Design principles

(a) Landscape character and place making

(i) Landscape design outcomes should demonstrate consideration and application of the landscape character and place making design principles, as described within this section. Landscaping and open space design provide the opportunity to protect and enhance the local character and place making of Townsville. Major aspects of achieving these outcomes include maximising shade, minimising reliance on irrigation, and using appropriate plant species and construction materials.

(ii) Deliver landscapes that reflect Townsville's local character and identity to facilitate and encourage community ownership, local tourism, and business growth and investment (e.g., open space design that provides opportunity for activation, festivals, and community-based activities).

(iii) Design safe public and private open spaces using CPTED principles that improve the quality and value of the built environment (e.g., create more liveable space that promotes Townsville as an attractive place to live and invest).

(iv) Respond to Townsville's dry tropic climate, local character and any specific vegetation of a local area with functional and attractive landscaping and open space design that also reflects the natural environment and any specific vegetation themes of a local area.

(v) Deliver landscaping and open space design in accordance with master plans adopted by Council. Master plans may specify strategy and plans to deliver key design and construction outcomes for local areas or sites.

Editor's Note - Outcomes identified in an adopted Master Plan take precedence over all other design guidelines, unless assessed and approved by Council.

(vi) Deliver landscaping and open space design in accordance with an identifiable character and/or desired design outcome of a local area, as applicable and where Council has not adopted a master plan. The design should seek to be consistent or complementary to this established direction and may include:

1. an established colour or furniture palette;
2. a dominant tree, plant species or planting style;
3. heritage features or an identifiable character;
4. significant natural features, materials, or environmental setting (e.g., natural bushland or coastal settings); and
5. a consistent, hierarchical based landscape design style.

Editor's Note - Statements pertaining to identifiable character or design outcomes for locations or land uses are contained within Townsville City Plan. Where applicable, landscape design outcomes are to comply with these statements and must be addressed within the "Landscape Statement of Intent". Where proposals will deviate from the desired outcomes, applicants must justify this deviation for further assessment and approval by Council.

(b) Economic sustainability

(i) Landscaping and open space design should demonstrate consideration and application of the economic sustainability design principles, as described within this section. Landscaping and open space design, establishment, and ongoing maintenance and management obligations must be economically sustainable for Council and property owners, and should:

1. incorporate equitable distribution of public open space assets that avoids overlapping of service areas and subsequent oversupply of public open space assets;
2. design landscaping and open space that considers the ongoing operational requirements and available maintenance resources; and

Editor's Note - Applicants are required to identify the ongoing operational requirements in a maintenance plan, as detailed in Section SC6.4.2 Development application guidelines, SC6.4.12.7 Attachment D – Parks and Open Space Maintenance Service Level and SC6.4.12.7 Attachment E - Parks and Open Space Maintenance Costing Table. For public open space, maintenance plans should be aligned with Public Open Space Management (POSM) Framework as outlined in Clause SC6.4.12.3 and developed with consideration of Clause SC6.4.12.7 Attachment A - Public Open Space Embellishment Framework.

3. prioritise landscaping and open space design that is low maintenance, including plant species selection and embellishments that respond to the extreme climatic conditions of the dry tropics.

(c) Environmental sustainability

(i) landscaping and open space design should demonstrate consideration and application of environmental sustainability design principles, as described within this section and Council's Corporate Plan through;

(ii) minimising the use of non-renewable resources;

(iii) protection, rehabilitation and enhancement of existing natural assets and ecological systems;

(iv) protection and integration of remnant vegetation, significant trees, and habitat areas in site planning, including, but not limited to:

1. large, existing mature trees;
2. vegetation in intact natural areas;
3. trees or vegetation protected by heritage listing;
4. trees or vegetation not formally protected by heritage listing but where the size and/or quantity present has a significant character impact;
5. marine plants including mangroves;
6. vegetation in riparian zones or on slopes, especially where the vegetation is performing a stabilisation role; and
7. vegetation external to the development site but where activities within the site may impact its long-term sustainability.

(v) promotion of local native and non-invasive introduced plant species;

(vi) promotion of ecological design and responsible urban forestry management;

(vii) implementation of integrated water cycle management practices by incorporating water sensitive urban design (WSUD) techniques to manage stormwater, slow runoff, recharge groundwater, store for re-use and to passively irrigate landscape areas. Refer to Section SC6.4.10 Stormwater quality;

(viii) implementing efficiency mechanisms and strategies to minimises the use of, and therefore conserve, non-renewable resources during both the establishment and ongoing maintenance of landscaping and open space (e.g., reduction of potable water use through water wise landscape and irrigation design);

(ix) ensuring landscaping and open space design responds to and enhances urban and community safety and resilience to natural hazards and risk, such as bushfires, flooding, coastal inundation and erosion, and cyclones;

(x) prioritising the use of renewable resources in landscape design such as renewable materials or substitutes (e.g: recycled products) and energy sources and embellishments (e.g. solar powered lighting);

(xi) reducing both directly and indirectly, resource consumption and waste generation by:

1. implementing opportunities for waste reduction and reuse (e.g., concrete recycling for gabion walls);
2. prioritising and promoting the use of recycled materials (e.g. recycled plastic composites);

3. promoting means for reducing carbon emissions and improving opportunities for carbon offsets and sequestration (e.g., reducing land clearing by promoting protection of existing trees and vegetation areas and incorporation of natural areas into public open space design); and

4. promoting environmentally sustainable design principles to reduce resource consumption, both directly and indirectly (e.g., increased street tree plantings to support passive cooling of streetscapes and buildings whilst improving amenity to promote pedestrian and cyclist activity).

(d) Social sustainability

Landscaping and open space outcomes should demonstrate consideration and application of social sustainability design principles, as described within this section, Part 9.3.3 Landscape code. and Section SC6.4.2 Development application guidelines.

Landscaping and open space design provides the opportunity to enhance the health and wellbeing, equity, and safety of the community.

(i) Promote community development principles in the design of open space by:

1. promoting social interaction and inclusion (e.g., civic spaces and private communal areas that promote, social activities and community gatherings);

2. promoting the equitable distribution of open space opportunities and resources (e.g., equitable distribution of different open space facilities throughout Townsville);

3. designing for community diversity (e.g., promoting open space design that responds to the varying needs of the community and creates a diversity of experiences suitable for different cultures and demographics);

4. engaging with the community on design proposals (e.g., working with the local community members and groups in the design or development of facilities within open space); and

5. seeking landscaping and open space co-design and development opportunities with First Nations peoples.

(ii) Encourage and improve the health, wellbeing and safety of the community by:

1. creating opportunities for community health and well-being activities (e.g., provision of outdoor activity elements that promote physical activity for all ages through structured or unstructured recreation);

2. applying principles for *Crime Prevention Through Environmental Design* (CPTED), which provides a common sense approach to designing built environments and facilities that help to create safer spaces and reduce and prevent crime; and

Editor's Note - Further guidance on implementing CPTED principles can be found in the following locations: Queensland Government, *Crime Prevention through Environmental Design, Guidelines for Queensland*.

3. complying with all standards and safety requirements to ensure safe open space for the community and maintenance personnel.

(iii) Ensure accessibility and equitable access of open spaces where possible (e.g., applying universal design principles in the design and construction of recreation facilities to promote inclusion of users of different abilities).

(iv) Landscape and open space design and location, must cater for accessibility and mobility requirements in accordance with AS 1428 Design for access and mobility (Set of standards), and as required by Part 9.3.3 Landscape code.

(3) Management and maintenance

The ongoing management and maintenance of landscaping and open space is fundamental to reinforcing the local character and identity of Townsville and ensuring sustainable outcomes for Council, property owners and the community. Landscaping and open space outcomes should demonstrate consideration for the ongoing management and maintenance principles, as described within this ~~sub-~~section. A development should seek to minimise maintenance requirements, including resources (e.g., irrigation and general water consumption, pruning and mowing). A proposed maintenance schedule must be provided with the design of Public Open Spaces identifying the ongoing operational requirements to allow effective life cycle costing planning – refer to Section SC6.4.2 Development application guidelines, Clause SC6.4.12.7 Attachment D - Parks and Open Space Maintenance Service Level and Clause SC6.4.12.7 Attachment E - Parks and Open Space Maintenance Costing Table. Typical ongoing management and maintenance principles are as follows.

(a) Landscaping and open space design should utilise low maintenance, but high-quality, materials, design elements and plant species.

(b) The irrigation, maintenance, and other resource inputs necessary to maintain the functionality and longevity of planting design outcomes and species should be sustainable, cost-effective and comparable with the available resources.

(c) The level and type of maintenance and management activity requirements should generally align with the intensity of use for landscaping and open space.

(i) High intensity uses occur throughout Townsville and include district and citywide public open space that encourage daily social and recreational activities, and primary pedestrian and cycle linkages.

(ii) Passive uses occur in smaller, informal spaces that cater to local and private recreation and pedestrian and cycle linkages, which see occasional use by small numbers of people.

(iii) Sports parks generally have short periods of intense activity followed by long period of off-season low activity.

(iv) Other uses include low intensity uses such as natural and bushland areas, cemeteries, easements, and unallocated space. Nodes may encourage greater activity (e.g., a picnic or camping area).

(d) Reduce maintenance requirements of natural areas, such as bushland, coastlines and waterways, by regenerating and rewilding landscapes.

(e) Minimise environmental impacts that may result from landscape management and regeneration activities, and utilise environmentally sustainable practices, including for the management of natural hazard risks. Target noxious weeds and feral animals through the use of integrated pest management approaches.

(f) Provide opportunities for greater community involvement in the management and maintenance of public open space and landscaped areas, particularly joint management opportunities with First Nations peoples.

SC6.4.12.2 Private landscaping and open space

(1) Introduction

(a) Overview

Private open space are open spaces that are located on privately owned land that is accessible by the public. Private open space does not include fully enclosed spaces that are not accessible, or the gardens of dwelling houses. Private open space may include outdoor communal areas in multi-unit developments, or privately operated spaces within commercial developments. These may be laneways, plazas, courtyards or detailed planting areas that are not fully enclosed, thus allowing public access.

Both private landscaping and open spaces are a key element that contribute to the amenity and character of Townsville, the lifestyle of residents and the wider community, and success of businesses. Significant environmental benefits of private open space must be recognised for their contribution to the wider landscape. Potential positive contributions of these spaces include the reduction of stormwater runoff, increased biodiversity, the provision of ecological connectivity, reduction of urban heat through passive cooling and the breakdown of urban heat islands.

(b) Scope

Landscape elements within private open spaces may include areas of deep planting in natural ground, open to the sky and open landscaped areas including carparking areas, plazas, green walls and roofs, and screen planting. As in all planting for Townsville's dry tropic climate, emphasis is placed upon the establishment of shade through the planting of shade trees and screening planting as required to break up heat islands within development. Landscape elements within private open spaces reduce the size and bulk of built form, add local amenity or provide privacy screening, both within a lot or to adjacent lots.

These planting locations are the public interface of private developments and are often artificial environments that are highly constrained where planting is required on building podiums, in raised planters, on rooftops or awnings, or between retaining elements. Planting treatments in these locations require full coordination with architectural and engineering works to ensure their success.

(c) Deep planting

Deep planting is vegetation, usually trees or large shrub planting, that is planted into natural ground within a development to allow the canopy and root system to reach its full growth potential without being restricted by built elements above or below ground. These areas are open to the sky to allow for solar access and rainfall to assist in the growth of the planting. Deep planting is required in developments where more than 80% of the lot is covered by built elements.

Deep planting is to be provided as a minimum 10% of site area withing urban developments. Deep planting must:

(i) be located in an area of the site that is open to the sky to allow for solar access and rainfall capture;

(ii) allow for the retention and protection of existing significant vegetation where this exists on the site (existing vegetation can be included within areas of deep planting);

(iii) planted into the natural ground and not located above underground constraints to allow for plant root development; and

(iv) provide of a variety of plant species including larger tree species. Plant species suitable for this type of planting can be found in Clause SC6.4.12.7 Attachment C1 to C4 – Preferred Plant Species Lists.

(d) Artificial growing environments

(i) Artificial growing environments are those where planting is not growing in natural ground. This type of planting is characterised by high water use and high levels of maintenance. These life cycle costs need to be considered prior to inclusion in a development. Other considerations are:

1. safe access for maintenance;
2. non-potable water supply; and
3. coordination with building and engineering services for the development.

(ii) Types of artificial growing environments include:

1. retaining wall planting

   planting between tiered retaining walls to provide trailing planting to assist in reducing the perceived heights and overall impacts of the built structure;

2. green walls

   planting systems attached to building walls either internal or external to provide a green feature in the development and assist in passive cooling of the building;

3. green roofs

   planting of roof structures to provide a degree of stormwater polishing as well as passive cooling of the building by increased insulation of the roof surface. These treatments require close coordination with the architectural and engineering elements of the structure to ensure effective structural soundness as well as effective function to achieve building goals (green star ratings etc);

4. raised / container planters

   planting in isolated planting areas on building surfaces, requiring both drainage and irrigation connections to guarantee long term survival; and

5. podium planting areas

   planting in large areas on building surfaces, integrated with the built structure. Like raised/container planting, the coordination of both subsurface drainage and irrigation is essential to their functioning over time. Minimum soil depths and maximum weights are required to be adhered to in order to achieve both structural and planting stability and longevity.

(iii) In all cases these artificial planting environments must ensure that:

1. minimum soil depth of 600mm (in excess of drainage materials and waterproofing) is provided to allow for adequate root development and moisture retention within the planting area. Overall planting areas dimensions and soil volumes must be scaled to suit the proposed plant species and type;
2. drainage, waterproofing and civil, structural and hydraulic engineering requirements are provided in accordance with related building codes and structural and hydraulic requirements;

3. species used are suited to their location and the amount of maintenance allowed in the maintenance schedule for the development with an emphasis on minimising irrigation and maximising passive cooling of the space/building;
4. plant selection provides the required visual amenity for the development without adversely impacting on neighbouring developments;
5. safe maintenance access is provided in compliance with all applicable standards, BCA, WH&S requirements; and
6. planting provided within the development is robust and securely installed to minimise damage during cyclonic conditions or other predictable weather conditions.

(e) Screen planting

Screen planting involves landscaping to manage users or provide general amenity or privacy, and larger vegetated buffers to minimise adverse impacts from development, such as visual, noise and air quality impacts. In all cases, the use of species with a suitable natural hedging form is preferred rather than artificially hedged species. Landscape screening must ensure that:

(ii) design and species selection allows for long-term performance, ease of maintenance and access, and minimal irrigation requirements;

(iii) provide a minimum of 2 tier planting and

(iv) provide a variety of plant species that;

1. meet planting densities to adequately achieve the purpose of the screening, including larger tree species where possible;
2. avoid damage to any surrounding infrastructure by utilising appropriate setbacks; and
3. are suitable for this type of planting.

(2) Residential communal areas

Residential communal areas may be provided by development at ground level, or on a podium, rooftop or partially open storey. Residential communal areas are an important asset to enhance social connection, lifestyle, health and wellbeing of residents and their visitors. It is important for residential communal areas to therefore meet the needs and aspirations of the community, as well as sustainable landscaping outcomes. Residential communal area must ensure that:

(a) flexible spaces are provided that meet different users' needs and aspirations are provided. Flexible spaces also provide opportunities for community initiative and ownership (e.g. community garden, recreational open space);

(b) contribute to the local character of locality or development;

(c) cost effective for shared funding arrangement, such as body corporates, to maintain and replace at end of life;

(d) fully or partially open to the sky;

(e) oriented and shaded with consideration for the dry tropics climate, solar access during winter and summer, wind tunnels, and shading from surrounding buildings and landscapes; and

(f) CPTED principles are used to provide spaces that are safe for use at various times of the day and night.

Editor's Note - Further guidance on implementing CPTED principles can be found in the following locations: Queensland Government, *Crime Prevention through Environmental Design, Guidelines for Queensland, Parts*

A and B, (refer to current version), and CPTED Association website.

(3) Commercial and industrial development

Private open space of commercial and industrial development will vary greatly, depending on the use, and may include areas such as shared employee recreation space, publicly accessible plazas, laneways, outdoor carparking areas and campuses. It is important for commercial and industrial development to provide private open space to attract employees and visitors, reduce impacts from development, respond to Townsville's dry tropic climate, and contribute to the lifestyle, amenity and character of Townsville. Commercial and industrial private open space must ensure that:

(a) design provides cues to distinguish between a public area, a semi-public area and a private area;

(b) carparking areas provide shade trees and landscaping in accordance with Clauses SC6.4.5.3 Public transport facilities and SC6.4.5.4 Car parking;

(c) provide a variety of plant species including larger tree species;

(d) plant species suitable for this type of planting can be found in Clause SC6.4.12.7 Attachment C1 – C4 – Preferred Plant Species Lists;

(e) employee break-out areas are separated and private from public areas;

(f) amenity and character of the streetscape, development and adjoining lots is retained and enhanced; and

(g) open spaces are oriented and shaded with consideration for Townsville's dry tropic climate, solar access during winter and summer, wind tunnels, and shading from surrounding buildings and landscapes.

SC6.4.12.3 Public open space

(1) Introduction

(a) Overview

The landscape and character design outcomes associated with the development of public open space are required to demonstrate alignment with the standards set out in this section and addressed in accordance with Section SC6.4.2 Development application guidelines.

Public open space includes all areas of open space that are publicly owned and/or accessible. Public openspace includes parks and land that has been reserved for the purpose of sport and recreation, ecological function and natural environment protection, infrastructure corridors, stormwater management, and the general provision of green space.

Public open space, existing, planning and proposed, contributes significantly to community well-being, urban place-making and the general amenity and liveability of a city. Parks and other open space typologies also perform dual or multifunctional roles. This includes supporting the provision and buffering of roadways, stormwater devices and other infrastructure networks including but not limited to bikeways, and utility services, particularly within corridor parks. These spaces can often provide a means of maintenance or other function to associated infrastructure, making them a critical part of the function of many forms of open space.

Within public open spaces, there are some areas that are designated for special uses or functions, possibly with specialised facilities for recreation uses. In these spaces, the nature of the recreation activity may control access and preclude free, unrestricted access to members of the public. In other cases, land its associated and facility result in a single use activity. In all cases public infrastructure must meet accessibility requirements ensuring equitable access to public open space.

(b) Scope

Public open space Hierarchy and framework seeks to provide access to open space in accordance with the planning scheme in particular The Local Government Infrastructure Plan. This document identifies trunk network vs local and non-trunk, and dedication/contribution charge for non-trunk network.

(2) Public open space hierarchy – typology and hierarchy

(a) The public open space hierarchy refers to the size, form, and function of public open space which will vary significantly across different park types and other public open space typologies. As such, public open space networks are usually defined by various open space typologies that are rationalised, planned, and designed against a "Public Open Space Hierarchy".

This approach ensures that the distribution, development and management of public open space occurs in a strategic and structured manner that reflects the different classifications and importance of each open space typology.

Group and individual typologies within the Public Open Space Hierarchy reflect the diversity of functions and uses between different open space typologies within the city. Council's open space hierarchy has been divided into four functional groups:

(i) recreation parks;

(ii) sports parks;

(iii) streetscapes; and

(iv) other public open space.

(b) Importantly, it should be recognised that one area of public open space may contain more than one open space typology function across the different functional groups.

For example, a park may contain two informal sports fields (district sporting function), a local recreation node (local park function) and a drainage corridor (utility function). In instances such as this,the public open space may be:

(i) classified based on the most dominant function (e.g., classified a district sports park, with the presence of a local recreation node recognised but not separately designated); or

(ii) split into different functional areas, where each area is separately recognised and designated.

Classification of public open space against the hierarchy is reached through a strategic audit and evaluation of the open space, its characteristics, and the standards of embellishment. Profile, accessibility, and usage catchments are also a key determinant in hierarchy classifications, with typologies generally being categorised on a local, district or regional basis.

To support these classifications, council has developed a Public Open Space Embellishment Framework that defines the embellishments and infrastructure that are "Suitable" or "Accepted" for different public open space typologies. The purpose of this framework is to support equitable, cost-effective and sustainable development of public open space that is functional and meets the needs of the community.

The Public Open Space (POS) Embellishment Framework is further defined in Clause SC6.4.12.7 Attachment A - Public Open Space Embellishment Framework, and the balance of this section.

Editor's Note - Open Spaces classified as being of District or Regional significance have been determined as priority trunk infrastructure. (Refer Part 4 Priority Infrastructure Plan of the Townsville City Plan).

The proposed landscape design and character outcomes associated with the development

of public open space are required to demonstrate alignment with the standards set out in this section and address this through landscape design outcomes and in the “Landscape Statement of Intent”, as detailed in Section SC6.4.2 Development application guidelines.

(c) Recreation parks

Recreation Parks are generally defined by their size, location and potential uses in accordance with RAL and trunk infrastructure requirements. These parks include the following:

(i) amenity parks are landscaped areas with a strong focus on visual attributes. Traditionally Amenity parks may include monuments, memorials or gateway treatments. The park area may also include opportunities for passive recreation such as seating areas. An example of an Amenity Park is Garbutt Park, Garbutt, which acts as an entrance statement welcoming visitors and residents to Townsville;

(ii) civic parks and spaces are areas generally associated with a high level of built infrastructure. While recreation use is minimal they provide landscape and amenity values for the general community. Civic parks provide an urban respite for social interaction and community gatherings. Often characterized by hard surface treatments associated with its setting and high activity use levels, these spaces may be used for social events such as community markets;

(iii) pocket parks are open space parklands that offer a limited range of recreational activities for local residents. They are generally associated with specific urban design outcomes, e.g. to support small lot housing. These parks are intended to act as a supplement where local parks are too distant to access on foot for local residents;

(iv) local recreation parks are open space parklands that offer local residents a communal open space to complement their own backyards. Local recreation parks are ideally located within 400m walking distance from residential properties and are generally accessed by non-motorised transport. These parks contain only basic infrastructure for recreational use;

(v) district recreation parks are much bigger than local sized parks that can service several suburbs, or a whole community and or a community event. The parks provide for a variety of passive and active recreation and/or contain facilities to cater for a wider user group of all age and levels of ability. The parks are well known destinations for those people living within their catchment, enabling the park to become a significant social hub;

(vi) regional recreation parks are open space parklands that offer a wide variety of both active and passive recreation opportunities to a broad section of the community. The park area is capable of hosting large community events such as festivals, and unique functions. These parks have major embellishment features designed to attract visitation from a wider catchment area and encourage extended stay. It provides unique recreational experiences and is a major landmark and/or destination; and

(vii) recreation corridors are usually a linear open space that follows creeks, drainage channels, service corridors or green belts. Corridor parks traditionally have a dual functionality and may include opportunities for cycling, walking and other recreational activities. It can also provide an important ecological link for flora and fauna. Corridor parks are intended to provide a safe connection between two or more destination points. As a minimum, the width of these spaces should be no less that 15 metres at the narrowest point. These spaces are often the location of active transport use and design priority must be given to making these spaces safe for this purpose by maintaining passive surveillance opportunities and minimising narrow constrained spaces that could allow for entrapment.

Editor's Note - Currently, further definitions and intent statements are not developed for all individual recreation park typologies. Refer to Part 4 Local government infrastructure plan of the Townsville City Plan for definitions, distribution and land areas relating to trunk recreation parks.

(d) Sports parks

Sports parks provide facilities suitable for the practice and play of structured or organised sports. These are categorised according to their size and location and the level of embellishments provided. Facilities provided include large, open park spaces for sporting activities, lighting, a club house, toilet facilities, change rooms and off street parking.

Categories of sports parks include district, regional, and special use parks. District and regional sporting parks are generally accessible to the public at all times for various sporting activities while special use parks have specialised facilities that precludes free, unrestricted public access. These facilities may be under the control of Council or a private organisation creating a user pays system for the facility. Special use parks may include facilities to support the following activities: Water play parks/Privately Owned or Leased Swimming Pools, Equestrian, Archery/Bow hunting/Sport Shooting, Golf, Tennis, Lawn bowls, Model Planes and Motor Vehicle Sports.

Editor's Note – Refer to The Townsville City Council Sport and Recreation Facility Strategy 2018-2028 and supporting documentation for further guidance.

(3) Public Open Space Management (POSM) framework

(a) A key objective of the public open space management and associated levels of service is to ensure that the level of embellishment is consistent and sustainable with the available resources to maintain them.

Associated with the Public Open Space Hierarchy, council has developed a Public Open Space Management (POSM) Framework that specifies acceptable maintenance levels of service against different open space typologies. This POSM Framework and associated levels of service are also applied against the road hierarchy.

In accordance with the POSM Framework, infrastructure must not be provided where the necessary maintenance required exceeds the allocated maintenance level of service in order to ensure the public open space or items remain serviceable and safe for public use (e.g., dynamic fitness equipment that requires regular safety inspections or electric barbeques that require weekly cleaning to remain hygienic should not be installed in a park that has assigned monthly maintenance service). Further, the cost to establish, maintain and ultimately renew the infrastructure must be sustainable and cost effective for council and the community in the long term.

In order for council to properly assess future POSM requirements for each public open space development proposal, council requires a maintenance plan for maintenance activities, as detailed in Section SC6.4.2 Development application guidelines, Clause SC6.4.12.7 Attachment D - Parks and Open Space Maintenance Service Level and Clause SC6.4.12.7 Attachment E - Parks and Open Space Maintenance Costing Table. This maintenance plan must demonstrate alignment with the adopted POS Embellishment Framework and POSM Framework.

(b) Irrigation Profile Level (IPL) framework

As part of council's commitment to efficient, cost effective and responsible use of natural resources, council has developed an Irrigation Profile Level (IPL) Framework to categorise and define irrigation water usage within public open space.

(c) The IPL Hierarchy identifies and defines a number of “profile levels” based on the level of irrigation applied, an indicative “functional application” based on open space typologies, and the performance indicators associated with each irrigation application rate. Refer to Clause SC6.4.13.1 IPL hierarchy definition and matrix.

Supporting this, the IPL Matrix identifies a number of criteria and “influences” used in the determination of an assigned IPL. Refer to Clause SC6.4.13.1- IPL hierarchy definition and matrix.

Importantly, it must be recognised that the level of irrigation required is directly dependent upon the landscaping which it must support. As such, in the development of new public open space, the landscaping should be designed with consideration of the typical IPL classification for the public open space typology as well as the extent of landscaping and irrigation defined by the POS embellishment standards. Additional requirements are identified in Clause SC6.4.13.2 Irrigation design and system requirements.

For existing public open space, the IPL classification must be based upon the required irrigation application rate necessary to support the health and longevity of the existing landscaping. Where a change to the IPL is proposed, this must include consideration of the open space typology, the intended use of the open space area and the impacts of reduced water application rate on existing plant specimens and include changes to the landscaping plantings where required.

Critically, an area of public open space may have more than one IPL (e.g. “high” IPL level around the activity node or within the minimum usable space, and then a “medium” or “low” profile for the balance of the open space). To achieve this in an efficient and effective manner, however, the associated landscaping and irrigation systems must be purpose-designed for this outcome (i.e. separate irrigation systems consistent with species selection and placement based on principles of hydro-zoning).

(4) Streetscapes

(a) General requirements

Streetscape areas are the street or road landscape area including all public open space within the road reserve. The design and development of streetscapes will vary according to the road hierarchy, its associated function, as well as the surrounding land use and built environment.

Editor’s Note - Applicants should refer to Clause SC6.4.6.1 Geometric road design for more information.

It is noted, however, that there is interdependency between elements within the private realm and the overall streetscape. Critically, elements with the private realm (e.g., residential, or commercial frontages) contribute to the appearance and function of a streetscape. It is important, therefore, that any streetscape design proposal is integrated and responsive to the surrounding context.

All streetscapes must be designed, constructed and planted in accordance with:

(i) the provisions within the Townsville City Plan, planning scheme policies and this section of the Development manual planning scheme policy;

(ii) all applicable Australian Standards and legislation;

(iii) all applicable council local laws; and

(iv) all council approved standard drawings.

Editor’s Note - Where streetscape outcomes are within roads managed by the Department of Transport and Main Roads, applicants should refer to the Department of Transport and Main Roads’ *Landscape Design Manual* (2013). Requirements of the Department of Transport and Main Roads’ Landscape Design Manual will take precedence in these instances. Engagement and approval from other stakeholders/authorities may additionally be required as part of any development proposal.

All streetscape outcomes should be underpinned by and contribute to the safety and functionality of the streetscape while upholding the sustainability principles outlined in the landscape policy. At the same time streetscapes need to contribute to the aesthetic value of the place. Streetscapes must also represent value for money in both their implementation and life cycle costs while responding to the needs of the community and local environment.

Editor's Note - Whilst the above strategic objectives are relating specifically to streetscape outcomes, these objectives are aligned with the overarching sustainability principles outlined at the beginning of this section and within Part 9.3.3 Landscape code. Alignment with both the above strategic objectives and the overarching sustainability principles are to be expressed in the proposed streetscape design outcomes and detailed in the "Landscape statement of intent" per Section SC6.4.2 Development application guidelines.

(b) Safety

Streetscapes shall not introduce risk to road users and contribute positively to a safe road environment while being safe to construct and maintain.

Streetscapes shall create a safe road environment by ensuring:

(i) a safe system approach to road safety is used, as detailed by Austroads, where additional hazards, safety or security risks are not introduced to the streetscape;

(ii) safe and efficient pedestrian, cyclist and vehicle movement is facilitated through the integration of all infrastructure and landscape elements within the road corridor;

(iii) safe sight distances. Set backs and other clearances are applied and maintained as per Austroads Part 3 and Part 4. At intersections, use of Minimum Gap Sight Distance, and at roundabouts, criteria 1 and 2, are mandatory;

(iv) clear zones and frangibility requirements are met in accordance with clear zone criteria as per Austroads Part 6;

(v) signage and other road furniture is not obscured;

(vi) safety and traffic management is enhanced through the functional use of landscape plantings;

(vii) surface treatments are slip-resistant and non-reflective;

(viii) effects of glare and shadowing are minimised;

(ix) CPTED principles are incorporated into all streetscape designs; and

(x) a safe work environment for maintenance personnel is achieved and requirements for traffic control are minimised.

(c) Functionality

Proposed outcomes are fit-for purpose and comply with landscape and road planning and design principles, appropriate to the road hierarchy and function.

To this end streetscapes must:

(i) be supported by all other ancillary infrastructure requirements that are essential to the overall functionality and longevity of the streetscape, including but not limited to subsoil drainage, root barrier and irrigation (where required by Council); and

(ii) demonstrate sound application of design theories including legibility, form, function, connectivity, way-finding, accessibility and mobility, robustness, place-making and imaging.

Editor's Note - Where proposed streetscape outcomes deviate from the outlined requirements of this section, the merit for this deviation must be detailed. Notes documenting how all safety, functional and operational requirements are satisfied by the design exception must be included for further consideration. Any variances will be assessed on a case-by-case basis relative to the situation. Approval will not be granted where the design exception opposes safety requirements or increases safety risk. All plans are required to be signed off

by a RPEQ registered engineer.

(d) Environmental sustainability
Ecological and sustainable design principles are incorporated to mitigate the environmental impacts of the road and maintain or improve the intrinsic value of the streetscape.

These include:

(i) street trees must be integrated into the streetscape that will create shade for all users (including pedestrians and cyclists) and ameliorate the urban heat island effect;

(ii) applying an appropriate planting approach such as: structured, naturalistic, and water sensitive planting; grass seeding; or turfing;

(iii) providing a buffer between the road and surrounding land uses;

(iv) integrating the streetscape within natural areas through planting approaches with a natural appearance and naturalistic, informal distribution;

(v) improving the health and resilience of the urban forest by establishing green corridors along streets or roads and providing habitat corridors within the urban matrix;

(vi) functional landscape components must be incorporated such as the use of vegetation to screen headlight glare;

(vii) using varied vegetation treatments to highlight progression or transition to a different speed environment;

(viii) using vegetation and other components to maintain or frame views;

(ix) large areas of streetscape must be treated in an economical way, with regard to construction, maintenance and ongoing contribution to the urban fabric;

(x) streetscape treatments must assist with integrated stormwater management by establishing vegetation that will reduce erosion and avoid large expanses of impervious surface; and

(xi) vegetation with “temporary irrigation “and other treatments must be incorporated in ways that minimise maintenance in high risk areas, require reduced maintenance interventions and become self-sustaining over time.

(e) Aesthetic value
Streetscapes provide high visual amenity and are contextually sensitive to the character of the surrounding built and natural environment. Streetscapes shall be contextually sensitive and provide high visual amenity by:

(i) establishing streetscape characters themes that address, retain, reflect and where possible enhance the local context of the project area (architectural themes, colours, visual heritage values etc.);

(ii) creating balance in term of scale and mass between new streetscape components and the existing natural features and urban building forms;

(iii) integrating natural elements that recognise and promote the value of the urban forest in all streetscapes;

(iv) establishing innovative approaches to providing functional, high amenity outcomes whilst maintaining and enhancing the safety and operational function of the road;

(v) responding to changes in road conditions and promoting legibility under varied road conditions or different design speeds;

(vi) presenting a visually cohesive and unified suite of treatments that are simple, refined and without unnecessary, non-functional embellishment;

(vii) creating treatments that are visually recessive except where intended to be highly visible feature elements;

(viii) maintaining an uncluttered road environment with limited visual intrusion that will minimise risk of road user distraction and minimise conflict with official traffic signs and signals; and

(ix) devising colouration and surface treatment solutions that shall mitigate the visual impact of dirt, staining and adhesion of other pollutants.

(f) Community value
Proposed streetscape outcomes are responsive to the needs and concerns of stakeholders and maintain or improve the quality of life and liveability of communities by:

(i) identifying and addressing community values and associated interests, perceptions and preferences as part of transport and road landscape planning and design process;

(ii) promoting participation and contribution by implementing effective community engagement processes;

(iii) enhancing public amenity for all users through improvements to user comfort, way finding and walkability;

(iv) promoting the health and well-being of the community by improving the useability of pedestrian networks through provision of shade and the like;

(v) improving accessibility, connectivity and security within the streetscape;

(vi) establishing streetscapes that are functional and facilitate equitable access to a variety of multi-modal transport systems;

(vii) seeking design outcomes that create a sense of community and reinforce local character, identity, and cultural heritage; and

(viii) improving experiences both for users traveling within the transport infrastructure corridor itself and the community beyond.

(g) Economic Value
Streetscapes must represent value for money and provide cost effective design outcomes that seek to minimise costs over whole of life cycle by:

(i) implementing appropriate designs that provide balanced outcomes across all strategic objectives;

(ii) creating iconic gateway entry statements, in strategic locations only, which emphasise the urban or regional identity and enhance tourism, business potential and associated economic benefits;

(iii) promoting increased usage and visitation to business and services through the provision of user friendly vehicular, pedestrian, cyclist and public transport networks which incorporate a high level of amenity and deliver a high quality experience;

(iv) ensuring the ongoing cost and level of service for operational requirements associated with the streetscape is appropriate for the hierarchy and profile of the road;

(v) minimising the overall cost of operational activities through responsive design that reduces high cost, high risk, high frequency and high intensity activities;

(vi) avoiding landscape treatments that require traffic control to maintain (for example hedges in a road reserve that require lane closure to maintain);

(vii) creating designs that will evolve into a self-sustaining streetscape and have a progressive reduction in the number of maintenance interventions over the operational

life of the corridor;

(viii) promoting alternatives to permanent irrigation where seasonally dry landscape aesthetic outcomes are consistent with the local character and road; and

(ix) promoting innovation in the development of alternative treatment types that achieve a balance between the desired aesthetic and reduce maintenance outcomes.

(5) Other public open space

(a) Other types of open space that are listed below generally have very little in the way of embellishments other than those to allow the fulfillment of their purpose. Infrastructure or embellishments in these spaces may change over time and result in a change in the function of the open particular space allocation.

(i) Natural and bushland areas: are set aside primarily for conservation purposes to protect and retain natural vegetation and habitat areas. Size may range from small to large areas that reflect the importance of the environmental value. These parks may also provide opportunities for outdoor recreation activities such as bushwalking, trail running, mountain biking, nature viewing and appreciation. Embellishment improvements are generally limited infrastructure associated with the above activities such as seating, lookouts and signage. Some of the park areas may also include cleared areas intended to be rehabilitated to improve habitat corridors.

(ii) Utility spaces / easements are areas that are often owned or maintained by council, for specific utility services such as electrical transmission, telecommunications, water and sewerage pump stations or other infrastructure purposes. These spaces may offer some dual functionality for recreation activities such as walking, cycling or civic amenity.

Editor's Note - Applicants should refer to guidelines for public utilities or more information.

(iii) Unallocated open space may be any reserve area of land and/or water reserve which has not been named or developed at present, but which has been deemed important enough to be set aside for future open space development. A proposed park area is usually substantially undeveloped with no built infrastructure and only minor improvements such as rural fencing.

(iv) Cemeteries are an area under the control of council that is dedicated for the burial of the dead, or containing graves, tombs, funeral urns and interment of ashes.

(6) Open space embellishments

(a) General requirements

The design requirements for public open space areas are in a general sense to embellishments to open spaces to fulfill the design principles of landscaped and open space areas nominated in Clause SC6.4.12.1 (2) Design principles and Part 9.3.3 Landscape code.

Embellishments may be hard or soft landscape embellishments but must be consistent and sustainable to achieve the open space use allocation in accordance with the POS Embellishment and the POSM Framework.

As such, infrastructure must not be provided where the necessary maintenance required exceeds the allocated maintenance level of service. This is to ensure that the public open space or items remain serviceable and safe for public use (e.g. dynamic fitness equipment that requires weekly safety inspections or electric barbeques that require daily cleaning to remain hygienic should not be installed in a park that has assigned fortnightly maintenance service intervention). Further, the cost to establish, maintain and ultimately renew the infrastructure must be sustainable and cost effective for council and the community in the long-term.

Open space embellishment levels should be consistent with the assigned public open space hierarchy and typology (Refer to SC6.4.12.7 Attachment A - Public Open Space Embellishment Framework) and / or road hierarchy classification or the characteristics of the associated land use.

Where private open space is associated with development, the private open space shall be considered on a case-by-case basis with consideration of the design selection criteria set out below.

(b) Selection criteria

The following key characteristics should be considered in the design process when selecting the level of embellishment for all public open space (including Streetscapes):

(i) comply with any adopted master plan, environmental, heritage and character requirements;

(ii) consider the context, functionality and purpose for use (e.g. particular open space usage patterns for the site such as regular use for community events, or shared usage by multiple tenants in a large residential complex);

(iii) consider the setting, durability and aesthetic requirements for the intended area (e.g. specific materiality requirements for areas with a risk of vandalism, or more ornate detailing for intimate private courtyard space);

(iv) cater for the expected usage rates, demographic/s and their associated needs (e.g. reduced intervals between accessible bench seats along a pathway at a location with large senior user group);

(v) be located at appropriate locations or intervals, clustered near activity nodes and/or to complement any distinguishing site features (e.g. seating situated to maximise a vista or allow surveillance of a play area by carers);

(vi) be climatically appropriate and consider localised conditions of the site (e.g. dynamic activity elements in coastal areas are not located in areas exposed to high onshore winds and salt spray);

(vii) ideally be located under natural or built shade to allow day long use through reduced exposure, glare and heat absorption (e.g. playground slides to be shaded or, communal gathering areas located under shelters);

(viii) complement natural materials or features and/or incorporate these where possible (e.g. grass mounding for seating; feature rock retaining walls consistent with local geology);

(ix) be vandal resistant;

(x) be installed on an appropriate surface material, on well drained ground and with an appropriate level of flood immunity (e.g. playgrounds not installed in an area surrounded by a retention basin); and

(xi) prioritise use of recycled, sustainable materials where practicable and available (e.g. decking to be constructed of recycled plastic and composite fibre supports).

(xii) complement those facilities in nearby precincts or parks, ideally providing diversity in the facilities available to the community;

(xiii) be consistent with any an existing style that is already established unless approved otherwise;

(xiv) only include high quality, fit for purpose, proprietary items for which replacement parts are readily available from an Australian distributor;

(xv) for district and regional level parks, custom items may be permitted at particular sites,

where the profile and location of the park warrants it;

(xvi) avoid the use of timber elements unless approved otherwise;

(xvii) utilise high quality finishes that will reduce ongoing maintenance requirements and/or frequency (e.g. 2PAC epoxy paint in lieu of powder coating where items are not easily dissembled or repainted); and

(xviii) for all foreshore locations and other locations subject to salt spray or prolonged wet conditions, embellishments must be constructed of marine grade materials, including 316L stainless steel fittings, to ensure improved asset longevity and lifecycle cost reduction.

Editor's Note - Areas within this section provide specifications for individual open space infrastructure types and for landscape treatments in streetscapes.

SC6.4.12.4 Hardscape embellishments

(1) Introduction

All hardscape embellishments must be designed, constructed, and maintained in accordance with:

(a) appropriate abrasion resistance in accordance with test methods stipulated in AS/NZS 4456.9 - Masonry units and segmental pavers and flags - Methods of test - Determining abrasion resistance;

(b) appropriate slip resistance capability as required by AS/NZS 4586 - Slip resistance classification of new pedestrian surface materials;

(c) be colour-fast, UV resistant and non-reflective;

(d) ensuring treatments are durable, weatherproof, and of robust construction and finish to reduce repair or replacement frequency;

(e) minimising the potential to create litter traps;

(f) promoting resistance to damage, vandalism, unauthorised use and removal;

(g) promoting easy cleaning, unhindered accessibility and suitable for maintenance activities including mechanical cleaning procedures;

(h) incorporating erosion and sediment control measures to reduce clearing out of drains; and

(i) minimising the need for herbicide applications and brush cutting around furniture such as guard rail posts or signs.

Where the width of hard landscape treatments may exceed 6 m, it is desirable that a combination of hard and soft landscape treatments is used to avoid large expanses of hard surface and minimise the Urban Heat Island Effect. This excludes roundabouts below 10 m in diameter.

(2) Surface treatments

(a) General

Surface treatments within all open space are to be:

(i) of an appropriate extent and material that will be durable under the local climatic and site conditions, being permeable where possible to mitigate potential overland flow;

(ii) fit for the intended purpose of the surface, its location, and the anticipated type and level of usage;

(iii) shaded wherever possible and not prone to excessive heat retention, reflectivity and glare;

(iv) not conducive to water pooling or slippery when wet;

(v) designed and located with consideration of the need for softening of hard surfaces with plantings; and

(vi) be practical to maintain.

(b) Materials

Landscape hardscape treatments may include:

(i) artificial turf – this treatment is only to be used in public spaces where it provides a maintenance advantage to Council or an aesthetic associated with high profile public infrastructure (playground);

(ii) stencil-crete;

(iii) concrete (plain, coloured or exposed aggregate);

(iv) permeable paving treatments (Refer to Clause SC6.4.12.7 - Attachment B - Permeable Paving Colour Guide or click here to view the document); and

(v) other associated hard landscape treatments – unit pavers (brick pavers or similar) are not to be used in public open space as their life cycle costs are excess of expectations for hard pavements.

Editor's Note - Refer to the potential specialty footpath requirements under Clause SC6.4.20.1 Footpath treatment.

(3) Fencing, barriers and screening

(a) Fencing, barriers and screening elements described in this section may be fencing or architectural screening to obscure a view into or out of a location. These barriers may also perform an acoustic attenuation function (refer to Section SC6.4.19 Noise and vibration) or to mark a property boundary or edge of a particular activity or use area.

(i) Fencing, screens / barriers are often used to define a property boundary and may include, but are not limited to the following:

1. fencing panels;
2. bollards;
3. post and rail systems;
4. architectural screening;
5. rural type fencing; and
6. other crash barriers.

(ii) Fencing, screens / barriers are to be provided in order to:

1. provide a legible definition of the open space boundaries and limits;
2. provide enclosure of a space appropriate to its function (e.g. fenced playgrounds);
3. prevent encroachment into open space by adjacent private properties;
4. mitigate noise impacts from adjoining land uses (refer to Section SC6.4.19 Noise and vibration);
5. prevent unwanted vehicle access by the provision of barriers along the road frontage, including into drainage reserves, parks and other public open spaces;
6. restrict access to unsafe locations or private property; and

7. promote passive surveillance of an area (CPTED).

(iii) All fencing, screens / barriers must be designed, constructed and installed in accordance with:

1. the provisions within the planning scheme, planning scheme policies and this section of SC6.4 Development manual planning scheme policy;

2. manufacturer specifications;

3. all applicable Australian Standards and legislation;

4. all applicable council local laws; and

5. council's approved standard drawings.

Editor's Note - Currently, limited standard drawings are formally adopted for fencing.

(iv) Fencing, screens / barrier materials, design and location.

1. Materials, design and location should not unreasonably hinder pedestrian circulation through open space, with sufficient pedestrian access points to be provided.

2. Where vehicle access prevention is required along pathways or bikeways, bicycle deflections rails are the preferred method and removable bollards should be avoided. Refer to Section SC6.4.3 Standard drawings SD-066 - Miscellaneous Traffic Details – Shared Path Terminal Treatments Deflection Rail and Intersection at Side Road.

3. For public open space or streetscapes, proposals should seek to be consistent with the existing style that is already established unless approved otherwise.

4. Materials, design and location should be considered in the context, functionality and purpose (e.g. post and rail installed where prevention of vehicle access, including motorbikes, is required).

5. Public playground area and pool fencing must be in accordance with AS1926.1 Swimming pool safety – safety barriers for swimming pools. Fixings for fencing and gates must be of a commercial grade to contend with high usage.

6. Where appropriate, use of plants to for screening or to soften the fencing is recommended, except where this will conflict with CPTED requirements.

7. Fencing of private allotments along common boundaries with open spaces, particularly corridor parks, must restrict their screening height to 1500mm to promote a level of passive surveillance of the adjacent open space. Above this height, the fencing material must allow for views through to the adjacent open space promoting passive surveillance of these open spaces. Where appropriate, Council may condition the use of transparent panels to increase the level of casual surveillance.

(v) Fencing / screening alignment and type shall include consideration of ongoing maintenance requirements and ensure:

1. access for maintenance and other authorised vehicles shall be provided through a lockable gate or removable bollard, including provision of a kerb ramp or crossover at a safe location acceptable for Council;

2. planting must be offset from fencing to allow enough space for the maintenance of the fencing and the planting and to discourage the dumping of refuse from private property into public open space. Minimum offsets are suggested at 0.5 – 1m however these are dependant of the size of the adjacent open space;

3. where provided in turf, a minimum 2 m wide clearance to other infrastructure (including trees) shall be maintained on either side of the fencing alignment to allow efficient mowing activities;

4. where bollards are provided in concrete, construction joints shall be provided to minimise damage to concrete slabs due to collisions, and allow ease of removal and replacement to damaged bollards; and

5. fencing is to be located within the surveyed boundary of the open space allotment or where open space borders private property, fencing is to be located within the surveyed boundary of the private allotment.

(4) Shelters and shading devices

(a) General

(i) Shelters and shading devices may include, but are not limited to the following:

1. awnings;

2. picnic shelters or gazebos; and

3. shade sails.

(ii) All shelters and shading devices must be designed, constructed and installed in accordance with:

1. the provisions within the planning scheme, planning scheme policies and this section of SC6.4 Development manual planning scheme policy;

2. manufacturer specifications;

3. all applicable Australian Standards and legislation;

4. all applicable council local laws; and

5. council's approved standard drawings.

Editor's Note - Currently, no standard drawings are formally adopted for shelters and shading devices.

(b) Awnings

Editor's Note - Due to the place-specific, custom nature of awnings, no standard specifications are currently developed. Proposals will be considered on a case-by-case basis in accordance with all applicable building and engineering requirements, Australian Standards and council's overarching design and management principles. Applicants should refer to Clause SC6.4.20.2 Outdoor dining design for permanent outdoor dining structures for shading requirements applicable in this situation.

(c) Shade sails

(i) All shade sails are to be:

1. designed, engineered, built and certified against Building Code of Australia, C2 wind rating requirements as per AS1170 *Structural design actions* and all other applicable standards;

2. located with consideration of shading requirements, sun orientation and natural shading opportunities on site. As such, provision must be considered on a case-by-case basis, and account for the existing versus desired extent and daily duration of shade cover (natural and built);

3. provided in public car parking areas as a substitute to natural shading when there is insufficient available planting space or shade sails are deemed a more practicable and/or cost effective shading system;

Editor's Note - Refer Clause SC6.4.12.5 (6) Car park plantings for additional information.

4. be provided at approved locations and in accordance with council's Public Open Space Embellishment Framework, as detailed in Clause SC6.4.12.7 Attachment A - Public Open Space Embellishment Frameworks, unless approved otherwise

5. be primarily provided over high use activity elements. Demand and need for shade sails is likely to be higher in greenfield sites or where there are minimal mature shade trees. In these instances, shade sail provision should be supplemented by ancillary shade tree plantings to ensure both natural and built shade are developed in the long term;

6. be located to minimise proximity to trees that may increase maintenance due to leaf drop or pose a risk to the sail structure from falling limbs during storm events;

7. have a 2.5 m minimum clearance between the highest accessible standing point of the shaded equipment/item and the lowest point of the shade sail. Access opportunities from adjacent structures should also be avoided, in order to reduce potential vandalism and damage to the structure or sail;

8. within playground areas, all poles are to be located outside equipment fall zones and, where practicable, outside the softfall surfacing area provided this will not conflict with mowing activities or circulation;

9. be of premium quality shade fabric made of 100% monofilament yarns with a 10 year fabric warranty unless approved otherwise;

10. include hot-dipped galvanised and powder coated poles of a colour consistent with any existing colour palette or adjacent park infrastructure;

11. pole profile and diameter should inhibit climbing of the poles or anti climbing devices should be installed;

12. include marine grade fittings for all locations; and

13. include quick release mechanisms on all sails for ease of removal during storm events and all necessary edge reinforcement and hardware to ensure longevity of the shade sail.

(d) Shelters and gazebos

(i) All shelter structures are to be designed, engineered, built and certified against Building Code of Australia, C2 wind rating requirements as per Australian Standard AS 1170.2 *Structural design actions – wind actions* and all other applicable standards.

(ii) All shelter installations within public open space are to:

1. be provided at approved locations and in accordance with council's Public Open Space Embellishment Framework, as detailed in Clause SC6.4.12.7 Attachment A - Public Open Space Embellishment Framework;
2. have a minimum 300 mm clearance from the edge of the roofline to the edge of the slab to reduce erosion around the structure;
3. be design and installed without roof guttering systems unless specified otherwise;
4. have a frame constructed of oiled hardwood timber, or marine grade metal materials;
5. include marine grade fittings for all locations; and
6. where painted, be of a colour consistent with any existing colour palette or accompanying furniture suite.

(5) Structures and buildings, Llokout platforms, and fishing pontoons

(a) General requirements
Structures and buildings may include, but are not limited to the following:

(i) public toilets;

(ii) community facilities;

(iii) commercial facilities;

(iv) lookout platforms;

(v) fishing pontoons;

(vi) clubhouses, change rooms or canteens; and

(vii) sheds and shipping containers.

Currently, no further guidelines and standards are developed for the provision of structures and buildings across the public open space network. Inclusion of structures and buildings will be considered on a case-by-case basis and in accordance with the Public Open Space Hierarchy and Embellishment Frameworks and all other applicable sections of the Townsville City Plan and sections of SC6.4 Development manual planning scheme policy. Where council develops and adopts a strategic plan for the provision of outdoor sporting facilities, all development proposals will be assessed against the provisions within that plan.

(b) Public toilets

Currently, no further guidelines and standards are developed for the provision of public toilets across the public open space network. Inclusion of public toilets will be considered on a case-by-case basis in accordance with the Public Open Space Hierarchy and Embellishment Frameworks and all other applicable sections of the Townsville City Plan and sections of SC6.4 Development manual planning scheme policy. Where council develops and adopts a strategic plan or design guidelines for the provision of public toilets, all development proposals will be assessed against the provisions within these documents.

(c) Lookout platforms and fishing pontoons will only be permitted in limited circumstances, at specific locations, and where all relevant considerations are reasonably satisfied.

(i) Where the proposed lookout platforms or fishing pontoons are associated with public open space, council owned land or will involve potential future council assets, infrastructure may only be permitted at approved locations and in accordance with Clause SC6.4.12.7 Attachment A - Public Open Space Embellishment Framework.

(ii) In order to properly assess any such proposals, council may request the provision of a maintenance plan as part of the development application, as per Section SC6.4.2 Development application guidelines, Clause SC6.4.12.7 Attachment D - Parks and Open Space Maintenance Service Level and Clause SC6.4.12.7 Attachment E - Parks and Open Space Maintenance Costing Table.

Due to the place-specific, custom nature of lookout platforms and fishing pontoons, no standard specifications are currently developed. Proposals will be considered on a case-by-case basis in accordance with necessary requirements defined by all applicable engineering and water safety standards, legislation, and council's overarching design and management principles. Engagement and approval from other stakeholders/authorities may also be required as part of any development proposal.

(6) Furniture (and park signage)

(a) General requirements

Where within public open space or streetscapes, furniture should be consistent with any existing or adopted furniture suite for the public open space or streetscape, unless approved otherwise.

Currently, no city-wide adopted furniture suite is developed. Some individual locations do, however, have formally adopted furniture suites and colour schemes. Others have informally established suites and colour schemes that have developed over the years. In both instances, new furniture selection should be consistent with these suites unless reasonable justification for deviating from the palette can be established.

(i) Furniture may include, but is not limited to the following:

1. barbeques (gas, electric and wood-fired);
2. benches, seats and picnic settings;
3. refuse bins;
4. signage for public open spaces;
5. bicycle parking facilities;
6. water bubblers and taps; and
7. tree grates and guards.

(ii) All furniture must be designed, constructed and installed in accordance with:

1. the provisions within the planning scheme, planning scheme policies and this section of SC6.4 Development manual planning scheme policy;
2. manufacturer specifications;
3. all applicable Australian Standards and legislation;
4. all applicable council local laws; and
5. council's approved standard drawings.

Editor's Note - Currently, limited standard drawings are formally adopted for furniture.

(b) Electric and gas barbeques

(i) Within public open space, gas and electric barbeques are to only be provided at approved locations and in accordance with Council's Public Open Space Embellishment Framework, as detailed in Clause SC6.4.12.7 Attachment A - Public Open Space Embellishment Framework.

Deviation from Council's Public Open Space Embellishment Framework

provisions for barbeques may only be considered where sufficient benefit to the wider community is demonstrated and supplementary conditions are satisfied. Proposed deviations must be discussed with council at preliminary approval stage and will only be approved where all community expectations have been considered; an extended maintenance period has been successfully negotiated and all other conditions are satisfied.

(ii) Where permitted, gas and electric barbeques must be provided in accordance with council approved standard drawings.

Editor's Note - Currently, no standard drawings are formally adopted for electrical and gas barbeques.

(iii) The following are the specifications for outdoor gas and electric barbeques:

1. cooktops to be all stainless steel construction, including high efficiency mono pressed stainless steel hotplate with laminated heat dispersion coating, high contact heating element and all stainless clamp plate;
2. timing, ignition and temperature control functions should feature on all hotplates to ensure optimum cooking temperature is constantly maintained and to maximise performance and efficiency. Visual and audible indication of operation and mode change should also be a key feature;
3. safety push button/stop systems are a mandatory requirement. These should ideally be located above the bench top, out of reach of children and fitted with a safety delay feature to ensure units cannot be inadvertently turned on;
4. hotplates are to be enclosed in a raised hob elevated and isolated above the bench top and with a minimum 100 mm protection zone. Benches should be designed without protrusions or ledges that may assist climbing;
5. hotplates should be non-porous with no welds, creases or deep corners to trap food and bacteria. An automatic pre-heat mode should also feature and deliver minimum sterilising temperature;
6. enclosure frames are to consist of high strength, powder-coated aluminium extrusions. Cladding to be 18 mm compressed fibre cement backing panels with 0.55 mm stainless steel decorative fascia panels or approved similar. All doors to be stainless steel powder-coated or brushed stainless steel and fitted with a door lock matching council's preferred security key system;
7. barbeques are to be ideally located underneath a shelter, mounted on a concrete slab with minimum 450 mm clearance around the bench top on all sides;
8. units should be fitted with a fat collection tray with unobstructed access through maintenance access doors. Components should be designed to be easily unbolted and lifted out for maintenance and easy replacement;
9. electric components to be all fully sealed and power requirements are to be 240 volt A.C., 3.6 Kw, per plate or approved similar. All electrical works to be undertaken by a qualified electrician and in accordance with all relevant Australian Standards and legislation;

10. gas barbeques may only be permitted by council where electricity power supply is restricted or where connection to an electrical supply is cost prohibitive. Gas supply to be installed by a qualified plumber and in accordance with all relevant Australian Standards and legislation;

11. a water tap should be readily accessible to the barbeque cooking and eating area for ease of use during barbeque operation and cleaning; and

12. a minimum 2 year warranty must be provided with all barbeques installed within public open space.

(iv) Wood fire barbeques and open fire areas

1. Wood fire barbeques or open fire areas are NOT to be provided unless approved by Council.

2. “Natural settings” will be the only exception where wood fire barbeques or open fire areas may be permitted. Adequate environmental, fire and other safety measures must be included as part of any provision proposal to Council.

3. Where permitted, wood fire barbeques must be provided in accordance with council approved standard drawings.

Editor’s Note - Currently, no standard drawings are formally adopted for wood fire barbeques and open fire areas.

(v) Benches, seats and picnic settings

1. Where provided, benches, seats and picnic settings must be provided in accordance with council approved standard drawings with allowance for DDA at picnic settings.

Editor’s Note - Currently, no standard drawings are formally adopted for benches, seats and picnic settings**.**

2. All benches, seats and picnic settings are to be flange mounted on an appropriately sized concrete slab unless approved otherwise.

(vi) Refuse bins

1. Where provided, refuse bins must be provided in accordance with council approved standard drawings.

Editor’s Note - Currently, no standard drawings are formally adopted for refuse bins.

2. For district and regional level parks, civic spaces and amenity parks, acceptable bin provision includes 240 L rubbish and recycling wheelie bins, with single or dual bin enclosures, mounted on a concrete slab. Cigarette Butt bins may be attached where deemed appropriate or requested by Council.

3. For local recreation parks and all other public open space, acceptable bin provision is restricted to 240 L rubbish and recycling wheelie bins, mounted on a concrete slab with a metal security bin stand unless approved otherwise.

Editor’s Note - Refuse bin style and design for streetscapes will be considered on a case by case basis until further standards and design guidelines are developed.

4. For all public open space and streetscapes where bin enclosures are provided, these must be fitted with a door lock matching council’s preferred security key system.

5. For all public open space, variations to size and quantity standards may be approved, as required to support the associated waste collection requirements, particularly at locations of high usage or where sporting and community clubs are

co-located.

6. All bins and enclosures are to located to ensure ease of accessibility for use and waste collection, without compromising the amenity of the public open space or adjacent land uses.

7. All bins and enclosures are of a design, construction and location that minimises any likely impacts, or the risk of hazards due to vandalism or fire.

(vii) Bicycle parking facilities

1. Bicycle parking facilities are to be provided in accordance with AS 2890.3 Parking facilities – Bicycle parking facilities.

(viii) Tree guards

1. Tree guards may be used in order to temporarily, semi-permanently or permanently protect trees during establishment and ongoing growth.

2. Trees guards should consist of proprietary available products and be installed as per manufacturer specifications.

3. Where new trees are to be planted within known areas of high vandalism, more durable, vandal resistant, temporary tree guards may need to be selected and installed to reduce potential loss of new plantings during establishment.

4. Where tree guards are to be provided semi-permanently or permanently and/or in conjunction with tree grates, tree guards are to be designed, constructed and installed as an integrated component of the tree grate system. In these instances, all requirements for tree grates detailed below should be considered, where applicable.

(ix) Tree grates and surrounds are to be provided in accordance with the following;

1. tree grates are to be designed, constructed and installed in accordance with AS 3996 – Access covers and grates;

2. tree grates and alternative tree surrounds are to be provided in order to increase the usable walking space, protect tree and root systems and provide a cost effective solution to reduce maintenance requirements;

3. installation of tree grates and tree surrounds is to be limited to high trafficable areas of streetscapes (as detailed in Clause SC6.4.20.1 Footpath treatment), regional level parks and civic spaces, unless approved otherwise;

4. the tree grates or surrounds should be of an appropriate material, size and colour suitable for the location, tree type and available space. Tree grate or surround design must allow for the penetration of air and water to the soil, whilst minimising potential trip and slip hazards and rubbish trapping. Consideration should be given to the growing habit of the selected trees, trunk shape, "off centre" trunks and expected changes to trunk and root diameter, allowing for variation or future modification with tree growth;

5. tree grates or surrounds must be installed flush with adjacent surfaces, with grate metal support frames and appropriate fixings to be installed at the time of construction, as required to meet the specified loading capacity;

6. tree plantings with grates or other surrounds must be supported by all other necessary elements including but not limited to, structural root cell, root barrier, drainage gravel, and perforated pipe;

7. permeable paving may be considered to be a suitable tree surround option, particularly for installation around existing, mature trees but will only be considered on a case by case basis so that maintenance and arboricultural considerations can be evaluated; and

8. where Clause SC6.4.20.1 Footpath treatment applies, permeable paving may be considered as an alternative option for tree grates but would be considered on a case by case basis. In these instances, the specified colours must be used, in accordance with the pavement treatment hierarchy as per Section SC6.4.20.1 Footpath treatment. Clause SC6.4.12.7 Attachment B - Permeable Paving Colour Guide, provides the corresponding permeable paving colours relative to the footpath treatment pavement hierarchy.

(x) Water fountains and taps

1. For all public open space, ready access to a potable water source is to be provided as part of any open space development, including at activity nodes and at reasonable intervals along corridor parks or recreational pathways.

2. All water fountains and taps should be located near existing services and water supply points wherever possible, focused around activity nodes or areas of high use.

3. Dog bowls should be included as part of water fountain provision where necessary as detailed in Clause SC6.4.12.7 Attachment A - Public Open Space Embellishment Framework. Additional separate stand-alone units (or two dog bowls per water fountain) may be required where anticipated usage will be very high (e.g. in dog off-leash area).

4. All water fountains should be installed on a concrete slab, above a drainage well and with adequate surface drainage inlets to prevent water pooling on adjacent surfaces.

5. For all public open space, water fountains and taps should be designed, constructed and installed as per council specifications detailed in Section SC6.4.3 Standard drawings for landscape and open space. Each water fountain/tap is be connected to a metered water connection.

(xi) Park signage may include, but is not limited to the following:

1. park name signs;

2. information signs;

3. directional signs; and

4. regulatory signs.

Editor's Note - For signage within public open space, consideration should be given to the Public Open Space Embellishment Framework and council's corporate branding requirements, as detailed in Council's Graphic Standards Manual (GSM).

(7) Electrical / Lighting / CCTV

(a) Lighting

(i) All lighting must be architecturally consistent with other lighting in the locality and suitable for tropical climatic conditions (including a heat rating of >50ºC). All lighting products proposed must be readily available from an Australian stockist and noted by the stockist as being readily available into the foreseeable future (i.e. not a discontinued product).

(ii) Public open space lighting must be designed, constructed and installed in

accordance with:

1. the provisions within the planning scheme, planning scheme policies and this section of SC6.4 Development manual planning scheme policy;
2. manufacturer specifications;
3. all applicable Australian Standards and legislation;
4. all applicable council local laws; and
5. council's approved standard drawings.

Editor's Note - Currently, no standard drawings are formally adopted for lighting.

(iii) Lighting requirements within public open space will be advised by council in accordance with the hierarchy classification of the public open space or pathways involved, including defining the appropriate lighting category.

(iv) Power supply options (mains or solar) will be considered on a case-by-case basis, subject to the nature of the proposal, the existing supply opportunities and the site context.

(v) All lighting works must be undertaken in accordance with Section 6.4.14 Public utilities and building over/near services.

(vi) Pathway lighting - Bicycle paths or pedestrian paths within public open space that require lighting shall be lit to the council specified applicable pathway lighting category, as per AS 1158 Lighting for roads and public spaces and Section 6.4.14 Public utilities and building over/near services.

(vii) Activity node lighting - Pathways within public open space that require lighting shall be lit to the council specified applicable pathway lighting category, as per AS 1158 Lighting for roads and public spaces and Section 6.4.14 Public utilities and building over/near services.

Editor's Note - Currently, no further standards are set for lighting of activity nodes. Council will consider these requirements on a case-by case basis until formal standards are set.

(viii) Sports field and court lighting in accordance with Section 6.4.14 Public utilities and building over/near services.

Editor's Note - Currently, no further standards are set for lighting of sports fields and courts. Council will negotiate these requirements on a case-by-case basis. Guidance on the recommended levels of illumination for each sport can be found in external references such as the Western Australian Department of Sport and Recreation Sports Dimensions Guide for Playing Areas.

(b) Electrical

(i) All electrical works must be undertaken in accordance with Section 6.4.14 Public Utilities and building over/near services~~,~~ all applicable Australian Standards and legislative requirements.

(c) CCTV

(i) All CCTV systems must be undertaken in accordance with Section 6.4.14 Public utilities and building over/near sServices (or similar public surveillance system standards) and all applicable Australian Standards and legislative requirements.

(8) Activity elements (incl. playgrounds, water play, etc.)

(a) General requirements

All activity equipment proposed should be readily available into the foreseeable future (e.g.. not a discontinued product) and have locally available spare parts and servicing.

(i) Activity elements may include, but are not limited to the following:

1. outdoor fitness equipment;
2. play spaces and play equipment;
3. softfall surfacing;
4. skate and parkour elements and facilities; and
5. informal sporting facilities.

(ii) All activity elements must be designed, constructed and installed in accordance with:

1. the provisions within the planning scheme, planning scheme policies and this section of the Development manual planning scheme policy;
2. manufacturer specifications;
3. all applicable Australian Standards and legislation;
4. all applicable council local laws; and

(b) Outdoor fitness equipment

(i) Outdoor fitness equipment may include a combination of:

1. static fitness equipment such as step ups, hurdles and sit up benches; and
2. dynamic fitness equipment such as bench presses, leg presses and pull downs.

(ii) Within public open space, outdoor fitness equipment shall only be provided at approved locations and in accordance with council's Public Open Space Embellishment Framework, as detailed in Clause SC6.4.12.7 Attachment A.

Editor's Note - Currently no further guidelines and standards are developed for the provision of outdoor fitness equipment across the public open space network. Inclusion of fitness equipment within public open space will be considered on a case-by-case basis and with consideration of the Public Open Space Hierarchy and Embellishment Frameworks. Where council develops and adopts a strategic plan for the provision of outdoor fitness equipment, all development proposals will be assessed against the provisions within that plan.

(iii) Fitness equipment selection

1. All fitness equipment shall be designed, manufactured, installed, certified and maintained in accordance with all applicable Australian Standards, including:

a) AS4685 – *Playground equipment – General safety requirements and test methods;*

b) AS2555 – *Supervised adventure playground – Guide to establishment and administration;*

c) AS4422 – *Playground Surfacing – Specification, requirements and test methods;* and

d) AS4486.1 – *Playgrounds and playground equipment – Development, installation, inspection, maintenance and operation.*

2. Equipment selection should take into account the existing demographics and cater

for multiple age groups, subject to the population profile within the local area. Projected changes to the local demographic and/or aging of the original groups that will utilise the equipment should also be considered.

3. A diversity of exercise activities should be developed within the site.

4. Future inspection and maintenance requirements of the fitness equipment must be considered as part of the design and selection process. More maintenance intensive equipment must be limited to district or regional level public open spaces only.

5. Longevity of materials must be considered, particularly within the context of the local conditions (e.g. only include equipment of a high quality design and materials, particularly for moving parts and where intense usage is anticipated).

6. For all proposed fitness equipment, council require the provision of a maintenance plan as part of the development application, as per Section SC6.4.2 Development application guidelines, Clause SC6.4.12.7 Attachment D - Parks and Open Space Maintenance Service Level and Clause SC6.4.12.7 Attachment E - Parks and Open Space Maintenance Costing Table.

(iv) Fitness equipment siting

1. Fitness equipment should be located away from play spaces to reduce the temptation for children to play on the equipment.

2. Ideally, equipment should be located along or in close proximity to a primary access path, with the fitness units to be offset from this for the comfort of users.

3. All fitness equipment is to be located on concrete slabs, all required shock pads, and wet-pour rubber surfacing in accordance with AS/NZS 4422 *Playground Surfacing – Specifications, requirements and test method*.

(v) Play spaces and play equipment

1. Play spaces are to be provided in order to:

   a) provide a wide range of quality inclusive play opportunities that meet the needs and abilities of all children and young people alike;

   b) aid children's development by providing spaces and elements for physical coordination activities such as balancing, climbing, jumping, crawling and running;

   c) assist in the development of social skills such as sharing and cooperation;

   d) promote children's use of their imagination and development of problem solving skills; and

   e) provide a place for meeting and socialising amongst children, parents and other care givers.

2. Play spaces shall include a combination of:

   a) active, equipment based play structures (e.g. swings);

   b) active, non-structured play areas (e.g. kick-around areas or grass mounding);

   c) imaginative and creative play areas (e.g. trees or natural "cubby" areas); and

   d) a parent or care-givers area (e.g. picnic settings or bench seats).

3. Within public open space, play spaces and play equipment shall only be provided at approved locations and in accordance with council's Public Open Space Embellishment Framework, as detailed in Clause SC6.4.12.7 Attachment A.

4. Playground equipment selection

   a) All playground equipment shall designed, manufactured, installed, certified and maintained in accordance with all applicable Australian Standards, including:

      AS 4685 *Playground equipment – General safety requirements and test methods, including AS 4685 parts 1- 6 and part 11*;

      AS 4486 *Playgrounds and playground equipment – Development, installation, inspection, maintenance and operation*; and

      AS/NZS 4422 *Playground surfacing –Specifications, requirements, and test method*.

   b) Should take into account the existing demographics and cater for multiple age groups, subject to the population profile within the local area and the likely park users. Projected changes to the local demographic and/or aging of the original groups that will utilise the equipment should also be considered.

   c) Diversity of play experiences between sites within the local area should be provided where possible.

   d) Future inspection and maintenance requirements of the play facilities must be considered and elaborate, more complicated equipment limited to locations with a higher maintenance level of service.

   e) Longevity of materials must be considered, particularly within the context of the local conditions (e.g. plastic coated chains are to be avoided due to accelerated deterioration in Townsville's dry tropic climate).

   f) Equipment selection and orientation should take into account the potential for vandalism. As such, equipment with significant amounts of hard, non-transparent panels should be avoided, except where this can be mediated through orientation and casual surveillance opportunities.

5. Playground equipment siting

   a) Active and passive play areas should be integrated but physically separated to promote more cohesive use of the space and facilitate quiet areas for creative and imaginative play activities.

   b) Play spaces, particularly toddler areas, should be sited within close proximity to the main activity node to maximise accessibility and casual surveillance from parents, carers and adjacent users.

   c) Play spaces should ideally be located within close proximity to the main access path. Care should be taken, however, to not create a point of conflict by locating a busy activity area on a main thoroughfare of the open space, as per below.

   d) Play spaces should be located away from potential safety hazards such as car parks or trafficable areas, watercourses or steep slopes.

e) Play spaces should be located away from adjacent properties to limit potential nuisance from ongoing noise. A minimum buffer of 15 m from adjacent property boundaries should be applied.

f) Sun safety and protection opportunities including natural and built shade options should be addressed in accordance with Clause SC6.4.12.4 (5) Shelters and shading devices. Shading opportunities should consider sun orientation and ensure that shading of the equipment is maximised during the highest UV risk period of the day and over the highest need elements (e.g. metal slides).

g) Natural elements such as turf mounding, trees, shrubs and rocks should be safely integrated into the play space where possible.

h) Fencing of the play space is to be considered on a case-by-case basis and established as required, in accordance with Clause SC6.4.12.4 (4) Fencing, barriers and screening.

i) At larger playgrounds of a district or regional level, consideration should be given to the location of public toilets within short walking distance of the play space.

Editor's Note - Public toilets should be installed at select locations only. Refer to Clause SC6.4.12.4 (4) Public toilets for further details.

j) Large, purpose built, "all-abilities" play areas are to be considered on a case by case basis. The preference is for inclusive play elements to be designed into the play space to promote inclusivity.

k) All playground equipment must be installed in accordance with the manufacturer's specifications. Certification of the equipment and the design must also be provided.

6. Softfall surfacing

a) Softfall surfacing shall be provided in order to:

- create a safe, impact absorbing surface underneath activity elements; and
- provide textual stimulation through different surfacing types (e.g. sand and rubber softfall).

b) Softfall surfacing may include a combination of:

- wet-pour rubber softfall or approved rubber alternatives, including shock pads beneath;
- astro turf, including shock pads beneath; and
- certified softfall sand.

Editor's Note - Organic softfall surfacing such as woodchips is not considered an acceptable softfall outcome.

c) Softfall surfacing shall be installed under all play spaces/equipment where a fall zone has been identified. Within public open space, the provision of equipment, and therefore softfall surfacing shall be at approved locations and in accordance with council's Public Open Space Embellishment Framework, as detailed in ClauseSC6.4.12.7 Attachment A.

d) Rubber softfall surfacing

- Rubber softfall must be installed in accordance with the equipment fall zone requirements, manufacturer's specifications and council approved standard drawing SD-642 in Section SC6.4.3 Standard drawings for landscape and open space. Certification of the softfall installation must also be provided.
- Shockpads shall be installed under all rubber softfall layers, as required by the applicable Australian Standards.
- Rubber softfall colour selection shall minimise large areas of bright colours prone to fading in the sun. Rubber softfall mixes shall contain a minimum 70% EPDM rubber due to higher UV rating of this product.
- Small, narrow and intricate designs (e.g. less than 300 mm in width) within the rubber softfall should be avoided due to ongoing deterioration of such designs.
- Rubber softfall shall be prioritised to areas requiring higher levels of accessibility or underneath high wear items.

e) Sand Softfall

- Sand softfall must be installed in accordance with the equipment fall zone requirements and council approved standard drawing SD-643 in Section SC6.4.3 Standard drawings for landscape and open space. Certification of the softfall sand and its installation must also be provided.
- Installation of sand softfall must include a buffer zone between the sand area and any nearby paths or other hard surfaces where it may create a slip hazard. The buffer must be scaled and constructed to prevent sand spillage onto the path or other hardstand.

(c) Water play areas

(i) Water play areas will only be permitted in limited circumstances, at specific locations, and where all relevant considerations are reasonably satisfied, and will be considered on a case-by-case basis.

(ii) Where the proposed water play areas are associated with public open space, council owned land, or will involve potential future council assets, the infrastructure may only be permitted at approved locations and in accordance with council's Public Open Space Embellishment Framework, as detailed in Clause SC6.4.12.7 Attachment A. Approval from the relevant council asset owner/s will also be required.

(iii) In order to properly assess any such proposals, council require the provision of a maintenance plan and a life-cycle costing as part of the development application, as per Section SC6.4.2 Development application guidelines, Clause SC6.4.12.7 Attachment D - Parks and Open Space Maintenance Service Level and Clause SC6.4.12.7 Attachment E - Parks and Open Space Maintenance Costing Table.

(iv) All water play areas must be designed and installed to comply with all relevant Australian Standards.

(v) Due to the site-specific, custom nature of water play areas, no further specifications are currently developed. Proposals will be considered on a case-by-case basis in accordance with necessary requirements defined by all

applicable engineering, electrical, drainage, swimming pool and water safety standards, legislation, local laws and council's overarching design and management principles. Engagement and approval from other stakeholders/authorities may additionally be required as part of any development proposal.

(d) Informal sporting facilities

(i) Informal sporting facilities may include but are not limited to:

1. basketball half courts;
2. outdoor table tennis tables;
3. handball courts or rebound walls;
4. skate facilities and;
5. parkour practice areas.

Editor's Note - Currently no specific requirement relating to informal sporting facilities are developed.

(9) Dog off leash facilities

(a) General

Dog off leash facilities are designated spaces under council's local law where within an open space dogs can recreate with their owners. These areas provide a safe and fun environment for owners and their dogs to enjoy parks and open spaces. Areas where these facilities are proposed to be established shall have due regard for;

(i) Site selection

1. within public open space, dog off leash facilities shall only be provided at approved locations and in accordance with council's Public Open Space Embellishment Framework, as detailed in Clause SC6.4.12.7 Attachment A;
2. an appropriately sized large dog off leash fenced facility should range between 2000 (minimum) to 4000 m^2;
3. an appropriately sized small dog off leash fenced facility should range between 1000 m^2 to 1500 m^2. Small dog off leash fenced facilities will not be installed as stand-alone facilities;
4. dog off leash facilities should have adequate drainage and should have reasonable flood immunity (Q10); and
5. dog off leash facilities should have cross fall drainage of at least 2%. to minimise ponding.

(ii) Surface finish and planting

1. groundcover in the open space within the off leash facility is to be turf consisting of 25 mm depth of dense, well rooted, vigorous grass growth with a 25 mm depth of topsoil. The type of turf to be used will be selected from the Clause SC6.4.12.7 Attachment C1 - C4 - Preferred Plant Species Lists;
2. the use of garden beds should be avoided;
3. trees should be incorporated into the overall design of the dog off- leash areas with existing established trees providing visual amenity to the park and provide protection from the wind and sun;

4. landscaping and plants add to the amenity of the park, but it is important to ensure that species selection is non- toxic and non-irritating to dogs. Some trees may have seeds, stems, leaves, fruits, or flowers that are irritating and/or toxic to dogs; and

5. all dog off leash enclosures are required to be irrigated with pop up sprinklers to maintain grass cover throughout the year.

(iii) General
All dog off leash facilities must be designed, constructed, and installed in accordance with:

1. the provisions within the Townsville City Plan and this section;

2. manufacturer specifications;

3. all applicable Australian Standards and legislation;

4. all applicable council local laws; and

5. Council's approved standard drawings.

Editor's Note - Currently there are no approved standard drawings for dog off leash areas.

(b) Siting of dog off leash facilities

(i) Dog off leash facilities should also be located away from other non-congruent recreation activities (e.g., barbeque areas, play spaces and fitness equipment) and adjacent residential areas. As a general guide it is recommended that a spatial buffer of approximately 40 m is considered appropriate. However, other factors such a site gradient and vegetation coverage can be utilised to lessen the spatial buffer.

(ii) A variety of open and shaded spaces should be created within a dog off leash facility. There should be enough space to include active running areas as well as quieter environments where dogs can sniff, play and interact with their owners. As a guide it is recommended that a dog off leash area have shade coverage (both natural and artificial) of approximately 35 per cent.

(iii) Effective dog off leash areas disperse the dog and human traffic throughout the park, and spread the wear and tear on the underlying surface evenly across the facility.

(iv) In all instances dog off leash facilities should be supported by sufficient car parking spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use of the site. Refer to Clause SC6.4.12.7 Attachment A - Public Open Space Embellishment Framework.

(v) To enhance site accessibility and convenience, locate dog off leash areas in close proximity to the available car parking. Additionally, equitable access ramps and a connecting path from the car parking to the dog off leash facility should also be installed.

(vi) The placement of Dog off leash facilities and planting treatments, shall take into account the maintenance requirements for maintaining such a facility.

(vii) For all public dog off leash facility designs,, council require the provision of a maintenance plan as part of the development application, as per Section SC6.4.2 Development application guidelines, Clause SC6.4.12.7 Attachment D - Parks and Open Space Maintenance Service Level and Clause SC6.4.12.7 Attachment E- Parks and Open Space Maintenance Costing Table.

(c) Design of dog off leash areas

In general, any embellishments installed within the Dog Off Leash Areas that promote gathering, seating, drink fountains and bins, should be located away from entry and exit points and also away from the activity areas; long running spaces and agility equipment. With regard to maintenance of these areas, placement of equipment must allow space for maintenance (mowing). A minimum of 3 metres between embellishments and fencing is required to allow space for mowing and manoeuvring of maintenance machinery.

(i) Entry way

1. Double gated entry to prevent dog escapees is required at all access points. Consideration should be given to the installation of multiple access points, to minimise congestion.
2. Access points are high wear areas and appropriately sized concrete areas are required here. These concrete pads should cover the entire entrance areas and extend out past the arc of the gate openings.
3. Gates should be fitted with self-closing child-proof latches to prevent dog escapes and unsupervised children from entering the facility.
4. A separate entry for a maintenance gate (which should be 3.5 m wide) will be installed within the perimeter fence line. This should be located away from all the other user access points.
5. Other physical structures to support amenity such as shelters, benches or drinking fountains should be located at a suitable distance away from the access points to discourage dogs and people from congregating.

(ii) Fencing

1. Secure perimeter fencing will be installed that discourages canines from escaping under, over or through the fence;
2. The fence alignment shall avoid acute angles that can result in entrapment issues for dogs and humans;
3. Fencing around all dog off leash facilities will be a minimum of 1.5 m in height; and
4. Fencing materials must provide good visibility so that park users can see activity inside and around the park. Standard powder coated fencing panels traditionally used in pool fencing should be utilised as fence panels.

Editor's Note - Be aware that smaller dog breeds may be able to run through the gaps in the panels of traditional pool fencing. When designing small dog off leash areas give consideration to the installation of alternatives or undertaking modifications to the fencing panels to ensure that the enclosure is fit for purpose.

(iii) Seating

1. As a minimum, four bench seats should be installed within the large dog off leash areas, and two bench seats within small dog off leash areas.
2. Seating should be placed in areas to maximise the benefit of any nearby shade.
3. Seating should be aligned and in close proximity to the fencing of the off leash area. This ensures that the majority of the dog activity will occur in front of where the owner is sitting.

4. The type of seating used within the dog off leash will be consistent with any existing or adopted furniture suite within the nearby park open space. Consideration should also be given to the space between the slat sizes utilised on the bench seat. Minimum gaps should be utilised to avoid dog paws entrapment points.

5. Picnic tables must not be located inside dog off leash areas as this encourages food to be brought into the facility.

(iv) Drink facilities

1. As a minimum, two drink fountains shall be installed within dog off leash areas. These fountains should be accessible by dogs and people, but should be located to discourage congregation in high traffic areas.

2. Water fountains and taps should be designed, constructed, and installed as per council's standard drawing *SD-664 – Furniture – Drinking Fountain.*

(v) Waste facilities

1. As a minimum, two dog faeces bag dispensers should be installed within dog off leash areas.

2. Dog faeces bag dispensers must have a locking device to prevent bags being pulled continuously and scattered in the park. Dog faeces bag dispensers should be located in close proximity to the access points (but should also not impede access). However, dog faeces bag dispensers must also be located in positions that ensure an ease of refill, which does not require council staff to enter the enclosure.

3. Two covered rubbish bins shall be installed outside of the dog off leash area, in close proximity to the main gate access point without impeding access. Bin positions should be located for easy collection.

4. Generally, the acceptable bin provision will be a 240 L rubbish wheelie bin, mounted on a concrete slab with a metal security bin stand. Variations to size and quantity standards may be approved, as required to support the associated waste collection requirements, particularly at locations of high usage.

(vi) Lighting

1. Most dog off leash facilities do not require lighting. In many instances one security light may be installed to link the entrance of the dog off leash area to the adjacent car parking.

2. Full lighting of dog off leash facilities will be accepted where there is a demonstrated need and where the lighting will not have a negative impact on adjacent residential areas.

3. All lighting shall be carried out to the applicable lighting category, as per the Australian Standard AS11580 – Lighting for roads and public spaces.

(vii) Agility equipment / separate small dog area / specialised play

1. Not all dog off leash facilities will require agility equipment or a dedicated small dog off leash area. These facilities will only be supported where there is a demonstrated demand on a case-by-case basis.

2. If agility equipment is considered appropriate it should be located away from access points and high running areas. Consultation with agility dog groups should be undertaken prior to assist in the design of appropriate agility facilities within dog off leash areas.

3. Small dogs are dogs that weigh less than 8 kilograms or are less than 35 cm in height when measured from the floor to the top of the dog's front shoulders.

4. Small dog off leash areas will not contain agility equipment.

5. Specialised canine recreation equipment will be considered on a case-by-case basis. Consideration of ongoing maintenance costs, asset replacement costs and any potential impacts on canine health will be the major considerations when determining the request to install specialised canine recreation equipment.

(viii) Signage

1. Council information signs on dog off leash area rules are required to be installed in close proximity to all access points.

2. Council standard information signs shall be used at all dog off leash areas and outline usage and behavioural requirements.

3. Park name signage should be installed in close proximity to the dog off leash area so that people utilising the facility are able to readily recognise the name of the facility. Generally, dog off leash areas will not have a separate specialised park name.

4. When dog off leash facilities are not readily visible from the road frontage, directional signage from car parking facilities or areas of high visibility are required.

(10) Transport and access infrastructure

(a) General requirements

(i) Transport and access infrastructure within open space is considered to include:

1. car parking, both on and off street, associated with the open space or facilities;

2. internal roadways;

3. pedestrian paths, bicycle paths, shared paths;

4. public transport facilities;

5. end of trip facilities;

6. pedestrian bridges;

7. walking tracks; and

8. boat ramps.

(ii) All transport and access infrastructure within public open space must be designed, constructed, and installed in accordance with:

1. the provisions within the Townsville City Plan, planning scheme policies, Section SC6.4.4 Active transport infrastructure and this section of the Development manual planning scheme policy;

2. all applicable Australian Standards and legislation;

3. all applicable council local laws; and

4. Council's approved standard drawings.

Editor's Note - Refer to Clause SC6.4.12.3 (4) Streetscapes and landscape treatments for requirements relating to areas of a designated road reserve.

(iii) Bicycle, pedestrian, and shared paths within public open space are to connect to activity areas within the open space, and to the on-street verge pathway network. Where a verge pathway network does not exist, consideration may be given towards the future design and establishment of such a network to achieve the best outcome for connectivity.

Editor's Note - Refer to Section SC6.4.4 Active transport infrastructure for design guidelines for consideration of the type of paths to be provided through/within public open space. Consideration should be given to connectivity of networks.

(iv) All landscaping and irrigation associated with transport and access infrastructure is to be in accordance with the provisions of this section, and Sections SC6.4.12.Landscaping and open space and SC6.4.13.Irrigation.

(b) Pedestrian bridges

(i) Pedestrian bridge provision is to:

1. prioritise the use of concrete culverts where practical;
2. use durable materials such as concrete, hot dipped galvanized steel, stainless steel, structural composites, recycled plastics and other similarly performing products (timber structures will not be accepted); and
3. incorporate erosion control measures where necessary to prevent undermining of the bridge footings or other elements.

Editor's Note - Refer to Section SC6.4.17 Structures for further information relating to pedestrian bridge requirements.

(c) Walking tracks

(i) Walking track provision is to:

1. be provided in accordance with infrastructure design requirements, track markers and signage, in accordance with AS 2156 *Walking tracks*;
2. be at select locations only, where construction of the walking track/s will not create any foreseeable adverse impacts including unsustainable maintenance requirements, public safety and liability concerns, habitat destruction, land slip or slope destabilisation; and
3. be provided in accordance with any council adopted walking track strategy.

Editor's Note - Inclusion of walking tracks will be considered on a case-by-case basis and with consideration of the Public OpenSpace Hierarchy and Embellishment Frameworks. Where council develops and adopts a strategic plan for the provision of walking tracks, all development proposals will be assessed against the provisions within that plan.

(d) Boat ramps

(i) Boat ramp provision is to:

1. be permitted in limited circumstances only, at specific locations, and where all relevant considerations are reasonably satisfied; and
2. include engagement with, and approval from all relevant authorities and asset owner/s.

Editor's Note - Due to the place specific, custom nature of boat ramps, no standard specifications are currently developed. Proposals will be considered on a case-by-case basis in accordance with all necessary requirements defined by all applicable engineering, water safety and transport standards, legislation, and council's overarching design and management principles.

(11) Landscape entry statements

(a) Landscape entry statements are features used in both public and private open space to identify a particular place, residential or commercial development or locality that may include signage or graphics on a structure, wall or fence. They may be a standalone art element (Clause SC6.4.12.4 (13)) Public art) or installation, built feature or soft landscape feature.

(i) Landscape entry statements must meet the following requirements:

1. to be suitably located to clearly identify the public open space, individual neighbourhood or development, or area of distinctive character to which they refer;
2. to be of a form that is easily maintained into the future and does not increase risk within the area;
3. to be of a scale and form appropriate for the hierarchy classification and surrounding landscape character;

Editor's Note - Refer to SC6.4.12.7 Attachment A - Public Open Space Embellishment Framework relating to signage in public open space.

4. where involving a wall entry statement, the wall is to be located within the private property on the property boundary, unless relating to public open space or designated park;
5. any private properties containing wall/s or other landscape entry statements require a covenant protecting the wall or feature and outlining maintenance responsibilities, and a property note in council's rates system to ensure owners are aware of the existence of the wall or feature;
6. other entry statements of an alternative nature or located within the road reserve will be considered on merit and must meet requirements for visibility and frangibility;
7. landscape entry statements for residential or commercial estates are to be provided and maintained by the developer for the life of the development; and
8. landscape entry statements will not include water features.

(ii) Landscape entry statements are be provided in accordance with the following hierarchy and requirements:

1. "Suburb" level landscape entry statements:

a) generally be located on public land and owned by council after completion of any applicable maintenance period; and

b) conform with Council's corporate graphics standards;

Editor's Note - Refer to council's Graphics Standards Manual.

2. Estate" level landscape entry statement:

a) Walls or acoustic fence located within private property.

b) Lettering or logos must be of materials and attachment that resists vandalism and requires no painting or recoating (e.g. laser-cut polished aluminium, engraved stone block or similar).

c) Tiling or stone pitching to wall faces must utilise appropriate outdoor adhesives and grouts.

3. Neighbourhood/village" level landscape entry statement:

    a) generally a sign wall located on private property; and

4. "Street" level landscape entry statement:

    a) generally not acceptable.

(12) Public art and water features

Public art is considered to be "a concept or work created by an artist/s in any medium, permanent, temporary or ephemeral, which enables stimulation of one or more of the senses and is situated in a place of public access".

(a) Public art installations and water features are only permitted in limited circumstances and must conform with the following criteria:

(i) the public art proposal must demonstrate alignment with Council's adopted public art policy;

Editor's Note - Refer to Council's Public Art Policy.

(ii) the provision of the public art adds interest to the public open space or streetscape, reinforces the unique identity of Townsville, and contributes significantly to the sense of place;

(iii) the public art is used as a medium to interpret the social and cultural values of the community, reflecting Townsville's diverse heritage and cultural identity, as well as the social context of the site;

(iv) the public art responds to the environmental context of the site, and is integrated into the overall landscape or streetscape, being well-chosen and appropriately sited;

(v) the provision of public art or water feature within public open space is in accordance with council's Public Open Space Embellishment Framework, as detailed in Clause SC6.4.12.7 Attachment A, unless approved otherwise;

(vi) approval from the relevant Council asset owner/s will also be required to secure approval for such a feature / installation;

Editor's Note - Where a public art strategy has been formally approved by council for a precinct or development, this may take precedence over the Public Open Space Embellishment Framework provisions.

(vii) the provision of public art within streetscapes and at centres is aligned with the expected levels of embellishment and characteristics of the road or centre hierarchy classification (water features will not be approved as part of streetscape or centre improvement works);

(viii) all public art or water feature installation shall not create a public safety risk to the community or council maintenance staff;

(ix) engagement and approval from the relevant council asset owner/s and other stakeholders is required for the installation of such embellishments;

(x) for all public art and water feature proposals, council may request the provision of a concept statement and details including, but not limited to the following:

1. concept images or models;

2. detailed description of the artwork/theme/concept;

3. materiality and scale;

4. structural detailing and footing designs;

5. public safety considerations;
6. ongoing maintenance requirements;
7. project budget/costs;
8. all water features must be designed and installed to comply with all relevant Australian Standards;
9. previous works and references; and
10. for all public art and water feature proposals, council require the provision of a maintenance plan as part of the development application, as per Section SC6.4.2 Development application guidelines, Clause SC6.4.12.7 Attachment D - Parks and Open Space Maintenance Service Level and Clause SC6.4.12.7 Attachment E - Parks and Open Space Maintenance Costing Table.

(xi) where art installations or water features are proposed as a development entry statement, applications may will only be approved where the feature will be solely located within private property and the developer will remain, for the life of the asset, solely responsible for all aspects relating to the water feature (including ongoing maintenance and water costs).

SC6.4.12.5 Softscape embellishments

(1) Introduction

Softscape embellishments are generally those that are not built items. These include earthworks and mounding, planting and turf areas, and planting works including tree, shrubs and groundcover planting. These soft landscape embellishments are used in most open space areas to achieve many different aesthetic outcomes including, screening, shade, and the creation of themed spaces based on plant types, form, or locational attributes.

All softscape outcomes must be designed, constructed and planted in accordance with:

(a) the provisions within the Townsville City Plan, planning scheme policies and this section of the Development manual planning scheme policy;

(b) all applicable Australian Standards and legislation;

(c) all applicable council local laws; and

(d) all council approved standard drawings.

Editor's Note - Where streetscape outcomes are within roads managed by the Department of Transport and Main Roads, applicants should refer to the Department of Transport and Main Roads' *Landscape Design Manual* (Refer to current version). Requirements of the Department of Transport and Main Roads' *Landscape Design Manual* will take precedence in these instances. Engagement and approval from other stakeholders/authorities may additionally be required as part of any development proposal.

(2) Plant species selection

(a) The biophysical attributes of the plant should be considered, in additional to the ideal growing conditions of the species and its appropriateness for the site conditions and Townsville's dry tropic climate. Plant species used are to be those recommended in the Preferred plant species list in Clause SC6.4.12.7 Attachment C1 - 4 – Preferred Plant Species Lists.

Editor's Note -The list found in Clause SC6.4.12.7 Attachment C1 – 4 - Preferred Plant Species Lists, has been prepared as an indicative list that takes into account council's requirements and those of relevant service providers, and is acceptable for use in most circumstances. The species list does not account for frangibility requirements relating to street tree plantings in streets or roads. This, along with all other relevant considerations associated with the site context must be considered in the development of the landscape plan and species selection.

(b) Plant species are to be selected by a suitably qualified and experienced horticulturist, landscape architect or designer to reduce or preferably eliminate the reliance on irrigation.

(c) Plant species are not to include undesirable species listed in the undesirable plant species list.

Editor's Note - Currently, no undesirable plant species list has been developed.

(d) Declared weed species - Plant species used are not to include prohibited or restricted species listed in the Townsville City Council Biosecurity Plan.

Editor's Note - Refer to the Department of Agriculture, Fishers and Forestry for a declared weed species list. Currently, no design guidelines relating to other soft landscaping elements are developed.

(3) Planting design principles

Planting design principles such as scale, proportion, repetition, balance, contrast, focal points, and transition should be applied in the development of all planting designs.

The design qualities of the plant species including size, scale, form, line, texture, and colour should be considered and maximised through the planting design process.

The intended function and location of the plant species should be appropriate to its growing habit, size, and other design qualities, in particular ensuring the expected size of the mature specimen can be support in the available planting space to eliminate unnecessary maintenance interventions such as hedging.

Open space contribution from roof gardens and vertical gardens will be assessed on a case -by-case basis and with consideration of other on-site open space and landscaping provision.

(a) Maintenance and service requirements:

(i) The irrigation, drainage, root barriers, maintenance, and other resource inputs necessary to maintain the functionality and longevity of planting design outcomes and species must be sustainable, cost-effective and analogous with the available resources.

(ii) The quantity and density of planting proposed shall consider the expected mature plant size, the density required to achieve the desired effect, account for expected die out during establishment, and avoid any foreseeable maintenance issues.

(iii) Planting location and/or species selection should not create any, adverse impacts on access, circulation, or critical sightlines.

(iv) Plant habit and location, must not have an adverse impact on adjacent properties, built assets, services, roads, drainage, or other infrastructure.

(v) Streetscape planting must be safe, functional and respond to local conditions to achieve an aesthetic outcome that responds to local and community needs, while minimising life cycle costs and ongoing maintenance. These treatments may include the installation of street trees, planted or mulched garden areas, turf areas, artificial turf areas and irrigation (where required by Council).

(b) Vegetation used in streetscape planting must conform where required to the following definitions:

(i) "Frangible" vegetation

is plants (including trees) with a stem or trunk diameter equal to or less than 100 mm in diameter at maturity, measured from 300 mm above the finished ground level. Shrubs and ground covers are considered frangible except for shrubs that exceed 3.5 m in height.

(ii) "Non-frangible" vegetation

is plants (including trees) with a stem or trunk diameter greater than 100 mm in diameter at maturity, measured from 300 mm above the finished ground level. This includes shrubs greater than 3.5 m in height and most trees.

(iii) Setback

is the distance measured from the outer edge of the specified component to the centre of the vegetation trunk.

(iv) Clearance

is the distance measured from the edge of the specified component to the perimeter of the second component or vegetation.

(v) Canopy clearance

is the vertical distance measured between the finished ground level and the underside of the tree canopy.

(vi) Planting clearance

measurements between planting measured from trunk centre to trunk centre.

Editor's Note - The above definitions are based on Austroads' *Guide to Road Design*, Part 6B: *Roadside Environment* (Refer to current version) and Department of Transport and Main Roads' *Landscape Design Manual* (Refer to current version) – Appendix 4.

(4) Streetscape treatment provision

(a) Requirements relating to all safety objectives such as clear zones, sight distances and frangibility will take precedence and determine the placement and control of landscaping elements within the streetscape. Refer to Clause SC6.4.12.3 (4) Streetscapes for design criteria.

(b) All hard and soft landscape treatment construction must be in accordance with the specifications set out in Sections SC6.4.12 Landscaping and open space, SC6.4.3 Standard drawings and SC6.4.13 Irrigation.

(c) Kerb types will be as per Section SC6.4.3 Standard drawings (Typical Road Cross Sections SD-001, SD-002, SD-003, SD-004, SD-005, SD-006, SD-010), and Clause SC6.4.6.1 Geometric road design.

(d) Where a zero object height is necessary, only hard landscape areas must be established, subject to meeting all other requirements within this section and other sections of SC6.4 Development manual planning scheme policy.

(e) A minimum 1.2 m width of hard surface treatment (which may be inclusive of road pavement, kerb, concrete, mountable aprons etc.) must be provided between soft landscaping and the edge of the traffic lane, unless approved otherwise.

(f) In areas >70 km/hr, an increase to 3 m in width of hard surface treatment may be required between soft landscaping and the edge of the traffic lane, subject to assessment of the associated risks of the road environment.

Editor's Note - The above widths are based on standard clearances between traffic lanes and work sites, as detailed in *Manual Uniform Traffic Control Devices* (MUTCD), Queensland. These clearance requirements may be subject to reduction or increase dependent on the road speed environment being assessed and subject to council approval. The intention for all standard clearances is to ensure a safe work environment, reduced inconvenience to road users and reduced the reliance on traffic control and the associated costs.

(g) For medians, specific requirements apply being:

(i) Streetscape treatments shall be provided in accordance with Clause SC6.4.6.1 Geometric road design and Table SC6.4.12.1 Treatment Application Based on Median Width and other requirements of this policy.

(h) For the roundabouts, specific requirements apply being:

(i) streetscape treatments shall be provided in accordance with Table SC6.4.12.1 Treatment Application Based on Median Width, Table SC6.4.12.2 Treatment Application Based on Roundabout Diameter and other requirements of this section. Also refer to Clause SC6.4.6.1 Geometric road design;

(ii) splitter or blister islands should not accommodate any soft landscaping unless approved otherwise (generally, islands must be an average width of 6 m or greater and all safety and operational requirements must firstly be satisfied); and

(iii) where garden areas and trees are provided, plant species in the central islands of roundabouts should only consist of ground covers, low growing shrubs and/or mulched areas with clean trunked trees unless approved otherwise.

Table SC6.4.12.1 - Treatment Application Based on Median Width

Treatment	Appropriateness of Treatment Application by Median Widths (including width of kerbs)				
	< 2.5 m	**2.5 m – 3.5 m**	**3.5 m – 6.0 m**	**6.0 m – 10.0m**	**> 10.0m**
Hard landscape (Stencil-crete, artificial turf, concrete or similar) [1] where the width of hard landscape treatments may exceed 6.0m, a combination of hard and soft landscape treatments should be applied to avoid large expanses of hardscape, subject to satisfaction of all safety requirements.	Yes	Yes	Yes	Yes[1]	Yes[1]
Turf (Zoysia spp. or approved alternative) [2] may be approved in select locations only, minimum clearances may still apply subject to road speed environment. Unless approved otherwise, turf areas must be a minimum width of 2.0 m to support an irrigation system in a safe and efficient manner and facilitate efficient operational maintenance. Turf areas greater than 6.0m in width should be combined with other hard and soft landscaping treatments.	No	No[2]	Yes	Yes	Yes
Garden areas (Ground covers below 0.7m in height) *Frangible* [3] - may be approved in select locations only, minimum garden area width and clearances may still apply subject to road speed environment, subject to satisfaction of all safety requirements.	No	No	No	Yes[3]	Yes[3]
Small trees *Frangible or Non – frangible*	No	No	Yes	Yes	Yes
Medium trees *Non – frangible*	No	No	No	Yes	Yes
Large tree *Non – frangible*	No	No	No	No	Yes
Palms	No	No	No	No[4]	No[4]

Not desirable. [4] select locations only, minimum setbacks may also apply subject to species selection and mitigation of risks associated with frond drop. *Frangible or Non – frangible*					

Table SC6.4.12.2 - Treatment Application Based on Roundabout Diameter

Treatment	Treatments Application by Roundabout Diameter (including Width of Kerbs and Mountable Apron)			
	< 7.0 m	**7.0 m – 10.0 m**	**10.0 m – 14.0m**	**> 14.0m**
Hardscape (Stencil-crete, artificial turf, concrete or similar) [1] - where the width of hardscape treatments may exceed 10.0 metres, a combination of hard and soft landscaping treatments must be applied to avoid large expanses of hardscape.	Yes	Yes	Yes[1]	Yes[1]
Turf (Zoysia spp. or approved alternative) [2] - may be approved in select locations only, minimum clearances may still apply subject to road speed environment. Unless approved otherwise, turf areas must be a minimum width of 2.0m to support an irrigation system in a safe and efficient manner and facilitate efficient operational maintenance. Turf areas greater than 6.0m in width should be combined with other hard and soft landscaping treatments.	No	No	No[2]	No[2]
Garden areas (Shrubs/Ground covers below 0.5m in height) [3] - may be approved in select locations only, minimum garden area width and clearances may still apply subject to road speed environment.	No[3]	Yes[3]	Yes[3]	Yes[3]
Small trees *Frangible or Non – frangible*	No	Yes	Yes	Yes
Medium trees *Non – frangible*	No	No	Yes	Yes
Large tree *Non – frangible*	No	No	Yes	Yes
Palms Not desirable. [4] - select locations only, minimum setbacks may also apply subject to species selection *Frangible or Non – frangible*	No	No	No[4]	No[4]

(i) Turf area requirements

(i) Turf areas may form part of clear zones, provided all other requirements are satisfied.

(ii) Turf areas must be a minimum 32 m clear width to allow for mowing access unless approved otherwise (noting minimum 2 m total widths are desirable for irrigation purposes).

(iii) Where the width of the medians exceed 6 m, it is desirable that turf areas are combined with other hard and soft landscape treatments to provide balance against the median width.

(iv) Turf species must be low maintenance (e.g.: Empire Zoysia or an approved equivalent species).

(j) Garden area requirements
Garden areas (planted or mulched only) shall be in accordance with all applicable council approved standard drawings for garden areas.

Editor's Note - Currently, no standard drawings are formally adopted for garden areas.

(i) all garden areas must be a minimum width of:

1. 1 m where combined with other soft and hard landscaping treatment; and
2. 1.5 m where provided as full width planting.

(ii) vegetation must be set back (from back of kerb, fence, footpath or other infrastructure) such that vegetation at maturity without hedging will not overhang footpaths, fences, or create visual obstructions;

(iii) where garden areas are within the sight triangle, plantings should only consist of ground covers and low shrubs with a maximum mature height of 600 mm or less in order to preserve sight lines;

(iv) where garden areas are outside the sight triangle, plantings expected to exceed 600 mm in mature height may be provided where all clear zone and frangibility requirements are satisfied and plantings are provided:

1. as screen planting or buffers along fence lines or acoustic barriers;
2. for functional reasons such as a visual barrier for headlight glare, a windbreak or a physical barrier to human movement; and
3. where screening or accent planting is desired.

(v) approval of full width planting may be provided:

1. for strategic locations only;
2. where the garden area will be a minimum width of 1.5 m; and
3. where garden areas will be located behind road safety barrier system; or

   where the road speed and required clearances between the edge of the traffic lane and the garden area complies with MUTCD (Queensland) requirements for work sites (Short-term Low Impact - Built Areas or Static Work Areas) and will not require the use of traffic control.

   Editor's Note - Approval for full width planting will only be for select locations, subject to the satisfaction of all safety and operational maintenance requirements. Approved locations will generally be associated with central median screening or buffering plantings, key entry gateways or high profile roads, and/or associated with centres or commercial precincts. Where the road speed is 40 km/h or less, full width plantings may be provided in medians between 2.5-3.5 m, subject to achieving the minimum garden area width and council approval.

(vi) all species selection should have regard to aesthetic, suitability, functional and ecological selection criteria and include consideration of:

1. appropriateness for the planting approach (e.g. structured or naturalistic);
2. mature spread dimension and required density, noting encroachment into road shoulder or onto adjacent turf or other surface must be avoided(offset planting by a

minimum of 0.5 – 1m depending upon species planted);

3. mature height and compliance with sight triangle requirements, noting reliance on frequent maintenance to maintain sight lines must be avoided;
4. frangibility requirements;
5. drought resistance/water requirements;
6. suitability for prevailing soil type;
7. lifespan, noting long-lived species are desired and annuals are not to be used unless approved otherwise;
8. salt tolerance;
9. pollution resistance;
10. environmental and habitat value of particular species;
11. ongoing care and maintenance requirements; and
12. the intended purpose of the planting and the species' suitability for this, including uses such as:
    a) headlight screen planting;
    b) buffer screening;
    c) visual screening;
    d) visual guidance planting;
    e) user perceptions of speed;
    f) shade and sunlight control;
    g) windbreak;
    h) physical barrier;
    i) erosion control;
    j) safety; and
    k) noise attenuation.
13. garden areas (mulched only) shall:
    a) be provided where shrubs and groundcovers are not desired or cannot be planted without impacting sight lines; and
    b) where tree planting is incorporated in the mulched garden area.

(k) Street tree requirements
Street trees should be provided at the following rate:

(i) a minimum of one tree per standard building lot or spaced at approximately 15m intervals.

(ii) a maximum of four trees per standard building lot or spaced at approximately 7 m intervals.

(iii) the above rates may be altered where:

1. there is insufficient available space based on safety and setback requirements; or
2. existing street trees will be retained; or
3. subject to council approval of the reduced rate.

Editor's Note - In locations where lot sizes are below the standard lot width, street tree provision rates will need to be assessed on a case by case basis. In these instances, a balance between provision rates, reduced setback requirements and appropriate mitigation measures to reduce potential damage to adjacent infrastructure must be sought.

(iv) street trees shall be planted in accordance with all applicable council approved standard drawings for tree planting.

Editor's Note - Currently, no standard drawings are formally adopted for landscape treatments.

(v) all setback requirements, being:

1. a minimum 5 m from an electricity pole or pillar box;
2. a minimum 7 m from a street light pole;
3. a minimum 2 m from side entry stormwater pits;
4. a minimum 2.5 m from either side of a driveway;
5. a minimum 1.05 m from back of kerb; and
6. a minimum 0.5 m from a footpath.

Editor's Note - The above requirements are based on cross sections outlined on Section SC6.4.3 Standarad drawings SD-015 Verge Service Corridors and other longitudinal setbacks intended to mitigate risk of conflict between street trees and other infrastructure. Setbacks from all utility services should be confirmed with the relevant asset owner/service provider. For setbacks on the approach and departure sides of bus stops, refer to Section SC6.4.3 Standard drawings (SD-515 Standard bus stop urban location layout details Type 1 and 2). For setbacks from intersections, refer to Austroads minimum gap acceptance and sight distance criteria. For setbacks on the approach and departure sides of pedestrian crossings and other designated crossing points, refer to crossing sight distance (CSD) requirements in *Traffic and Road Use Management Manual – Pedestrian Cross Facility Guidelines* and *Prioritisation System User Guide*.

(vi) in addition to the above, the following apply:

1. When street trees are to be planted in medians or roundabouts, extended planting setbacks (from back of kerb or adjacent hard surface treatments) apply, being:
   a) for small trees or large shrubs (mature canopy between 5 – 10 m in height or large shrubs greater than 3.5 m in height), setback at a distance of 2 m or half the mature canopy diameter, whichever is greater;
   b) for medium trees (mature canopy between 10 – 15 m in height), setback at a distance of 4 m or half the mature canopy diameter, whichever is greater; and
   c) for large trees (mature canopy greater than 15 m in height), setback at a distance of 6 m or half the mature canopy diameter, whichever is greater.
2. Where setbacks cannot be achieved, appropriate mitigation measures such as root barrier must be included. Minimum requirement for root barrier is 3m length per planting tree to a depth of 600mm.
3. Where species proposed have a known invasive root system, increased setbacks are required and mitigation measures such as root barrier are to be provided as per arborist advice.
4. Street trees will not be planted in clear zones, except where:

a) tree species are considered frangible and the mature trunk diameter will not exceed 100 mm; or

b) where non-frangible, tree species will be located behind road safety barriers.

5. When planted in the CBD, commercial zones, or where the planting area is completely surrounded by impervious surfaces, a minimum root development zone of 4 m^3 must be provided for each street tree. This may be achieved through the use of structural soils, root cell products. Tree plantings in these circumstance typically have a 1200mm x 1200mm planting area with heel proof grate (CBD), permeable paving or mulching.

6. Street tree species should be selected with consideration of suitability criteria, including:

a) whether there is an existing dominant species in the street or suburb that contributes to the streetscape or suburb character;

b) size of the available planting space as some tree species are better able to survive in restricted growing areas;

c) location of the new tree, the species growing habit and branch structure;

d) whether the new tree will be planted under power lines as only a limited number of species are suitable in this situation;

e) tree species water requirements and drought resistance;

f) suitability for prevailing soil type;

g) pollution resistance;

h) species with minimal fruit, leaf and limb drop;

i) species with high shade potential;

j) species with higher resilience to cyclone damage; and

k) environmental and habitat value of particular species;

l) be appropriate for the available planting space, accounting for all setback, offset and clearance requirements (overhead, longitudinally and horizontally across the road cross section);

m) only consist of trees that will achieve canopy clearance heights applicable to the streetscape situations outlined in Table SC6.4.12.3 Canopy Clearance Heights and exhibit a maximum “1/3 of height” clear trunk at the time of planting;

7. In established areas, the street trees species are to be species already established in the area unless nominated by Council.

8. In new development areas, the street trees species are to be nominated by the developer and approved by Council.

9. Palms shall not be planted in medians and will only be approved in select locations only where:

a) palm species are self-cleaning; or

b) sufficient area beneath the palms are is provided to mitigate risks from falling palms fronds; and

c) the plantings will not impose an unsustainable maintenance requirement.

10. Selection of the street tree stock size for planting should consider:

a) the planting location such as whether it is in a median, roundabout or on the footpath (e.g. more mature stock may be required in roundabout plantings where sight lines will be impeded by the foliage of a young tree);

b) street trees must have a strong leader and be maintained in a form to allow for the optimal growth of the particular species;

c) the optimal size to achieve best establishment (e.g. smaller stock typically establish better, larger stock may be required to meet visibility requirements at time of planting); and

d) the size of the original tree where replacing a removed tree (e.g. in instances were a large, significant tree is removed, a larger sized and/or increased quantity of replacement stock may be considered).

Table SC6.4.12.3 - Canopy Clearance Heights

Streetscape Situation	Minimum Vertical Clearance Height (at Maturity)
Standard pedestrian and car park environment	2.4m
Cyclist environment	2.7m
Main and arterial roads	5.4m
Other roads	4.6m
High clearance routes	5.9m
Very high clearance routes (with no alternative)	6.5m

Editor's Note - Above clearances are based on minimum vertical clearances detailed in Austroads *Guide to Road Design*, Part 3: Geometric Design.

(l) Operational requirements

Streetscape designs must seek to minimise the ongoing costs and operational maintenance requirements by:

(i) ensuring that planting design at maturity (without hedging) will not overhang footpaths, fences, or create visual obstructions on roadways;

(ii) ensuring that mature height and spread must not rely on hedging or other intervention to maintain sight lines;

(iii) ensuring effective access for maintenance and to critical road infrastructure is integrated into the streetscape design to support easy, time efficient operations;

(iv) ensuring all turf areas are of the minimum specified width to facilitate safe and efficient operation of mowing vehicles and reduce the requirement for "on foot" maintenance;

(v) complying with all clearance and setback requirements to ensure maintenance can be safely undertaken without a reliance on traffic control;

(vi) use of appropriate mulching and planting densities to minimise weed growth and the reliance of regular maintenance;

(vii) identifying any traffic control requirements associated with ongoing maintenance operations in early design stages. This should include any lane or road closures, detours, and the ongoing cost to implement any such requirements. All options to reduce identified traffic control requirements should be explored in order to reduce ongoing operational costs;

(viii) use of appropriate species in streetscape planting to minimise damage to infrastructure; and

(ix) species selection requiring temporary irrigation for establishment only, with irrigation removal at off maintenance in line with Clause SC6.4.12.3(4)(vi) Economic value.

(m) In order to properly assess maintenance requirements associated with streetscape proposals, council may require the provision of a maintenance plan and approved traffic management plan as part of the development application, as per Section SC6.4.2 Development application guidelines, Clause SC6.4.12.7 Attachment D - Parks and Open Space Maintenance Service Level and Clause SC6.4.12.5 (7) Attachment E - Parks and Open Space Maintenance Costing Table.

(5) Open drains

Open drain landscape designs must typically seek to minimise the ongoing costs and operational maintenance requirements by developing systems that include required hydraulic capacity (Refer to Section SC6.4.9 Stormwater quantity), appropriate open space features (e.g. recreational pathway along a high bank and minor furniture elements) and a planting palette that seeks to emulate a natural watercourse as much as is practicable.

In cases where open drains are not able to be developed to emulate natural watercourses soil stability will typically be achieved through the application of a suitable hydromulch mix (refer to Section SC6.4.12.6 (20)) to establish grass cover including species *Bothriochloa pertusa* (Indian Blue Couch). Overall grass cover must be >80% with a minimum of >60% of that cover being *Bothriochloa pertusa* (Indian Blue Couch).

Open drain design outcomes will be achieved by;

(a) incorporating hardy trees and native grasses to provide soil stability and shading to the corridor;

(b) avoiding garden beds and mulch (which would require high maintenance when damaged by overland flow);

(c) ensuring all grass areas requiring mowing are a minimum of 2m wide to other infrastructure (including trees) to allow efficient mowing activities and avoid the need for “on foot” maintenance;

(d) complying with all clearance and setback requirements to ensure maintenance can be safely undertaken without reliance on traffic control;

(e) using planting design and appropriate species selection to progressively reduce the number of the maintenance interventions required over time; and

(f) avoiding any potential for any landscape elements to cause damage to other road infrastructure such as driveways, kerb and channel, road pavement and utility services, including by way of aggressive root growth or surface root proliferation.

(6) Car park planting

(a) Landscaping is to be provided to on-street and off-street car parking areas so as to improve the aesthetic and climatic properties associated with these sites. The prevailing climatic conditions in Townsville demand that shade is provided to car parking areas to improve the comfort and reduce the urban heat island effect from large areas of hard surface.

(b) Private car parking areas must conform to the minimum requirements for shade tree planting. As theses spaces are in many cases the front entry to a development, more planting may be used to create an entry to the development.

(c) Planting and shading

Dependent on site and safety considerations, shading of car parks can be in the following manner:

(i) in single sided, angle or parallel bays – 1 tree per 3 car parks;

(ii) in double sided – 1 tree per 6 car parks; and

(iii) shade structures may be used in conjunction with low shrubs and low groundcovers internal to the parking area; and trees, low shrubs and ground covers on the periphery of the car park.

(d) Tree planting in car parks
Trees planted within off-street car parking areas are provided with:

(i) a minimum surface planting area of 1.2 m^2, or are incorporated into continuous garden beds;

(ii) planting pits for trees in car parks surrounded by hardstand are to provide a minimum of 4 m^3 for root zone development, at no greater depth than 1 m. The use of structural soils or root cell type products is essential to achieve acceptable growth and form in shade trees;

(iii) trees planted within road reserve angle car parking areas are provided with garden bed areas between parking bays, which are to be kerbed and no less than 1.2 m wide internally;

(iv) trees must be planted in accordance with any approved standard drawings; and

(v) trees must be allowed to mature naturally and only pruned in accordance with AS4373.

Editor's Note - Currently, no standard drawings are formally adopted for tree planting. Refer also to Clause SC6.4.20.1 Footpath treatment for tree planting details in specialty footpaths.

(e) Landscape design and species

Selection All car parking plantings must satisfy the following landscape design and species selection requirements while incorporating WSUD principles to improve water quality and reduce the reliance on irrigation in public open space:

(i) ground cover and shrubs should have a maximum height of 600 mm to preserve sight lines;

(ii) tree canopies should achieve a minimum clearance above ground of 2.4 m above pedestrian and parking zones, or 4.6 m over vehicle movement zones;

(iii) in public parking areas, trees are to be a species as nominated by Council;

(iv) in private parking areas, trees species are to be nominated by the developer and approved by Council; and

(v) trees and garden beds within car parking areas are protected by raised kerbs, wheel stops or bollards.

(f) Green roofs and vertical gardens (refer to Clause SC6.4.10.2 Water sensitive urban design guidelines)

(i) Green roofs

Editor's Note - Due to the custom nature of green roofs, no design and construction standards are provided. Each site will be assessed on a case-by-case basis.

(ii) Green walls, vertical gardens and façade greening

Editor's Note - Due to the custom nature of green walls, vertical gardens and façade greening, no design and construction standards are provided. Each site will be assessed on a case-by-case basis. Generally, planting features these types are to be within private property and should be under the maintenance regime of the owner. All engineering and hydraulic certification must be provided with any structure proposed.

(7) Irrigation Profile Level (IPL) Hierarchy definition and matrix

(a) Irrigation Profile Level (IPL) Hierarchy definition

Refer to Clause SC6.4.13.1 (7) for details.

(b) Irrigation Profile Level Matrix

Refer to Clause SC6.4.13.1 (8) for details.

SC6.4.12.6 Landscaping construction standards

(1) Introduction

(a) Scope

This section sets out the standards and provides advice and guidelines for the construction of landscape works that will become a council asset.

Landscape works includes but is not limited to, site co-ordination, turfing, gardens, grass seeding, treeplantings, pathways, paved areas, concrete works, stormwater drainage and infrastructure.

This section consists of:

(i) the vegetation of cut and fill batters, median areas, pathway verges, open drains, and other areas withinthe site. Vegetation includes the initial surface preparation, topsoiling, fertilising, sowing of seed and may include surface protection works, hydroseeding, hydromulching, and straw mulching; and

(ii) the supply of plants, planting at locations fertilising, mulching, staking, watering, and maintenance ofplants.

Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, arecited in Section SC6.4.23 Construction management, quality management, inspection and testing.

(b) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(i) SC6.4 Development manual planning scheme policy sections:

Section SC6.4.7 Clearing, grubbing, and earthworks.

(ii) Australian Standards:

AS 1160	*Bituminous emulsions for the construction and maintenance of pavements*
AS 1289	*Methods of testing soils for engineering purposes – General requirements and list of methods*
AS 1672.1	*Limes and limestones – Limes for building*
AS 2507	*The storage and handling of agricultural and veterinary chemicals*
AS 3000	*Electrical installations (known as the Australian/New Zealand Wiring Rules)*
AS 3700	*Masonry structures*
AS 3798	*Guidelines on earthworks for commercial and residential developments*
AS 3972	*Portland and blended cements*
AS 4419	*Soils for landscaping and garden use*
AS 4454	*Composts, soil conditioners and mulches*
AS/NZS 4671	*Steel reinforcing materials*
AS 4843	*Synthetic weed blocking fabric*
AS 4970	*Protection of Trees on Development Sites*

(iii) Other:

Electricity Act 1994	
International Erosion Control Association (IECA)	*Best Practice Erosion and Sediment Control*

(c) Terminology

For the purposes of this document the following definitions apply:

Defects liability period	refer to Section SC6.4.24 Acceptance of completed works.
Gardens, garden beds andgarden areas	means a defined area of mulched “garden” containing various shrubs, trees,plants, or hedges.
Litter	means bottles, paper, cigarette packets, cigarette butts, drink cans, ice cream sticks, plastic, rubber, glass, milk and fruit juice cartons, paper platesand the like. Litter also includes fallen branches, palm fronds, waste, household rubbish, condoms, sharps/syringes, leaves where leaves are unsightly or cause damage to lawn or garden areas, or other dumped material.
Maintenance period	equivalent to the defects liability period and includes the plant establishment period.
Plant establishment period	coincides with the defects-liability period.
Planter box	means a transportable or in situ container designed specifically for containing a garden of trees and /or shrubs.
Sub grade	means the level at the underside of garden or turf topsoil or the level at theunderside of paving gravel base course.
Superintendent	means the nominated representative for council.

(2) Works management

(a) Qualified personnel

Personnel shall be suitably qualified and competent in all aspects of landscape works and shall be familiar with all relevant Australian Standards. All maintenance work to new and existing trees shall be carried out under the supervision of an Arborist with formal qualifications (Level 5 Australian Qualification Framework) or at least 5 years recognised experience in Arboriculture.

(b) Design approval

The design of the landscape works will be prepared by a qualified Landscape Architect.

(c) Contractor inspections

Inspections must be certified and documented by a Registered landscape Architect (the supervising landscape architect). All approved works are required to be inspected by Townsville City Council.

(d) Council inspections

(i) Council may inspect the following:

1. sub grade prior to placing fill;
2. sub grade prior to placing garden soil or turf soil;

3. sub grade prior to placing the gravel base course; (iv) sub grade prior to placing paving or concrete works;
4. installation of gypsum;
5. condition of plants after delivery to site and prior to planting, including planting holes prior to planting;
6. gardens prior to planting;
7. turf areas prior to laying turf;
8. areas to be hydro-mulched / seeded prior to treatment;
9. concrete structures (formwork) prior to placing concrete;
10. block work and reinforcing prior to placing core fill concrete; and
11. other elements considered necessary by the Superintendent.

(ii) Inspection of irrigation works shall be undertaken by the Superintendent and a council Irrigation Officer in association with the Landscape works and is detailed below:

1. all mainline to be inspected prior to covering;
2. drip tube layout prior to covering;
3. 240v power conduit from Ergon POS to controller for correct depth prior to covering;
4. all envelopers (conduits) work under hard surfaces prior to covering;
5. all envelopers (conduits) under hard surfaces must be continuous 100 mm PVC CL9, all conduitends must be sealed with expanding foam prior to covering; and
6. water meter assembly installation prior to covering to ensure correct installation of thrust blocksand copper protection.

(e) Inspection results

(i) Work inspected that complies with the section and/or the design plans will be accepted by Council.

(ii) Any work inspected that does not comply with the section and/or the design plans, will not be accepted by Council. Items not acceptable will be noted for rectification.

(iii) The contractor is required to rectify these items prior to proceeding to the next construction phase andshall apply for a re-inspection by Council on completion of the rectification work.

(f) A minimum of 24 hours' notice' by the Contractor is required for notification of an Inspection. Failure by the Contractor to notifycouncil of any inspections required, will result in the works being excavated at the Contractors cost to allow aninspection to be carried out.

(g) Inspection documentation.

Editor's note - This section relates to Inspection Test Plans and is currently under development.

(3) Supply of materials

(a) Materials supply - general

(i) Substitutions

The Contractor shall notify the council immediately if an item is unavailable for inclusion in the works andshall provide alternative supply details if appropriate. Substitutions of any materials or products shall not be made unless approved by the Superintendent in writing.

(ii) Material samples

In certain instances, Council may request the Contractor to provide samples of materials to be installedor used for work under the development approval.

(iii) Materials testing

In certain instances, Council may request the Contractor to provide results of materials testing. Whereapplicable, testing requirements will be set out in the conditions of approval.

(iv) Materials warranty

Where requested, the Contractor shall provide to Council all relevant warranty details for the materials nominated in any conditions of approval.

(b) Supply of plants

(i) Plant specifications

1. All plants supplied shall be in a healthy condition free from weeds, pests, and diseases. Plants shall be well foliated, showing signs of active growth, true to type and of a form and shape considered typical for the species or variety.
2. Leaves shall be of normal size, shape, colour, and texture with no physical or insect damage ordisease lesions.
3. The plant roots shall be fibrous, well developed and not root bound, with no kinking, knotting, girdling, or spiralling and shall be free of any pests or diseases or any other root defects.
4. All plants supplied shall be hardened off and in a condition suitable for planting in the Townsville climate.
5. Trees supplied (unless required to be multi-stemmed) shall have a single leading stem and shall be self-supporting and unstacked.
6. Root bound plants, deformed plants and plants showing recent signs of root pruning will not be accepted.
7. At time of delivery to the site, each group of plant species shall be clearly and accurately labelledaccording to botanical nomenclature. Labels shall be water resistant and tied securely to one plant in every 20 for each species.
8. Plants which are above the minimum size requirements may be accepted for inclusion within theworks.

(ii) Container stock

Plants grown in containers shall have a root system firmly established with no large roots growing out ofthe container, shall be of such a size that the roots have penetrated to the bottom of the container and occupy 95-100% of the soil volume and/or have sufficient roots to hold the container soil together afterremoval of the plant from the container.

(iii) Ex-ground stock plants

1. Where plants are growing in ground prior to delivery to the site, the necessary root pruning and/or preparation procedures in accordance with accepted transplanting practice shall be commenced insufficient time to ensure that, at the time of planting the plant is ready and will meet the specifiedrequirements. Transplanting of ex-ground stock should be conducted under the supervision of a qualified (Level 3 Australian Qualification Framework) horticulturalist or arborist.
2. Refer to Table SC6.4.12.4 – Acceptable Root Ball Sizes for minimum acceptable root ball sizes for ex-ground stock plants.

Table SC6.4.12.4 - Acceptable Root Ball Sizes

Small Trees		**Large Trees**	
Height of Tree (mm)	Root Ball Diameter (mm)	Approximate Tree Trunk Diameter (mm) (300 mm above ground)	Root Ball Diameter (mm)
600 - 900	300	40	500
900 - 1200	350	50	550
1200 - 1500	400	65	600
1500 - 1800	450	75	800
1800 - 2100	550	100	950
2400 - 2700	600	125	1200
2700 - 3000	650	150	1450
3000 - 3600	750	175	1600
3600 - 4200	800		
4200 - 5000	900		

(iv) Substitutions

Substitutions of plants shall not be permitted unless approved in writing by council. In the event that a plant is unavailable the Contractor may request to provide a substitution. Substituted plants shall be of the same specified type, quality and size unless otherwise agreed to by Council.

(c) Supply of imported soil mix

(i) Imported soil mix shall be organic soil, soil blend or top dressing in accordance with the Australian Standard AS 4419 Soils for landscaping and garden use.

(ii) The Contractor shall note the requirements of AS 4419.

(d) Supply of turf

(i) Turf shall be the species nominated on the drawings and shall be supplied by a specialist grower of cultivated turf.

(ii) The soil of the turf sod shall be an even thickness of 25 mm minimum.

(iii) Turf shall be free from any matter toxic to plant growth and shall be free from roots, weed or weed seeds.

(e) Supply of hydro seeding/mulching

The specific mix/blend of hydro seeding/mulching required shall be nominated on the drawings and supplied by specialist supplier of hydro seeding/mulch.

(f) Supply of mulch materials

(i) All mulch materials supplied shall be in accordance with the current relevant AS 4454 Composts, soilconditioners and mulches.

(ii) Organic and inorganic mulch shall be of the type and quality as noted on the drawings.

(iii) Organic mulch derived from vegetation cleared on site may only be used where it is free from deleteriousmaterials such as rock, soil and weed material.

(g) Tree stakes and ties

(i) Unless otherwise noted on the drawings or approved by council, tree stakes shall be durable hardwood, straight, free from knots or twists and pointed at one end.

(ii) Small plants may only require 1 stake where required.

(iii) For trees up to 45 litre 2 stakes – 50 mm x 50 mm x 1800 mm long.

(iv) For trees over 45 litre 3 stakes – 50 mm x 50 mm x 2400 mm long.

(v) Ties shall be 50 mm wide furniture grade hessian webbing or similar.

(vi) Supply of proprietary items

Timber/concrete garden edging, soil conditioners, root barrier, furniture items, play equipment and other project specific items shall be supplied to the requirements and details noted on design and/or construction drawings.

(h) Supply of gypsum

Gypsum application rates shall be supply in accordance with AS 4454 and as required by soil types specific tothe site.

(i) Supply of fertiliser fertilisers supplied shall be:

(i) delivered to the site in sealed bags clearly marked to show the manufacturer or vendor, weight, fertiliser type, N:P:K. ratio, recommended uses and application rates; and

(ii) applied at the locations and frequencies in accordance with the manufacturer's recommendations.

(4) Earthworks

(a) General

Earthworks relates to gardens, grass areas, pathways and paved areas and includes:

(i) site clearing;

(ii) stripping of existing vegetation;

(iii) stripping of existing topsoil;

(iv) excavation to sub grade level;

(v) filling to sub grade level; and

(vi) cultivation of the sub grade surface.

(b) Quality management

All materials supplied and work carried out shall be in accordance with the current, relevant Australian Standards:

AS 1289 *Methods of testing soils for engineering purposes*; and

AS 3798 *Guidelines on earthworks for commercial and residential developments.*

(c) Existing services

Per Section SC6.4.7 Clearing, grubbing and earthworks, the Contractor is required to locate all existing and newly installed services prior to commencement of any earthworks. Care shall be taken in areas to be excavated, filled or cultivated not to unearth or damage services. Any damage to services caused by the Contractor shallbe reinstated by the Contractor at no cost to Council.

(d) Site preparation

(i) Clearing/demolition

1. Clearing shall mean the removal of trees, shrubs, scrub and undergrowth and other vegetation above ground level and includes the removal of artificial obstructions such as fences, concrete slabs rubbish, timber, boulders, rubble. and other man-made products.

2. Clearing shall be carried out in accordance with Section SC6.4.7 Clearing, grubbing and earthworks.

(ii) Grubbing

Grubbing shall mean the removal from below ground level of trees, roots, stumps, rocks and artificialobstructions as defined and specified by Section SC6.4.7 Clearing, grubbing, and earthworks.

(iii) Stripping of existing vegetation

Areas to be excavated or filled shall be stripped of all vegetation to a depth just sufficient to include theroot zone (nominal 50 mm). All stripping of vegetation is to be in accordance with Section SC6.4.7 Clearing, grubbing, and earthworks and must not affect trees/vegetation to be retained, as per AS 4970 – *Protection of Trees on Development Sites.*

The striped material shall be removed from site or may be stockpiled on site for later reuse, if approvedby council and in accordance with Clause SC6.4.23 (4) (q) Stockpiling of materials.

(iv) Existing topsoil

Existing topsoil excavated on site may be reused provided that the material conforms to the AS 4419 requirements and is approved for reuse by the Superintendent. The material may be stockpiled on site, inaccordance with Clause SC6.4.23 (4) (q) Stockpiling of materials.

(e) Excavation (down to sub grade level)

(i) General

The existing surface of areas to be excavated shall be stripped of all vegetation prior to excavating. Care shall be taken not to unnecessarily expose subsoils through the area of construction by over excavation,to prevent any potential for the development of acid sulphate conditions.

(ii) Excavation in gardens

1. Garden beds shall be excavated down to subgrade level as required to suit the finished surfacelevels, the depth of garden mix soil and the depth of mulch.

2. The subgrade shall be shaped and graded evenly to fall towards subsoil drains (if present) and thetopsoil shall be shaped to fall from the centre of the bed outwards in all directions.

3. Excavation in gardens shall be in accordance with council's approved standard drawings.

Editor's note - Standard drawings for these works are under development.

(iii) Excavation in grass areas

1. Grass areas shall be excavated down to subgrade level as required to suit finished surface levels,the depth of turf topsoil and the depth of turf.

2. The subgrade shall be shaped and graded evenly to fall towards subsoil drains (if any) and shall begraded evenly to follow the finished surface profile.

3. Excavation in grass areas shall be in accordance with council's approved standard drawings.
Editor's note - Standard drawings for these works are under development.

(iv) Excavation for pathways and paved areas (paving)

1. Pathways and paved areas shall be excavated down to subgrade level as required to suit finishedsurface levels, the depth of the gravel base course, bedding sand, pavers, or concrete. The subgrade shall be shaped and graded evenly to the falls shown on the drawings and/or to fall to stormwater pits or subsoil drains.

2. Excavation for pathways and paved areas shall be in accordance with council's approved standarddrawings.
Editor's note - Standard drawings for these works are under development.

(v) Excavation near existing trees

Excavation near existing trees shall be undertaken in accordance with AS 4970 – *Protection of Trees on Development Sites.*

(vi) Spoil

1. Spoil material resulting from excavation shall be reused on site wherever practicable, provided thatthe material conforms to the specified requirements for its intended use (e.g., filling or topsoil) as per AS 4419.

2. Spoil material to be reused may be stockpiled on site as per Clause SC6.4.23 (4) (q) Stockpiling of materials.
After the excavation process has been completed, the sub grade surface shall be inspected forsprings, soft soil areas and other structural weaknesses. Where such weaknesses are encountered the following remedial works may be required:

a) excavation and replacement of unsuitable material;

b) surface drainage blankets of sand; and

c) subsoil drains.

(f) Filling (up to sub grade level)

(i) Existing surface treatment

The existing surface of areas to be filled shall be stripped of all vegetation prior to placing any fill. The existing surface shall then be scarified to a depth of 200 mm. If required, water shall be added to bringthe existing surface up to optimum moisture content prior to placing any fill.

(ii) Unsuitable existing surface

After the stripping process has been completed, the existing ground surface shall be inspected for springs, soft soil areas and other structural weaknesses in the naturally occurring soil. Where such weaknesses are encountered, the following remedial works may be required:

1. excavation and replacement of unsuitable material;

2. surface drainage blankets of sand; and

3. subsoil drains.

(iii) Acceptable types of fill material for gardens and grass areas

Fill material to garden and grass areas shall be either:

1. "general purpose soil" to AS 4419 Clause 4.1; or

2. "natural soil" to AS 4419 Clause 4.3; or

3. spoil from onsite excavations if approved by the Superintendent, with a maximum particle size 25mm.

(iv) Acceptable types of fill material for pathways and paved areas

Fill material to pathways and paved areas shall be:

1. crusher dust, free from organic matter and lumps of clay; or
2. crushed rock gravel uniformly graded, nominal particle size 25 mm; or
3. other granular material approved by the Superintendent.
4. All material used shall have a linear shrinkage - 0 - 8%, Soaked California Bearing Ratio – 15 minimum.

(v) Fill in gardens

Gardens shall be filled up to sub grade level as required to suit the finished surface levels, the depth of garden mix soil and the depth of mulch. The sub grade shall be shaped and graded evenly to fall towardssubsoil drains (if any).

(vi) Fill in grass areas

Grass areas shall be filled up to sub grade level as required to suit finished surface levels, the depth ofturf topsoil and the depth of turf. The sub grade shall be shaped and graded evenly to fall towards subsoil drains (if any) or gully pits and to mirror the finished surface profile.

(vii) Fill to pathways and paved areas

Pathways and paved areas shall be filled up to subgrade level as required to suit the finished surfacelevels, the depth of the gravel base course, bedding sand, pavers, or concrete. The subgrade shall be shaped and graded evenly to the falls shown on the drawings and/or to fall to stormwater pits.

(viii) Fill around existing trees

For information regarding placement of fill and compaction issues refer to AS 4970 *Protection of Trees on Development Sites.*

(g) Placing and compacting fill

(i) Fill material shall be placed and compacted in successive horizontal layers to the dimensions, levels, grades, and cross sections as shown on the drawings and so that the surface is always self-draining. Refer to Table SC6.4.12.5 for Fill Compaction Standards. Care shall be taken to ensure that fill to gardenareas is not excessively compacted.

(ii) Each fill layer shall be scarified, and/or harrowed and processed to a finely divided condition, uniformly watered or aerated as the case may be, to obtain moisture content within the range of 80% - 90% of the optimum moisture content. The loose depth of the material in each layer shall be not more than 150 mm.

(iii) Fill shall be placed in layers simultaneously on both sides of structures, culverts, and pipe work to avoid differential loading. Fill shall not be placed against concrete or masonry structures, walls and the like until the concrete or masonry work has been in place for a minimum of 14 days.

Existing works and structures shall be protected from damage due to compaction operations. Compaction by mechanical means shall not be carried out within 300 mm of paths, kerbs, or structures. Compaction in these locations shall be carried out by hand or the size of compaction equipment shall belimited to ensure no damage is caused. Commence compaction of each fill layer at the structure and proceed away from it.

Table SC6.4.12.5 - Fill Compaction Standards

Location	Compaction Standard
Gardens and Grassed Areas.	85% Relative Dry Density Standard Compaction.
Pathways, Paved Areas and Structures.	95% Relative Dry Density Standard Compaction.

(h) Grading

(i) Runoff from impervious surfaces such as roofs, driveways and car parks, and overland flows from turf and garden beds is to be captured and allowed to infiltrate into subsoils by reshaping existing landforms through the use of swales, contour banks, soaks, percolation pits and basins, rain gardens and bioretention filters.

(ii) To reduce runoff and erosion and encourage rainwater infiltration into soil, a landscape embankment isnot to exceed grades of 1 in 5.

(iii) The regrading of land is not to occur within the tree protection zone of existing trees to be retained. 30 mm at any location.

(i) Cultivation

(i) Applies to gardens and grass areas (if directed or if noted on the drawings).

(ii) Where shown on the drawings, the sub grade of Gardens and Grass Areas shall be cultivated prior toplacing garden mix soil or turf topsoil.

(iii) The sub grade shall be thoroughly cultivated by ripping parallel to the final contours to loosen the compacted ground and to the depths nominated in Table SC6.4.12.6.

Table SC6.4.12.6 - Cultivation Depths

Location	Cultivation Depth
Garden Areas	200 mm
Grass Areas	100 mm

(iv) In areas of heavy clay natural soil, granulated gypsum shall be spread over the entire area of all gardensat a minimum rate of 2 kg per square metre and shall be thoroughly blended and incorporated into the subgrade during cultivation.

(v) In areas of heavy clay natural soil, granulated gypsum shall be spread over the entire area of all grassareas at a minimum rate of 2 kg per square metre and shall be:

1. thoroughly blended and incorporated into the subgrade during cultivation if cultivation is to becarried out; or

2. spread prior to placing turf soil.

(vi) Any soil additives and/or imported materials other than gypsum, that may be required to be applied tothe natural soil shall be thoroughly blended with or spread over the subgrade.

(vii) Cultivation shall not be carried out when the soil is wet or plastic.

(viii) The Contractor shall ensure that no damage occurs to tree roots, underground services, kerbing and the like during the cultivation process. Cultivation by mechanical means shall not be carried out within thedrip line of trees to be retained or within 300 mm of pathways, paved areas and/or structures. Cultivation in these locations shall be carried out by hand. Refer to AS 4970 – *Protection of Trees on Development Sites.*

(ix) After cultivation soil lumps shall have a maximum dimension of 50 mm. Stones exceeding 25 mm, clodsof earth exceeding 50 mm, weeds, roots, sticks, rubbish, and any other deleterious material brought tothe surface during cultivation shall be removed. Any depressions caused by the removal of these materials shall be filled with topsoil or on-site spoil material approved by the Superintendent.

(x) After cultivation the surface shall be graded smoothly and evenly and trimmed to the required levels allowing for placing the specified depth of imported soil to achieve the finished surface levels as noted onthe drawings. Care shall be taken to prevent areas of excessive compaction being caused by construction equipment.

(j) Backfilling trenches

(i) Backfill to trenches up to sub grade level under pathways and paved areas shall be clean sand or crusher dust compacted to 95% relative dry density standard compaction.

(ii) Backfill to trenches up to sub grade level in gardens and grass areas shall be imported soil mix or material excavated from the trench or may be other on-site material approved by the Superintendent.

(iii) Trenches excavated in gardens within the imported garden mix soil shall be backfilled with imported garden mix soil mix as specified.

(5) Vegetation of slopes and drains

(a) Execution and timing of work

(i) The work to be executed under this clause includes the vegetation of cut and fill batters, pathway verges,median areas, open drains, and other areas within the site. Vegetation includes the initial surface preparation, topsoiling, fertilising and either sowing of seed or turfing as shown on the drawings.

(ii) Exposed ground shall be vegetated before the area exceeds one hectare or lesser area in compliance with council requirements.

(b) Materials

(i) Topsoil

The Contractor shall use topsoil stockpiled on site under the Section SC6.4.7 Clearing, grubbing and earthworks. Where imported topsoil is required, it shall comply with AS 4419 and shall:

1. be of a friable, porous nature;
2. be free of weeds and weed seeds, bulbs, corms, and vegetable propagules;
3. contain no refuse or materials toxic to plant growth;
4. contain no stumps, roots, clay lumps or stones larger than 50 mm in size;
5. have an organic content of at least 3 per cent by mass;
6. have a pH neither less than 5.5 nor more than 7.5; and
7. have a soluble salt content not exceeding 0.06 per cent by mass.

(ii) Seed

1. All seed used shall be in accordance with the accepted design outcome for the slope and/or drain to be vegetated. Examples of species and varieties are listed in Clause SC6.4.12.6(20) Landscaping materials and shall be sown at the application rates specified therein.
2. The Contractor's attention is drawn to the lead time that may be required to procure some native seed species. The native seed shall be delivered to the site in separate lots for each species andvariety, clearly labelled to show species, variety, and weight.

3. All seed must be accompanied by a "Certificate of Authenticity" which shall be furnished by the Contractor to the Superintendent upon request at any stage of the work. Grass and clover seed shall be pre-packed commercially with an accompanying certificate of germination.

4. The Contractor shall not take possession of the seed more than 7 days before sowing is to occur.The seed shall be stored in clean, airtight containers and kept away from direct sunlight. It shall not be exposed to the elements at any stage during storage.

5. The Contractor shall replace at his own expense any exotic seed batch found not true to type.

(iii) Turf

Turf shall consist of 25 mm depth of dense, well rooted, vigorous grass growth with 25 mm depth of topsoil. The type of grass turf to be used shall be selected from Clause SC6.4.12.6 (20) Landscaping materials and in accordance with the drawings. Unless specified, Kikuyu grass shall not be used. Turf shall be free of weeds, soil pests and diseases. The turf shall be supplied as rolls in long lengths of uniform width, notless than 300 mm, and shall be in sound unbroken condition.

(iv) Vegetable mulch

Vegetable mulch used in hydromulching shall consist of straw, chaff, wood fibre, paper pulp or similar material all finely shredded to a maximum dimension of 10 mm. Meadow hay or weeds shall not be usedand paper pulp if used shall not exceed 50 per cent by mass of the total mulch.

(v) Water

Water used shall be potable.

(vi) Binder

The binder used in hydro mulching and straw mulching shall be Grade ASS, slow setting anionic bitumenemulsion, complying with AS 1160.

(c) Vegetation of slopes 3 to 1 or flatter

(i) Preparation of surface

1. Slopes shall be sprayed with herbicide applied at the rate specified in by the manufacturer to kill weed infestation. Sprayed areas shall remain undisturbed for two weeks.

2. The surface shall then be tyned to a depth of 200 mm to produce a loose surface and all large stones, rubbish and other materials that may hinder germination shall be removed before topsoiling.

(ii) Topsoiling

Topsoil shall be uniformly applied to provide an average compacted thickness of 50 mm with a minimum compacted thickness of 30 mm at any location. The topsoiled area shall be cultivated to a depth of 50mm to provide a roughened surface with soil lumps not exceeding 50 mm dimension.

(iii) Mixing of seed

The Contractor shall give the Superintendent 2 days' notice before each sowing operation. Seed shall be sown on the day of mixing with pesticide.

(iv) Sowing

1. Sowing shall be carried out with an appropriate mechanical spreader. Where practicable, passes shall follow finished surface contours. Seed shall be sown at a depth of 5 mm or shall be raked or harrowed to provide 5 mm cover.

2. Seed shall be evenly distributed over the areas to be sown at the rates specified in Clause SC6.4.12.6 (20) Landscaping materials. Fertiliser shall be applied concurrently with the seeding operation.

(v) Turfing

1. Turf shall be placed on the prepared topsoiled surface. Runs of turf shall butt hard against each other and be placed perpendicular to the direction of water flow. Turf seams shall then be top dressed with topsoil.

2. Four to six weeks after placement, the turf shall be lightly top dressed with topsoil to correct anyundulations or unevenness in the established turf.

(vi) Watering

The Contractor shall water areas to be sown to a moist condition and shall rewater areas to a moist conditionwithout surface runoff on a daily basis for a minimum of 15 days after sowing, or as otherwise directed by theSuperintendent, to promote and maintain growth.

(d) Vegetation of slopes steeper than 3 to 1

(i) General

Where required or directed by the Superintendent, slopes shall be vegetated by one of the following methods:

1. topsoiling and hydromulching; or

2. topsoiling, hydroseeding and straw mulching; or

3. hydroseeding.

(ii) Preparation of surface

1. Weeds shall be killed by spraying with herbicides.

2. No more than 7 days before seeding all loose material shall be removed from fill batters and cut batters, which are not stepped, by dragging a heavy steel chain of minimum weight of 30 kilograms per metre of length or by other methods approved by the Superintendent.

(iii) Topsoiling

Where batters have been stepped, the steps shall be loosely filled with topsoil. Elsewhere, topsoil shallbe uniformly applied to provide an average thickness of 50 mm with a minimum compacted thickness of 30 mm at any location.

(iv) Hydromulching or hydroseeding

1. The hydro mulch or hydroseed shall comprise the materials shown in Clause SC6.4.12.7 Attachment D – Parks and Open Space Maintenance Service Level. The materials shall be applied at the application rates shown in Clause SC6.4.12.6 (20)– Landscaping materials.

2. Dry surfaces shall be watered by a fine spray before the application of the hydro mulch.

3. Storage tanks, containers, and equipment to be used in hydro mulching or hydro seeding of slopes shall be clean and free of contamination from previous operations.

4. A slurry mixture shall be produced by addition of the specified materials in the tank and agitatedto maintain a uniform consistency during application. It shall be applied uniformly over the whole surface.

5. Hydro mulch or hydro seed shall not be applied under the following weather conditions at the site:

a) when temperature is higher than 35 ºC; and/or

b) when winds exceed 15 km/hr; and/or

c) where, in the opinion of the Superintendent, the surface is too wet; or

d) during rain periods or when rain appears imminent.

(v) Straw mulching

The mulch to be applied after hydroseeding shall comprise a matrix of straw and an anionic slow setting bitumen emulsion binder. Meadow hay shall not be used. The straw mulch shall be uniformly applied by a suitable blower unit at a rate of 250 bales (each of 20 kilograms) of straw per hectare of surface. Thebitumen emulsion shall be incorporated as a spray into the air stream of the mulch blower at a rate of notless than 2,500 litres of bitumen emulsion per hectare of surface. The finished straw mat shall have a minimum thickness of 20 mm at any location.

(e) Vegetation of open drains

(i) Preparation of surface

The Contractor shall so execute the work that the excavation of open drains to the specified profiles isfollowed within 7 days by the vegetation of the surface as specified in this clause. Topsoil shall be spread to provide an average compacted thickness of 50 mm with a minimum compacted thickness of30 mm at any location.

(ii) Sowing

Before sowing, the surface shall be watered. Seed shall then be applied uniformly at the rates specified in Clause SC6.4.12.6 (20) Landscaping materials. by one of the following procedures as directed by the Superintendent:

1. mechanical sowing or

2. hydromulching or hydroseeding.

(iii) Surface protection - general

Where shown on the drawings or directed by the Superintendent, one of the following protectivetreatments shall be applied immediately to all or part of the sown surface.

(iv) Surface protection - spraying with bitumen emulsion

An anionic slow setting bitumen emulsion, conforming with Grade ASS of AS 1160, shall be sprayedover the surface at a rate of 1 litre of bitumen emulsion per square metre of surface.

(v) Surface protection - lining with organic fibre mat

1. The channel surface shall be lined with an organic fibre mat listed in Clause SC6.4.12.6 (20) Landscaping materials. The runs of matting shall be laid along the direction of water flow. The matting shall be laid looselyon the soil surface and not stretched.

2. The upstream end of the matting shall be slotted into a trench 150 mm wide by 150 mm deep andpinned to the base of the trench at 200 mm centres. The trench shall be backfilled with soil and compacted by foot.

3. The pins shall be `U' shaped, 4 mm gauge wire, 50 mm wide and 150 mm long legs.

4. Adjacent runs of matting shall be overlapped 100 mm with the higher run lapped over the lower run.The matting shall be pinned along the sides of each run at 500 mm centres and along the middle of each run at 1 m centres. End overlaps shall be 150 mm wide with the higher run end lapped over the start of the lower run and pinned at 200 mm centres.

(vi) Turfing

1. Turf shall be as specified under Clause SC6.4.12.6 (20) Landscaping materials. Runs of turf shall butt hard against each other and be placed perpendicular to the direction ofwater flow in the drain and pinned into position at 500 mm centres.

2. Seams of turf shall be top dressed with topsoil.

(vii) Watering

The Contractor shall water treated areas in order to promote and maintain growth.

(6) Garden construction

(a) Scope

The following work activities relate to the construction of garden beds, garden areas and mass planting areas:

(i) earthworks (excavation, filling and cultivation);

(ii) supply and application of soil improvement additives;

(iii) supply and placing garden mix soil;

(iv) supply and placing mulch;

(v) supply and planting of trees, shrubs, ground cover plants and the like including stakes and other plantsupports;

(vi) supply and application of fertiliser;

(vii) supply and installation of garden edging; and

(viii) supply and installation of subsoil drains.

Editor's Note - All garden construction shall be in accordance with the current relevant Australian Standards:

- AS 4419 - *Soils for landscaping and garden use*; and
- AS 4454 - *Composts, soil conditioners and mulches*.

(b) Co-ordination

The sequence for placing garden mix soil, installing irrigation, placing mulch and planting will vary according tothe type of plants and irrigation system. The Contractor is required to liaise with other Contractors and the Superintendent to ensure the best possible method of construction is undertaken.

(c) Earthworks

Gardens may require Excavation or Filling to achieve the finished surface levels nominated on the drawings.After excavation or filling, all gardens may require cultivation.

(d) Garden bed dimensions

Planting bed dimensions are in accordance with the following:

(i) garden beds have an average minimum width of 1.2 m, provided that the bed is no less than 0.5 m wide; and

(ii) root zone depths for plants are at least that of the root ball of the plant at planting.

(e) Soil Condition

(i) Priority is to be given to using existing site soil as imported soil is a limited resource.

(ii) Existing topsoil is conserved by either not disturbing the soil during construction or by stockpiling it prior to construction commencing, in accordance with Clause SC6.4.23 (4)(q) Stockpiling of materials.

(iii) Subsoil is to be cultivated to a minimum depth of 200 mm for garden beds and 100 mm for turfed areasunless this will adversely affect the roots of established trees.

(iv) The minimum topsoil depth is:

1. 100 mm for non-irrigated turf areas;.

2. 200 mm for irrigated turf areas; and

3. 300 mm for garden beds.

(v) If additional soil is required to meet these minimum depths, soil is to meet AS4419 *Soils for landscaping and garden use.*

(vi) The soil quality is sufficient to allow plants to grow effectively. Soil amelioration measures to improve theinfiltration of existing soils, the soil's macropore and micropore balance and ensure a stable soil ecosystem, include the following:

1. scarification of crusted topsoil layers;

2. aeration of topsoil layers;

3. deep ripping of subsoil layers;

4. using hand tools only within the tree protection zone of a tree identified for retention;

5. the application of gypsum to sodic clay topsoils and subsoils;

6. installing a 50 mm layer of lucerne hay between the topsoil and mulch layer;

7. adding worms to the topsoil;

8. applying soil rhizobia in solution to the topsoil;

9. inoculating plants with Mycorrhizal fungi; and

10. incorporating soil wetters, crystals, and wettable foams.

(f) Soil improvement additives

Any soil additives to be applied shall be as required/recommended by soil test results.

(g) Placing imported soil in gardens

(i) Garden mix soil shall be an imported "Organic Soil".

(ii) Garden mix soil shall be a minimum depth of 300 mm after consolidation.

(iii) Garden mix soil shall be placed, spread, and graded evenly in maximum 150 mm thick layers to finish ata level which allows the surface of the mulching material after consolidation to be flush with adjacent finished levels. Care shall be taken to prevent areas of excessive compaction being caused by construction equipment.

(iv) Garden mix soil shall be graded evenly to form a gentle crowned appearance at the centre of the gardenbed and/or shall conform to the finished levels detailed on the drawings.

(v) The surface of the garden mix soil shall be smooth and free from stones or lumps of soil prior to planting.

(h) Placing mulch

(i) Mulch shall be placed as soon as practicable after planting and shall be placed progressively as plantingproceeds along the length of the garden or planting area.

(ii) Mulch shall be spread smoothly and evenly over the entire garden so that after initial consolidation thefinished level of the mulch is flush with adjacent finished levels.

(iii) Mulch shall be shaped around plants to slope into the plant and shall be kept a minimum of 50 mm clearof plant stems to avoid collar rot.

(iv) Organic mulch

Organic mulch shall be placed to a depth not greater than 100 mm and as a minimum shall be maintained to a depth of 75 mm after consolidation.

(v) Inorganic mulch

Not less than 14 days prior to the placing of inorganic mulch, herbicide shall be applied to the entire areato be mulched and prior to placing the mulch.

(vi) Inorganic mulch shall be placed to a minimum depth of 100 mm unless noted otherwise on the drawingsfor the type of mulch specified.

(7) Planting

(a) General

(i) Planting shall be carried out in accordance with the best horticultural practices.

(ii) Plants shall be installed at the spacings, and locations detailed on the drawings to avoid existing servicesor to cover an area uniformly.

(iii) In feature planting areas at least 25% of tree plantings are to be provided as larger advanced stock, witha minimum 25 litre pot size.

(iv) The Contractor is required to locate all existing services prior to planting.

(v) Planting shall not be carried out if the soil is very wet or waterlogged or during periods of extreme weather conditions such as extreme heat, cold wind or rain.

(vi) Plant supplies are to be healthy, attractive, and a general high standard of stock in order to ensure long-term viability of the specimen. The stock will be free from disease, pests and weeds and structural defects.

(b) Planting procedure – container stock

(i) A planting hole with vertical sides shall be excavated to a width of twice the diameter of the root ball ofthe plant and to a minimum depth of 100 mm deeper than the height of the plant container.

(ii) The depth of the planting hole shall allow for the clearance specified and shall be in relation to the finished surface level where applicable.

(iii) The sub grade material at the bottom of the planting hole shall be loosened to a depth of at least 50% ofthe root ball depth and the compacted sides of the planting hole shall be loosened to prevent confinement of root growth to the hole. Additional excavation of the base of the planting hole may be required to ensure that the plant has sufficient sub grade drainage.

(iv) Plants shall be thoroughly watered in the pot prior to planting so that when removed from the pot the rootball is moist. Plants shall be removed from their pots without damage to the root system. Plants shall not be removed from pots until the planting hole is complete and ready for planting.

(v) The plant shall be placed in the centre of the hole with the stem vertical and shall be set at a height suchthat the top of the potting material is level with the surrounding soil. Plants placed on a slope shall be setin the centre of the hole with the top of the potting material level with the lowest side of the planting hole and the plant stem vertical.

(vi) Fertiliser tablets or granules shall be placed in the planting hole at the time of planting in accordance with the manufacturers recommended rates of application. The fertiliser shall be placed around the plant at half the depth of the planting hole and shall be covered with backfill soil to ensure no direct contactwith the plant roots.

(vii) Plants other than container stock trees placed in gardens shall be backfilled with garden mix soil as specified for the entire planting hole. The garden mix soil shall be lightly tamped around the plant andthoroughly watered to eliminate air pockets.

(viii) During planting care shall be taken to ensure that soil is not mixed with the mulch. Mulch that is contaminated with soil shall be replaced.

(ix) Container stock trees shall be backfilled in 150 mm layers up to within 200 mm of the top of the plantinghole. The backfill soil shall be tamped around the tree and thoroughly watered to eliminate air pockets. Backfill the top 200 mm with garden mix soil.

(x) In areas other than heavily planted borders, shrubs or tuft plants, each individual plant shall have a watering basin for the extent of the planting hole formed with garden mix soil around the base of the plant.

(xi) Individual container stock trees located in irrigated grassed areas shall have a 150 mm high watering basin for the extent of the planting hole formed with garden mix soil around the base of the tree.

(xii) Plants placed on a slope shall have a small horizontal terrace formed for the extent of the planting hole.

(xiii) Immediately after planting, the plants shall be watered to thoroughly water the root ball and the backfill. Watering shall be carried out progressively as planting proceeds to ensure that plants do not dry out andas a minimum, plants shall be watered within a maximum of 1 hour from planting.

(xiv) All identification labels, nursery ties and the like shall be removed from the plants immediately after planting.

(c) Planting procedure - ex ground stock plants

Editor's note - Content under development.

(d) Transplanting trees

(i) Trees to be transplanted will be noted on the construction drawings prior to the commencement of construction.

(ii) Preparation of the tree prior to transplanting shall be carried out in accordance with accepted transplanting practice and any requirements provided by council to suit the particular species and project.

(iii) Preparation of the tree for transplanting shall be commenced in sufficient time to ensure that at the timeof planting the tree is adequately prepared and will meet the specified requirements.

(iv) All transplanting work shall be carried out under the direction of a suitably qualified horticulturist or arborist.

(v) Planting of the transplanted tree shall be generally in accordance with the details shown on the drawings.

(vi) The resulting excavation after the tree has been removed shall be backfilled with compacted fill material suitable for the location.

(e) Root barrier

(i) Locations and type of root barrier shall be noted on the drawings or shall be as directed by the Superintendent.

(ii) Root barrier shall be installed as per the manufacturer's recommendations and with particular attention tothe location of any underground services and service pits.

(iii) Root barrier must be installed in all situations where it is likely that tree roots may interfere or adversely affect infrastructure - such as driveways, kerbs, pathways and other street furniture and buildings, e.g. where species such as Ficus are to be planted in reasonable proximity to pathways.

(8) Staking, ties and guying

(a) Every container stock tree shall be staked and tied unless otherwise approved by the Superintendent.

(i) Tree stakes shall be:

1. a minimum of 2 stakes per tree;
2. placed outside of the tree root ball;
3. driven into the ground a minimum one third of their length;
4. for smaller trees (trees up to 45 litre), at least 1.0 metre apart; and
5. for columnar trees, spaced to avoid excessive root ball damage.

(ii) Care shall be taken to avoid damage to the tree root system and any services when installing stakes.

(iii) All stakes shall remain in place for the entire “maintenance period” unless otherwise instructed by theSuperintendent.

(b) Ties

Ties shall be fixed securely with staples to the stakes in a figure eight pattern around the tree stem. As aminimum one tie at half the height of the main stem shall be provided with additional ties as necessary tostabilise the tree.

(c) Guying

(i) Trees requiring the installation of guying shall be noted on the construction drawings or shall be as directed by the Superintendent.

(ii) Guying consists of a minimum of three heavy duty stakes of either steel or timber driven into solid ground, with heavy duty galvanised wire ties firmly fasten to the stakes and looped around the tree trunk with suitable wrapping to protect the trunk.

(iii) Underground guying where required to be used, shall be positioned for stability purposes, placement of the guy wires shall away from the tree trunk to avoid girdling issues as the tree matures. Such tree guying practices shall be removed prior to Off Maintenance inspection and acceptance by Council.
Editor’s note - Underground guying is accepted where suitable for the tree in question.

(9) Sub soil drains construction

(a) Sub soil drains in gardens may be required in areas of heavy clay soils and in roadway medians, roundabouts, and the like. Sub soil drains shall be installed at the locations and to the details shown on the drawings.

(b) Pipes and fittings shall be perforated plastic Type 1 Class 200 to AS2439: Part 1. Sub soil drain filter fabricsshall be approved geo fabric material in accordance with the relevant Australian Standards.

(c) Pipe surround shall be a coarse washed river sand complying with the grading requirements given in Table SC6.4.12.7 - Recommended Grading for Sub-Soil Drain Sand and shall completely surround the perforated pipe.

(d) The subsoil drainpipe shall be laid to grade continuously to the outlets nominated on the drawings at a minimum grade of 1:100.

(e) Sub soil drains may be inspected by the Superintendent prior to placing any garden mix soil or backfill.

Table SC6.4.12.7 - Recommended Grading for Sub-Soil Drain Sand

A.S. SIEVE	% PASSING
9.5 mm	100
4.75 mm	98-100
2.36 mm	70-100
1.18 mm	30-78
600 µm	2-15
300 µm	0-4
150 µm	0-1

(10) Garden edging

(a) Supply and installation of concrete or recycled plastic proprietary garden edging shall be in accordance with the details on the drawings and the manufacturer's recommendations where applicable. Garden edging must be specified and installed in accordance with council standard drawing SD-641 in Section SC6.4.3 Standard drawings for landscape and open space.

(b) Supply and installation of concrete kerbing shall be as specified in Clause SC6.4.12.6 (15) Concrete kerbs.

(11) Planter boxes

(a) Planter boxes shall be constructed at the locations and to the details shown on the construction drawings.

(b) Planter box soil shall be an imported soil mix (Potting Mix). Refer to project specific specifications where applicable.

(c) Planter boxes must have appropriate drainage (see Clause SC6.4.12.6 (9) Sub-soil drains construction) provided that it is connected to a lawful discharge point. The drainage discharge is not permitted to cause nuisance, such as staining or sediments, to adjacent areas.

(12) Grass area construction

(a) General

The following work activities relate to grass areas construction:

(i) earthworks (excavation, filling and cultivation);

(ii) supply and application of soil improvement additives;

(iii) supply and placing turf soil;

(iv) supply and lay grass turf;

(v) supply and lay grass seeding;

(vi) supply and installation of hydro-seeding/mulching; and

(vii) supply and application of fertiliser.

All grass area construction shall be in accordance with the current relevant Australian Standards:

AS 4419 *Soils for landscaping and garden use*; and

AS 4454 *Composts, soil conditioners and mulches.*

(b) Co-ordination

The sequence for placing turf soil, installing irrigation, and placing turf will vary according to the type of plantsand irrigation system.

(c) Earthworks

Grass areas may require excavation or filling to achieve the finished surface levels detailed on the construction drawings. Refer to Section SC6.4.7 Clearing, grubbing and earthworks.

(d) Placing turf soil

(i) Turf soil shall be an imported soil mix Type 2 “Soil Blend”.

(ii) Turf soil shall be a minimum depth of 100 mm after light compaction.

(iii) Turf areas shall be graded to fall evenly between the finished surface levels detailed on the drawingsand/or shall be graded to drain freely to stormwater inlets without causing ponding. As a minimum turfed areas shall be graded to fall at 1:100.

(iv) Turf soil shall be spread evenly and shall be lightly compacted to finish at a level which allows for the finished turf surface to be flush with adjacent surfaces such as paved areas, pathways mowing strips andthe like. Care shall be taken to prevent areas of excessive compaction being caused by construction equipment.

(v) The surface of the turf soil shall be smooth and free from stones or lumps of soil prior to laying the turf.

(e) Turf material

(i) Turf shall be the species nominated on the drawings and shall be supplied by a specialist grower of cultivated turf approved by the Superintendent.

(ii) Where turf areas are provided within centre medians, round-abouts and other identified areas of roadreserve where edging/mowing may require traffic control, all turf is to be Empire Zoysia or approved similar turf and of a minimum width of 1.6 m to allow for clear mowing access.

(f) Laying turf

(i) Prior to laying turf, fertiliser shall be thoroughly mixed into the turf soil. Refer to Table SC6.4.12.13 - Recommended Grading for Sub-Soil Drain Sand forapplication rates.

(ii) Areas to be turfed shall be divided into sections that can be prepared and completed (including adequate watering) in the same day.

(iii) Turf shall be laid in straight lines in a stretcher bond pattern across the fall of the slope or parallel withthe long side of level areas. Cross joints shall be staggered with a maximum gap of 5 mm between adjacent sections of turf.

(iv) Immediately after laying the turf shall be rolled with a roller weighing not more than 90 kg/m of width.

(v) As soon as practicable after rolling turf shall be watered thoroughly with a fine spray to a depth of 150mm. Watering shall continue as necessary to maintain moisture to this depth and to maintain the turf ina healthy condition.

(vi) Where levels have deviated from the design levels after placing and watering the turf shall be lifted and the section regraded with turf soil to achieve design levels prior to replacing the turf.

(vii) Turf shall be protected from pedestrian traffic until established and shall be protected from vehicle traffic at all times.

(13) Hydro seeding/mulching

(a) General

(i) Excavation, filling, cultivation and placing imported soil mix for hydro seeding/mulching areas shall be as specified for turf areas.

(ii) Details for hydro seeding/mulching supply and sowing shall be as noted on the drawings and/or asspecified under separate cover.

(iii) Organic mulches are to be applied to landscaped garden beds and trees which:

1. meet AS 4454 *Composts, soil conditioners and mulches*;

2. are applied to a depth of 75 – 100 mm;

3. are of a coarse texture to allow water penetration to prevent nitrogen drawdown of the soil;
a) are aged prior to application;

4. do not use plastic sheeting for weed suppression, as it prevents rainwater from infiltrating soils and inhibits gaseous exchange between the soil and air; and

5. use a biodegradable mulch mat on any waterway embankment.

(iv) Inorganic mulches, such as recycled concrete or brick cobbles, are limited to feature or themed landscapes, or in windy areas where organic mulches may be blown away.

(b) Supply of mulch materials

(i) Mulch materials supplied shall be free of deleterious and extraneous matter such as soil, weeds, seeds,rubbish, vermin, insects, pests, fungus, sticks, disease, declared plants or noxious weeds and shall be free of any matter toxic to plant growth or germination.

(ii) All mulch materials supplied shall be in accordance with AS 4454 *Composts, soil conditioners and mulches.*

(iii) Organic mulch

Organic mulch may be either:

1. tea tree mulch from an approved supplier; or

2. wood chip produced by the chipping of native and other approved vegetation removed during theclearing and grubbing process on site (max 50 mm size); or

3. wood chip obtained from a council stockpile as directed by the Superintendent or his delegated site supervisor; or

4. other material as noted on the drawings.

(iv) Inorganic mulch

(v) Inorganic mulch shall be of the type and quality and noted on the construction drawings.

(c) Surface preparation

(i) Level sites

Prior to hydro seeding/mulching the area to be treated shall be graded to fall evenly between the finishedsurface levels detailed on the drawings and/or shall be graded to drain freely to stormwater inlets without causing ponding.

(ii) Embankments and slopes (1 on 5 maximum slope)

Prior to hydro seeding/mulching the area shall be lightly cultivated across the slope to minimise surfacerun-off and erosion. After cultivation, soil crumb size shall not exceed 20 mm.

(iii) The surface of the area to be treated shall be free from weeds, stones, roots, sticks or other

deleteriousmaterial and have a general moisture content of around 10% just prior to applying the hydroseed/mulch.

(d) Irrigation

An approved temporary above ground irrigation system shall be installed to ensure establishment of the hydro seeding/mulching is achieved within the timer frame specified. Refer to Section SC6.4.13 Irrigation.

(14) Paving construction

Refer to Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.10 Segmental paving.

All areas of road reserve fronting a subject site must be assessed against and treated in accordance with Section SC6.4.20 Footpath treatment and outdoor diningdesign, Clause SC6.4.20.1 Footpath treatment where specified.

(15) Concrete kerbs

This section contains specific details for construction of concrete kerb in landscape and open space situations. Concrete kerb is most commonly used for garden edge or as a restraint for softfall areas in playgrounds.

All concrete garden edge kerb or similar structure shall have minimum rectangular profile dimensions of 150 mm wide x 200 mm deep with edges rounded to a radius of 20 mm (minimum) and constructed in accordance with Section SC6.4.18 Concrete works. Where the concrete garden edge kerb abuts grass areas, the surface of the kerb must finish level with the surface level of the grass area.

(16) Concrete works

For all concrete works associated with Landscaping activities refer to Section SC6.4.18 Concrete works.

(17) Masonry work

This section covers the supply of all materials, placing and finishing of all masonry blockwork including concrete core-filling and clay brickwork. Masonry Work includes walls, retaining walls, free standing piers, structures, and the like. All masonry work shall conform to the requirements of AS 3700.

(a) Materials

(i) Blocks - Hollow load bearing masonry blocks shall conform to the requirements of AS 3700 - Section 2and shall have a characteristic unconfined compressive strength of 15 MPa unless nominated otherwise agreed.

(ii) Masonry blocks shall be sound, dry, clean, and crack free and shall have been cured for not less than 14days before delivery. The correct type of block shall be used to make provision for all lintels, pilasters,bond beams, openings, etc.

(iii) Clean out blocks shall be used in the first course of all reinforced cores and/or where cores are to beconcrete filled.

(iv) Cement - for mortar shall be Portland Cement Type A and shall conform in all respects with the requirements of AS 3972.

(v) Sand - for mortar shall be clean, sharp, and free from organic impurities and excess fines and efflorescing salts.

(vi) Water - used in mixing concrete shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

(vii) Hydrated lime shall conform to the requirements of AS 1672.1.

(viii) Admixtures - no air entraining additives or other admixtures shall be incorporated in the mortar unless specifically approved by the Superintendent.

(ix) Reinforcement - shall comply with AS/NZS 4671 as applicable.

(x) Clay bricks - and brickwork shall conform to AS 3700. Clay brick shall have a characteristic unconfinedcompressive strength of 40 MPa unless otherwise agreed.

(b) Mortar for blockwork

(i) All mortar for blockwork shall consist of a homogeneous mixture of the ingredients and shall be classified as M4 in AS 3700. The following proportions by volume shall be used unless the minimum compressive strength of mortar at 28 days has been nominated on the drawings. Cement 1: Lime 0 to0.25: Sand 3.

(ii) The mortar components shall be properly volume batched using calibrated volume boxes. Batching by shovel will not be permitted.

(iii) Mortar shall be mixed in an approved mixing machine for not less than 3 minutes. Hand mixing shall not be permitted unless specifically approved by the Superintendent. The dry ingredients shall be thoroughly mixed prior to the addition of water, which shall then be worked thoroughly through the mixture.

(iv) Mortar shall be transported in a covered container such that excessive evaporation will be prevented.Retempering of mortar shall not be permitted.

(c) Core fill concrete

(i) Core fill concrete shall comply with the relevant requirements of AS 3600 *Concrete Structures*. Readymixed concrete from an approved supplier shall be used. As a minimum and unless shown otherwise onthe drawings, core fill concrete supplied shall have the following properties in Table SC6.4.12.8 – Core Fill Concrete Characteristics.

Table SC6.4.12.8 – Core Fill Concrete Characteristics

Property	Design Value
Characteristic strength F'c at 28 days	N 20
Nominal maximum size of aggregate	10 mm
Slump	230 mm +/-30 mm

(ii) Testing of core fill concrete supplied shall be carried out by the Concrete Supplier as part of the suppliers Quality Assurance System. The Contractor is required to provide the Superintendent with copies of the suppliers Test Certificates relating to the particular batch of core fill concrete supplied.

Core fill concrete supplied that does not meet the requirements of this specification shall be liable to rejection by the Superintendent. If directed by the Superintendent, the Contractor will rectify any masonry wall which has been filled with rejected core fill concrete.

(d) Laying blocks

(i) All work shall be carried out by experienced tradesmen to the general requirements of AS 3700 - Section 8. Blockwork shall be laid in lifts or not more than 2400 mm in height.

(ii) All blocks shall be laid dry and wetting of the blocks shall not be permitted under any circumstances.

(iii) Cutting of blocks shall be reduced to an absolute minimum by setting out to avoid irregular or brokenbond.

(iv) Blocks shall be stacked on planks or other supports free from contact with the ground and shall be covered at all times to ensure that the blocks remain dry.

(v) Blocks shall be laid in straight uniform courses of running bond unless noted otherwise on the drawings.Intersecting walls shall be bonded as shown on the drawings.

(vi) The surface of the concrete footing, floor slab, beam, etc. on which the base course is to be laid shall bethoroughly cleaned prior to laying the base course to ensure all laitance is removed.

(vii) The base course shall incorporate clean out blocks at every reinforced core, with the clean out openingon the inside face of the wall.

(viii) Reinforcement starter bars shall be checked for alignment prior to laying the base course. Starter barsshall be vertical. Bending starter bars to allow the laying of the base course is not acceptable. Any starter bars out of position shall be rectified by the Contractor as directed by the Superintendent.

(ix) For unreinforced and reinforced masonry walls, horizontal joints shall have full mortar coverage on theface shells and on the webs.

(x) For unreinforced masonry walls all vertical joints shall have full mortar coverage. For reinforced masonrywalls all vertical joints shall be buttered only for the thickness of the face shells.

(xi) All horizontal and vertical joints shall be 10 mm in width with a maximum mortar intrusion into the coresof 6 mm. Mortar droppings into cavities or cores shall be avoided.

(xii) Tooling of the joints shall be done when the mortar is partially set but still sufficiently plastic to bond. Alltooling shall be done with a V-shaped or round bar in a manner that will compact the mortar rather than drag it out. Raked joints shall not be permitted to encroach more than 5 mm in depth.

(xiii) If it is necessary to move a block after it has been set in place with mortar, then the block shall be removed from the wall, the mortar removed, and the block shall be reset in fresh mortar.

(xiv) Capping blocks shall be fixed with a suitable flexible external grade adhesive as detailed on the drawings. Laying capping blocks in mortar only is not acceptable.

(xv) Where new blockwork is to be laid on top of an existing masonry block wall, the existing core concreteshall be cleaned to expose all aggregate and treated using an adhesion enhancer such as bondcrete orapproved equivalent before block laying is commenced.

(xvi) Extreme care shall be exercised to prevent mortar adhering to the face of blockwork. Acid shall not beused to clean down masonry walls.

(e) Reinforcement

(i) Steel reinforcement shall be supplied and bent in accordance with AS 3700. Re-bending of reinforcement with or without heating is not permitted unless approved by the Superintendent.

(ii) Steel reinforcement shall be free from rust, oil, varnish, mud or any other coatings, cracks, scale blisterand other defects and shall comply in all respects with AS/NZS 4671.

(iii) All horizontal reinforcement shall be laid into the wall as the block laying progresses. Galvanised wire loops shall be cast into the horizontal joints prior to placing the reinforcement to ensure correct positioning of the reinforcement.

(iv) Vertical reinforcement shall be placed after the wall has been laid and shall be placed in the core withthe correct cover to the face of the blocks as detailed on the drawings. Unless noted otherwise on thedrawings vertical reinforcement shall be placed in the centre of the core.

(v) Splice lengths for both horizontal and vertical reinforcement shall not be less than 45 bar diameters forplain round bars or 30 diameters for deformed bars or 450 mm, whichever is the greater.

(vi) All reinforced block walls shall have vertical reinforcement in the core at the ends, corners, sides ofopenings, adjacent to control joints, at unbonded intersections and at the maximum centres betweenthese points.

(f) Cast in elements

(i) The Contractor shall co-ordinate with all other trades as necessary to ensure that all conduits, fitments,penetrations, and the like are incorporated in the masonry as detailed on the drawings and as specified.

(ii) All bolts, anchors and other steel fittings shall be accurately set into the walls as the work progressesand positioned such that they shall be thoroughly embedded in mortar or core filling concrete as required.

(iii) Where items to be cast into the blockwork are found to be out of position and cannot be satisfactorily corrected, then the section of blockwork shall be completely demolished, and then reconstructed toallow correct positioning.

(g) Joints in blockwork

(i) Joints in blockwork shall be the type and at the locations detailed on the drawings. Joints with steel dowels shall have the dowels securely supported to ensure that the dowel remains in the correct positionduring the placing of core fill concrete.

(ii) Construction joints shall be located as detailed on the drawings or shall be located where agreed withthe Superintendent to suit specific site requirements.

(iii) Joint filling compounds shall be as detailed on the drawings and shall be installed in accordance with themanufacturers' recommendations, with particular attention to the preparation of the blockwork surface to suit the application of the joint filling compound.

(h) Placing core fill concrete

(i) Masonry walls shall cure for at least 3 days before core fill concrete is placed.

(ii) The cores to receive core fill concrete shall be cleaned of all mortar protrusions by rodding from the top ofthe wall. All mortar droppings and foreign matter shall then be removed via the clean out openings at the base of the wall, the vertical reinforcement positioned, and formwork fixed in place to seal the clean outblock opening.

(iii) Core filling shall not proceed until the reinforcement and cores have been inspected by the Superintendent. Clean out openings shall not be sealed until the inspection has been carried out.

(iv) Core fill concrete shall be thoroughly compacted into place as it is poured with the aid of small immersion vibrators or rodding. Block cores shall be topped up after settlement occurs.

(v) Core fill concrete shall be placed for the full height of the blockwork in lifts of not more than 2400 mm inheight. A minimum delay period of 1 hour and a maximum delay period of 3 hours shall be observed between lifts.

(vi) Proprietary core plates shall be used to confine the core fill concrete to the reinforced cores.

(vii) Placing of core fill concrete in bond beams shall be done in one continuous operation for the full length of the bond beam. Construction joints in bond beams other than control joints, are not acceptable.

(viii) Extreme care shall be exercised to prevent slurry adhering to the face of blockwork. Acid shall not beused to clean down masonry walls.

(i) Mortar for clay bricks

(i) All mortar for clay bricks shall consist of a homogeneous mixture of the ingredients and shall be classified as M3. Refer to AS 3700.

(ii) The following proportions by volume shall be used unless the minimum compressive strength of mortar at 28 days has been nominated on the drawings. Cement: 1, Lime: 1, Sand: 6.

(j) Laying clay bricks

(i) Clay bricks shall be fully bedded and fully faced. Bed joints shall be 10 mm nominal height.

(ii) Clay brick masonry walls shall be laid with galvanised brick ties at 600 mm maximum centres each wayand at 300 mm centres adjacent to openings in accordance with manufacturer's specifications.

(k) Protection of walls

(i) During construction and after the wall is laid and prior to placing core fill concrete; under no circumstances shall masonry blocks be wetted or allowed to become wet.

(ii) At the completion of a day's work and during wet weather the top and sides of all walls shall be coveredto prevent rain penetrating the cores and wetting the blocks.

(iii) During the construction of masonry walls and prior to the core fill concrete having gained its full strength,the Contractor shall protect the wall by suitable means such as bracing to ensure that the wall is not damaged and to ensure the safety of workers on the site.

(l) Tolerances

(i) All masonry shall be built true and plumb such that the maximum "out-of-plumb" in a 3 m height does notexceed 10 mm.

(ii) The bed joint at any level shall be within ± 3 mm.

(m) Surface finishes to masonry

(i) Surface finishes, such as painting, rendering or textured finishes shall be as detailed on the drawings oras nominated in the Finishes Schedule.

(ii) Prior to applying any surface finish, the substrate shall be free from dirt, dust, oil, grease, mould, fungi, efflorescence, release agents, bond breakers, scaling and laitance or any other contaminants or foreignmaterial that may affect adhesion. Remove all traces of loosely adhering material by scraping, grinding,wire brushing or air blowing as necessary.

(iii) Preparation of the surfaces to be treated, application of the surface finish and curing after application if required, shall be carried out in strict accordance with the manufacturer's recommendations. Particular attention shall be made to application during suitable weather conditions.

(iv) Gap fill and/or sealant material used for joints or cracks in walls shall be checked for compatibility with the proposed surface finish.

(v) Anti-vandal coatings shall be used in circumstances where walls are exposed (I.e., not screened by softlandscaping) and prone to graffiti.

(vi) Dissimilar materials adjacent to surfaces to be treated shall be masked to avoid contact, (E.g., capping and flashings).

(vii) The Contractor shall provide the Superintendent with all warranty details of the surface finishes.

(18) Stormwater drainage

Reference should be made to Clause SC6.4.5 (5) Open drains.

(19) Infrastructure items

Supply and installation of infrastructure items such as timber decking, timber and steel fencing, seats, picnic sets,barbeques, play equipment and signage shall be as detailed on the drawings and constructed in strict accordance with the manufacturers' specifications. The Contractor shall provide the Superintendent with all warranty details.

Concrete for footings, plinths and the like for infrastructure items shall be in accordance with Section SC6.4.18 Concrete works.

(20) Landscaping materials

Material *(sample only - to be completed by compiler)*	**Type**	**Minimum Application Rate**
SEED - Open Drain	Cynodon dactylon (hulled) Cynodon dactylon (unhulled) Indian Blue Cooch (Bothriochloapertusa) Japanese millet n.b. application of Indian Blue Cooch(and other tropical grasses) must consider daily minimum temperaturesfor germination requirements. Typical planting for tropical grass seed is September to March	20kg/ha 20kg/ha 15kg/ha 10kg/ha
SEED - Native	Acacia buxifolia Acacia decurrens Acacia pravissima Leptospermum lanigerum Hardenbergia violacea Kennedia prostrata Acacia implexa Banksia marginata Bursaria spinosa Callistemon pallidus Dodonaea viscoca N.b., the species noted are indicativeonly. Native seed selection must consider the location (including surrounding vegetation and soil condition), purpose and maintenance outcomes. All native seed mixes must be accepted by council prior toapplication.	1 kg/ha 1 kg/ha 1 kg/ha 1 kg/ha 500 g/ha 500 g/ha 200 g/ha 200 g/ha 200 g/ha 200 g/ha 200 g/ha
ORGANIC FIBRE MATTING	E.g., Organic coir matting, minimum700gsm. N.b., products must be selected basedon specific purpose and design life required. Dry tropic UV radiation significantly reduces the life of many lightweight matting products.	N/A
TURF/GRASS – Medians	Cynodon dactylon (Green Couch) A-grade Zoysia japonica (Empire Zoysia)	

TURF/GRASS – Verges/Footpaths	Cynodon dactylon (Green Couch) A-grade Zoysia japonica (Empire Zoysia) N.b., grassing verges other than typical urban roadsides, where slopeor other maintenance considerations are present, requires a case by case assessment.	
TURF/GRASS – Parks & Formal Open Space	Cynodon dactylon (Green Couch) A-grade Zoysia japonica (Empire Zoysia) Zoysia macrantha (Nara Native) for salt tolerance	

SC6.4.12.7 Attachments

Attachments	**To obtain a copy of the document**
Attachment A - Public Open Space Embellishment Framework	Click here
Attachment B - Permeable Paving Colour Guide	Click here
Attachment C1 - Acceptable Plant Species List - Street Trees in Road Reserve	Click here
Attachment C2 - Acceptable Plant Species List - Trees in Public Parks and Open Spaces	Click here
Attachment C3 - Acceptable Plant Species List - Trees in Private Open Spaces	Click here
Attachment C4 - Acceptable Plant Species List - Understorey Plants	Click here
Attachment D - Parks and Open Space Maintenance Service Level	Click here
Attachment E - Parks and Open Space Maintenance Costing Table	Click here

Editor's Note (Attachments C1, C2, C3 and C4) -

(1) Nomenclature generally based on Census of the Queensland Flora 2013, edited by Peter D. Bostock and Ailsa E. Holland found on theQueensland Government data website = indicates where plant name differs from Australian Plant Name Index at http://www.anbg.gov.au/cgi-bin/apclist. Synonyms included where superseded name is still in common use in trade.

(2) Refer streetscape design and treatments section for location and setback requirements. Case by case assessment of species suitability will be required dependent on location (verge, central median etc.).

(3) Refer public open space section for requirements in these locations.

(4) Species with a natural distribution within North Kennedy Pastoral District. Distribution checked against Census of the Queensland Flora 2010.

(5) Refer to development codes for offset distances from property boundaries.

Development manual planning scheme policy (PSP)

SC6.4.13 Irrigation

Index

SC6.4.13.1 Irrigation policy

(1) Introduction
(2) Irrigation design
(3) Economic sustainability
(4) Environmental sustainability
(5) Social sustainability
(6) Irrigation Profile Level (IPL) Framework
(7) Irrigation Profile Level (IPL) Hierarchy Definition
(8) Irrigation Profile Level (IPL) Matrix

SC6.4.13.2 Irrigation design and system requirements

(1) Introduction

SC6.4.13.3 Water features and water play areas

SC6.4.13.4 Attachments

Attachment A – Adopted Master Plan

SC6.4.13.5 Construction

(1) Introduction
(2) Irrigation pipework
(3) Control systems
(4) Water meter assembly
(5) Sprinklers, turf valves, and drip irrigation
(6) Drinking fountain and water tap.
(7) Effluent reuse systems
(8) Installations located in landfill sites

SC6.4.13.1 Irrigation policy

(1) Introduction

(a) Purpose

The purpose of this section is to:

(i) support Part 9.3.3 Landscape code and other elements of the Townsville City Plan and SC6.4 Development manual planning scheme policy;

(ii) identify the application of this section to irrigation design across all types of openspace; and

(iii) provide detailed design and construction standards, advice, and guidelines for irrigation on private and public land ensuring a high standard, sustainability, life cycle costs & environmental enhancement of the city image and local character that are suited to site and climatic conditions and will remain fit for purpose over the long term.

(b) Scope

This section provides direction on irrigation design within open space, both within the public and private realm.

The scope of this section includes:

(i) overarching design, sustainability and management principles that should be applied to open space development including:

1. general design principles, master plans and identified design outcomes;
2. principles of sustainability economic, environmental, and social; and
3. management frameworks for Public Open Space (POS) Hierarchy, Public Open Space Management (POSM) Framework and Irrigation Profile Level (IPL) Framework;

(ii) the types, functions, and development objectives for open space:

1. private open space;
2. streetscapes; and
3. public open space recreation parks, sporting parks and other public open space; and

(iii) design and embellishment guidelines for application in open space development.

(c) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(i) Townsville City Plan and SC6.4 Development manual planning scheme policy sections:

Part 9.3.4 – Reconfiguring a lot code

Section SC6.9 Natural assets planning scheme policy

Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.1 Geometric road design

Section SC6.4.14 Public utility and building over/near services

Section SC6.4.20 Outdoor dining design

(ii) Australian Standards:

AS/NZS 1158.3.1	*Lighting for roads and public spaces - Part 3.1: Pedestrian area (Category P) lighting — Performance and design requirements*
AS 1170	*Structural design actions (set)*

AS 1428	*Design for access and mobility (set)*
AS 1926.1	*Swimming pool safety standards Part 1: Safety barriers for swimming pools*
AS 2156	*Walking tracks (set)*
AS 2890.3	*Parking facilities - Part 3: Bicycle parking*
AS 3996	*Access covers and grates*
AS 4373	*Pruning of amenity trees*
AS 4422	*Playground surfacing – Specifications, requirements, and test methods*
AS/NZS 4486.1	*Playgrounds and playground equipment – Part 1: Development, installation,inspection, maintenance, and operation*
AS 4685.1	*Playground equipment and surfacing – Part 1: General safety requirements and test methods*
AS 4685.2	*Playground equipment and surfacing – Part 2: Additional safety requirements and test methods for swings*
AS 4685.3	*Playground equipment and surfacing – Part 3: Additional safety requirements and test methods for slides*
AS 4685.4	*Playground equipment and surfacing – Part 4: Additional safety requirements and test methods for cableways*
AS 4685.5	*Playground equipment and surfacing – Part 5: Additional safety requirements and test methods for carousels*
AS 4685.6	*Playground equipment and surfacing – Part 6: Additional safety requirements and test methods for rocking equipment*
AS 4685.11	*Playground equipment and surfacing – Part 11: Additional specific safety requirements and test methods for spatial network*
AS/NZS 4456.9	*Masonry units and segmental pavers and flags – Methods of test – Determining abrasion resistance*
AS/NZS 4586	*Slip resistance classification of pedestrian surface materials*

(i) Other:

Austroads	*Guide to Road Design* (Set)
Department of Transport and Main Roads	*Road Landscape Manual, Second Ed., June* 2013
Department of Transport and Main Roads (MUTCD)	*Manual of Uniform Traffic Control Devices*
Department of Transport and Main Roads	*Queensland Guide to Traffic Management* (QGTM) - *Part 6: Intersection, Interchanges and Crossings Management*
Queensland Government	*Crime Prevention through Environmental Design*, *Guidelines for Queensland*,2021
Queensland Government	*Census of the Queensland Flora*, 2013, edited by Peter D.Bostock and AlisaE.Holland.

Western Australian Department of Sport and Recreation	*Sports Dimensions Guide for Playing Areas.*
Australian Building Codes Board	*National Construction Code*

(2) Irrigation design

(a) Introduction

Landscape and irrigation outcomes should demonstrate consideration and application of the overarching principles, as described within this section, Part 9.3.3 Landscape code and other parts of the Townsville City Plan.

Alignment with applicable principles should be expressed in the landscape and irrigation design outcomes and addressed in a "Landscape Statement of Intent", as detailed in Section SC6.4.2 Development application guidelines.

(b) Master plans

For certain sites or localities, Council may formally adopt Master Plans that identify specific strategies and plans to deliver key design and construction outcomes.

At sites or locations where these Master Plans apply, any landscape design outcomes must be in accordance with the requirements for that site or area.

The following plans contain site specific outcomes that must be complied with:

(i) Thuringowa Riverway Master Plan (2003); and

(ii) Riverway Sustainable Development Policy (2003).

Details of the above listed plans are contained in Clause SC6.4.13.4 Attachment B – Adopted Master Plans.

Editor's Note - Applicants should refer to all applicable sub-sections within the Development manual planning scheme policy which identify specific design principles and outcomes required across individual open space typologies as well as other infrastructure.

Editor's Note - Outcomes identified in an adopted master plan take precedence over all other design guidelines, unless approved otherwise. Where proposals deviate from the desired outcomes of the adopted master plan, applicants must justify this deviation for Council's assessment and approval.

(c) Identifiable character and/or identified design outcomes

For key sites or localities where Council has not formally adopted area specific plans and strategies but there is an identifiable character and/or desired design outcome, planning and design for new open space development in these areas should seek to be consistent or complementary to this established direction.

Identifiable character and/or design outcomes may include:

(i) an established colour or furniture palette;

(ii) a dominant tree, plant species or planting style;

(iii) heritage features or an identifiable character;

(iv) significant natural features, materials, or environmental setting (e.g., natural bushland or coastalsettings); and

(v) a consistent, hierarchical based landscape design style (e.g., all "main roads" to be developed in "tropical boulevard" style).

Editor's Note - Statements pertaining to identifiable character or design outcomes for particular locations or land uses are contained within Townsville City Plan. Where applicable, landscape design outcomes are to comply

with these statements and must be addressed within the “Landscape Statement of Intent”. Where proposals will deviate from the desired outcomes, applicants must justify this deviation for further assessment and approval by Council.

(3) Economic sustainability

Landscape and irrigation outcomes should demonstrate consideration and application of economic sustainability principles, as described within this section, Part 9.3.3 Landscape code and other areas of the Townsville City Plan.

Alignment with applicable principles should be expressed in the landscape and irrigation design outcomes and addressed in the “Landscape Statement of Intent”, as detailed in Section SC6.4.2 Development application guidelines.

(a) General principles

Principles for consideration should include, but are not limited to:

(i) promoting opportunities for business and investments by:

1. designing quality streetscapes that promote local business and attract patrons; and

2. creating opportunities for marketing initiatives such as festivals, events, and community-based activities (e.g., provision of event spaces within public open space areas);

(ii) developing and implementing an integrated and strategic approach to the long-term provision of open space infrastructure by:

1. aligning new public open space development with Council’s Public Open Space Embellishment Framework and priority infrastructure plans; and

2. designing and developing new infrastructure and open space that improves the quality and value of the built environment within both the public and private realm (e.g., creating more liveable spaces that promote the city as an attractive place to live and invest); and

(iii) establishing economically sustainable infrastructure outcomes by:

1. identifying the lifecycle costs of open space infrastructure (e.g., the costs to plan, develop, maintain, replace, and demolish a recreational facility are established); and

2. identifying and developing new infrastructure with consideration of the ongoing operational requirements (e.g., identify and design a new open space development in line with defined maintenance resources).

(b) Lifecycle costing

Editor’s Note - Currently, no framework or standard format for establishing lifecycle costs is developed. Applicants requested to submit lifecycle costing information should refer to best practice examples until a formal framework is established.

(c) Ongoing operational requirements

(i) Where requested, applicants are required to identify the ongoing operational requirements in a maintenance plan, as detailed in Section SC6.4.2 Development application guidelines.

(ii) For public open space, maintenance plans should be aligned with Public Open Space Management (POSM) Framework.

(4) Environmental sustainability

Landscape and irrigation outcomes should demonstrate consideration and application of environmental sustainability principles, as described within this section, Part 9.3.3 Landscape code, other areas of the Townsville City Plan and Council's Corporate Plan.

Alignment with applicable principles should be expressed in the landscape and irrigation design outcomes and addressed in a "Landscape Statement of Intent", as detailed in Section SC6.4.2 Development application guidelines.

Editor's Note - Currently, no framework has been developed for identifying and documenting outcomes against the environmental sustainability objectives listed. Until a formal framework or best practice examples are identified, applications will be considered on a case-by-case basis. This includes recognition of independent certification under an incentive-based branding and certification frameworks (e.g., Enviro Development) designed to increased sustainability in developments.

(a) Principles for consideration should include, but are not limited to:

(i) conservation and substitution of non-renewable resources, by:

1. responsible use of finite resources; and
2. implementation of efficiency mechanisms and strategies, (e.g., reduction of potable water use through water wise landscape and irrigation design);

(ii) efficient and sustainable use of renewable resources, such as:

1. prioritising and promoting innovative use of new, renewable materials or substitutes; and
2. transitioning to renewable energy sources and infrastructure where practicable (e.g., solar lighting);

(iii) direct and indirect reduction in resource consumption and waste generation, by:

1. implementing opportunities for waste reduction and reuse;
2. prioritising and promoting use of recycled materials (e.g., recycled plastic composites);
3. promoting means for reducing carbon emissions and improving opportunities for carbon offsets and sequestration (e.g., reducing land clearing by promoting protection of existing trees and vegetation areas and incorporation of natural areas into public open space design); and
4. promoting environmentally sustainable design principles to reduce resource consumption directly and indirectly (e.g., increased street tree plantings to support passive cooling of streetscapes and buildings whilst improving amenity to promote pedestrian and cyclist activity); and

(iv) protection, rehabilitation or enhancement of existing natural assets and systems through methods such as:

1. responsive planting design and species selection;
2. protection of remnant vegetation, significant trees, and habitat areas;
3. promotion of ecological design and responsible urban forestry management; and
4. implementation of integrated water cycle management practices.

(5) Social sustainability

(a) Outcomes

Irrigation outcomes should demonstrate consideration and application of social sustainability principles, as described within this section, Part 9.3.3 Landscape code and other areas of the Townsville City Plan.

Alignment with applicable principles should be expressed in the landscape and irrigation design outcomes and addressed in the “Landscape Statement of Intent”, as detailed in Section SC6.4.2 Development application guidelines.

(6) Irrigation Profile Level (IPL) Framework

As part of Council’s commitment to efficient, cost effective and responsible use of natural resources, Council has developed an Irrigation Profile Level (IPL) Framework to categorise and define irrigation water usage within public open space.

The IPL Hierarchy identifies and defines a number of “profile levels” based on the level of irrigation applied, an indicative “functional application” based on open space typologies, and the performance indicators associated with each irrigation application rate. Refer to Clause SC6.4.13.1 (7) for IPL Hierarchy.

Supporting this, the IPL Matrix identifies a number of criteria and “influences” used in the determination of an assigned IPL. Refer to Clause SC6.4.13.4 Attachment D for the IPL Matrix.

Importantly, it must be recognised that the level of irrigation required is directly dependent upon the landscaping which it must support. As such, in the development of new public open space, the landscaping should be designed with consideration of the typical IPL classification for the public open space typology as well as the extent of landscaping and irrigation defined by the POS embellishment standards. Additional requirements are identified in Clause SC6.4.13.2 Irrigation design and system requirements.

For existing public open space, the IPL classification must be based upon the required irrigation application rate necessary to support the health and longevity of the existing landscaping. Where a change to the IPL is proposed, this must include consideration of the open space typology, the intended use of the open space area and the impacts of reduced water application rate on existing plant specimens and include changes to the landscaping plantings where required.

Critically, an area of public open space may have more than one IPL (e.g., “high” IPL level around the activity node or within the minimum usable space, and then a “medium” or “low” profile for the balance of the open space). To achieve this in an efficient and effective manner, however, the associated landscaping and irrigation systems must be purpose designed for this outcome (I.e., separate irrigation systems consistent with species selection and placement based on principles of hydro zoning).

(7) Irrigation Profile Level (IPL) Hierarchy Definition

The Council’s Irrigation Profile Level (IPL) Hierarchy includes the following types: High, Medium, Low, None.

Table SC6.4.13.1 - Irrigation Profile Level (IPL) Hierarchy Definition

IPL	Function Description	Performance Requirements	Typical Image of Turf Area
High	Provides irrigation to Townsville City Councils landscaped areas including: Public open spaces, Facilities, and utility assets, Local road reserves and street scaping Provides irrigation to State Government main road - road reserves. Formal gardens irrigatedto (IPL) levels High and Medium only.	Provide irrigation in a uniform application to supply landscaping plants with soil moistureto Promote: Vigorous plantgrowth, Best planthealth, Best presentation. Visual Indicators - turf:Lush thick turf, Rich even green appearance. Yearly application range (assumed clay to clay loam soil types and subject to site conditions) - Turf 28 - 38 mm per week. Garden 18 –28mm per week.	
Medium	Provides irrigation to Townsville City Councils landscapedareas including: Public open spaces, Facilities and utility assets, Local road reserves and street scaping Provides irrigation toState Government main road - road	Provide irrigation in a uniform application to supply landscaping plants with soil moisture to Promote: Good plantgrowth, Good planthealth, Good presentation. Visual Indicators - turf: Mostly mediumthickness turf, Mostly green appearance, with some	

	reserves. Formal gardens irrigated to (IPL) levels High and Medium only.	patches of green/brown. Yearly application range (assumed clay toclay loam soil types and subject to site conditions) - Turf 18 - 28mm/week, Garden 15 – 25mm/week.	
Low	Provides irrigation to Townsville City Council's landscapedareas including: Public open spaces, Facilities and utility assets Local road reserves and street scaping Provides irrigation to State Government main road - road reserves. Formal gardens irrigated to (IPL) levels High and Medium only.	Provide irrigation in a uniform application to supply landscaping plants with soil moisture to Sustain: Minimal plantgrowth, Minimal planthealth, Minimal plant presentation. Significant seasonal influences on landscaping. Visual Indicators – turf:Thin coverage ofturf, Mostly brown with green tingeappearance, some patches ofbrown. Yearly application range (assumed clay to clay loam soil types and subject to site conditions) - Turf 12 - 20mm/week.	

Non	Areas where no irrigation is required: Natural areas Naturally landscaped areas such as native plantings, Open grass areas such as drainage swales, Other areas deemed not requiring irrigation.	Areas depend solely onrain and naturally occurring moisture. Seasonal plant growth, health, and presentation.	

(8) Irrigation Profile Level (IPL) Matrix

SC6.4.13.2 Irrigation design and system requirements

(1) Introduction

(a) Intent

Irrigation systems solely exist for the purpose of providing water to maintain the soil moisture content above the horticultural assets permanent wilting point and below the maximum field capacity. These conditions are required to maintain the health and growth of the horticultural assets.

(i) These guidelines, set out the scope of work, workmanship standards and the responsibilities for the supply and installation of irrigation systems within private open space and public open space and streetscapes that will become a Council asset on handover.

(ii) In addition to this requirement Council seeks to minimise water usage within all open space and reduce maintenance and operational costs associated with the council owned irrigation systems.

(iii) Product and brand names for components in this sub-section are used to define a standard and quality acceptable to Council, with particular emphasis on long term maintenance requirements. Components other than those specified may only be used if the components are of equal or better standard and quality of those specified and an authorised change has been approved by Council.

(iv) Where the developer/applicant has installed an unauthorized irrigation system not approved by Council, the developer/applicant will be required to remove such irrigation systems and rectify at their expense.

(v) Developer/applicants must acquaint themselves with Council's water restrictions of the time, and where required obtain written permission from Council to implement landscape treatments that require establishment water treatment. Such water treatment permissions shall be in line with Council's water restriction policy requirements for the establishment period.

(b) Irrigation design objectives

(i) to ensure that irrigation systems are designed to the highest industry standards with the goal of maximising the efficient usage of water;

(ii) to ensure that irrigation systems and components are installed in accordance with the relevant industry standards and tradesman like workmanship; and

(iii) to ensure that the irrigation systems and components installed are of a quality and standard acceptable to Council, with regard to the life of the system, the ongoing ease of maintenance and operational costs of the system and its components.

(c) General requirements

(i) All irrigation must be of a high standard, being designed, constructed, and installed in accordance with:

1. the provisions within the planning scheme, planning scheme policies and this section of SC6.4 Development manual planning scheme policy;

2. manufacturer specifications;

3. all applicable Australian Standards and legislation;

4. all applicable Council local laws; and

5. Council's approved standard drawings.

(ii) All irrigation systems are to be:

1. designed to achieve an even and efficient supply of water to the nominated Hydro Zone areas;
2. designed with consideration of local conditions such as topography, prevailing winds, micro-climate, rainfall volumes and seasonal dry and wet periods;
3. constructed using quality materials and components;
4. automated to allow for efficient water usage;
5. programmed to operate in accordance with any Council water restrictions;
6. designed to operate efficiently and effectively based on the water supply pressure and flow volumeavailable to the system;
7. the minimum industry accepted standard by Council for turf sprinkler uniform cover is a Distribution Uniformity (DU) of 75% cover; and
8. the minimum industry accepted standard by Council for sports field turf sprinkler uniform cover is a Distribution Uniformity (DU) of 85% cover for all of the sport playing surface.

(iii) All irrigation in private open space that is to be:

1. installed and operated by a private entity, is not required to comply with the specific design and construction standards, however such systems that are connected to the reticulated water network is required to comply with Council's water restrictions of the time.
2. installed and/or operated by Council, is to be designed and constructed as per requirements detailed in this section.

(iv) All irrigation systems in public open space and road landscaping are to:

1. be designed by qualified professionals, being a certified irrigation agronomist or a certified irrigation designer;
2. constructed using quality materials and components to ensure a robust, reliable, and long assetlife;
3. be designed to minimise life cycle costs through reduced operational and maintenancerequirements;
4. be designed and apply volume that should not cause foreseeable damage to the road structure or surface; and
5. be designed and constructed as per requirements detailed in this section.

(v) All irrigation systems in streetscapes and car parking areas are to:

1. in a "main street" or "special character" situation where Council owns and operates an irrigation system or has agreed to accept irrigation assets, the irrigation is to be provided in accordance with this section and will be subject to the acceptance of works procedure as per Section SC6.4.24 Acceptance of completed works; and
2. in all other locations where irrigated turf or plantings are required as a condition of development, the irrigation system is to be connected to the adjacent private development.

(vi) Irrigation systems in public open space and streetscapes should be designed in conjunction with all landscape elements to ensure that:

1. landscape design and plant selection ensures the required level of irrigation to maintain the function and longevity of landscape is analogous with the assigned irrigation profile, as detailed in Clauses SC6.4.13.4 Attachment C Irrigation Profile Level Hierarchy and SC6.4.13.4 Attachment D Irrigation Profile Level Matrix;
2. landscape design, and plant selection facilitates, hydro zoning;
3. landscape features are designed to maximise water infiltration through use of appropriate landforms, soil types and mulches;
4. landscape features are designed and constructed to ensure ease of irrigation coverage in the short and long term; and
5. landscape features are designed to contribute to an integrated water management system.

(d) Irrigation type requirements

(i) All turf areas shall be irrigated with pop-up sprinklers or subsurface drip irrigation with the following specific requirements:

1. all turf areas in roundabouts and median strips that border roadways shall be irrigated by drip irrigation;
2. all turf areas within 5 m of a roadway and within 50 m of the centre of an intersection shall be drip irrigated; and
3. where a site-specific risk analysis recommending either method has been provided and accepted by Council.

(ii) All garden areas shall be irrigated with subsurface drip irrigation, except for areas containing plants or trees with vigorous root systems such as palms or lilies which shall be irrigated by pop-up sprinklers.

(e) Agronomic requirements

For all irrigation systems the approved hours of operation shall be between 10.00 pm and 5.00 am, the operation of such irrigation systems shall also comply with Council's water restrictions of the time.

(i) For pop-up sprinklers the total time taken to deliver 7 mm of equivalent precipitation when each station is operated individually and consecutively shall not exceed a 7-hour period for all stations on a given system. Variations to this requirement may apply for stations operated simultaneously.

(ii) For drip irrigation the total time taken to deliver 7 mm of equivalent precipitation when each station is operated individually and consecutively shall not exceed a 7-hour period for all stations on a given system. Variations to this requirement may apply for stations operated simultaneously.

(iii) The irrigation application rate shall not exceed the infiltration rate of the soil.

(iv) The operation of irrigation systems must avoid operating in strong winds, excessive or poor irrigation mains pressure, poor irrigation design or lack of maintenance, which all contribute to system delivery inefficiency.

(v) All irrigation systems that are to become Council assets to maintain must be fully commissioned and operating efficiently in accordance with the approved irrigation design plans for a minimum of 3 months prior to acceptance “Off Maintenance”.

(f) Environmental requirements

The system shall not have excessive runoff which causes erosion or pollution of surrounding native areas and/or storm water drains.

(g) Automation requirements

(i) The irrigation controller shall be chosen from the units outlined in Table SC6.4.13.2.

Table SC6.4.13.2 - Controller Selection List

Controller Name	Power Type / Source	Valve Capacity
AC Irrinet M Slave 12 - 24	AC / 240V Mains	12 to 24
AC Irrinet M Slave 36 - 48	AC / 240V Mains	36 to 48
AC Irrinet M 12 - 24	AC / 240V Mains	12 to 24
AC Irrinet M 36 - 48	AC / 240V Mains	36 to 48
AC Irrinet ACE 24 - 48	AC / 240V Mains	24 to 48
XR 1 - 4	DC / 6V Solar	1 to 4

(ii) A maximum of three stations may be operated simultaneously (by programming only) given the following:

1. irrigation type and precipitation rate of the stations to be operated simultaneously shall be the same;
2. the soil type, vegetation, and topography of the stations to be operated simultaneously shall be the same; and
3. all stations to be operated simultaneously shall be able to supply the manufacturer’s recommended pressure.

(iii) Only one valve per controller output is acceptable.

(h) Separation of irrigation zones

(i) Irrigation zones shall be classified in the following vegetation types:

1. turf grass;
2. garden bed; and
3. native vegetation or revegetation plantings.

(ii) A single irrigation valve shall water no more than one irrigation zone.

(i) Safety requirements

The system shall not have runoff onto roadways, footpaths, or other pedestrian areas to such an extent that it may result in a hazard to traffic and/or pedestrians.

(j) Temporary irrigation design

Temporary irrigation is exempt from the technical design and installation conditions outlined in this document provided it meets all other legislated requirements.

(i) All temporary irrigation installed in the public realm must be removed and terminated in accordance with Council requirements prior to the area being accepted “off maintenance”. All terminations and disconnections of temporary irrigation must be inspected by a Council officer prior to backfilling.

(k) Existing council irrigation assets

(i) Council’s Irrigation Operations Unit must be notified of any disruptions to Council owned irrigation assets prior to works commencing on these assets;

(ii) Works in areas containing existing Council irrigation assets are required to have plans for the deconstruction and isolation of the existing irrigation to ensure the system is not unnecessarily damaged and account for the ongoing watering requirements of the soft landscaping serviced by that irrigation;

(iii) All existing Council irrigation affected by development works must be reinstated to standards current at the time of the works;

(iv) Any extensions to existing mainline require the installation of an isolation valve;

(v) Council shall charge costs for water usage based on agreement with the developer. Options include the installation of a sub-metering device or use of Irrinet flow data; and

(vi) Upon activation of any additions to Council owned irrigation, revised flow data must be provided to Council’s Irrigation Operations Unit.

Editor’s Note - For further information on the construction of all irrigation systems, refer to Clause SC6.4.13.5 Irrigation construction.

SC6.4.13.3 Water features and water play areas

(1) Water features and water play areas will only be permitted in limited circumstances, at specific locations, and where all relevant considerations are reasonably satisfied, and will be considered on a case-by-case basis.

(2) Where the proposed water features and water play areas are associated with public open space, Council owned land, or will involve potential future Council assets, the infrastructure may only be permitted at approved locations and in accordance with Council’s Public Open Space Embellishment Framework. Approval from the relevant Council asset owner/s will also be required.

(3) In order to properly assess any such proposals, Council may request the provision of a maintenance plan and a life-cycle costing as part of the development application, as per Section SC6.4.2 Development application guidelines.

(4) Where water features are proposed as a development entry statement, applications may only be approved where the water feature will be within private property and the developer will remain, for the life of the asset, solely responsible for all aspects relating to the water feature (including ongoing maintenance and water costs).

(5) All water features and water play areas must be designed and installed to comply with all relevant Australian Standards.

Editor’s Note - Due to the place specific, custom nature of water features and water play areas, no further specifications are currently developed. Proposals will be considered on a case-by-case basis in accordance with necessary requirements defined by all applicable engineering, electrical, drainage, swimming pool and water safety standards, legislation, local laws and Council’s overarching design and management principles. Engagement and approval from other stakeholders/authorities may additionally be required as part of any development proposal.

SC6.4.13.4 Attachments

Attachment A - Adopted Master Plans

Thuringowa Riverway Master Plan Stage 1: Pioneer Park and Loam Island February 2003

Riverway Sustainable Development Policy

City of Thuringowa Planning Scheme Policy 2003

SC6.4.13.5 Construction

(1) Introduction

(a) Scope

(i) This section sets out the standards for design, installation and construction of irrigation systems that will become a Council asset.

(ii) Irrigation systems that will be connected to an alternative water supply have additional requirements to this section.

(b) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(i) Australian Standards

AS 1432	*Copper tubes for plumbing, gas fitting and drainage applications*
AS/NZS 1477	*PVC pipes and fittings for pressure applications*
AS 2032	*Installation of PVC pipe systems*
AS 2033	*Installation of polyethylene pipe systems*
AS 2053	*Conduits and fittings for electrical installations (all Parts)*
AS 2129	*Flanges for pipes and valves and fittings*
AS 2698.2	*Plastics pipes and fittings for irrigation and rural applications – Part 2: Polyethylene rural pipe*
AS 2698.3	*Plastics pipes and fittings for irrigation and rural applications –Part 3: Mechanical joint fittings for use with polyethylene micro irrigation pipes*
AS 2845.1	*Water supply – Backflow prevention devices – Part 1: Materials, design and performance requirements*
AS 2845.2	*Water supply – Backflow prevention devices – Part 2: Air gaps and break tanks*
AS 2845.3	*Water supply – Backflow prevention devices - Part 3: Field testing and maintenance of testable devices*
AS 3000	*Electrical installation (known as the Australian/New Zealand Wiring Rules)*
AS/NZS 3008.1.1	*Electrical Installations –Selection of cables - Part 1.1: Cables for alternating voltages up to and including 0.6/1 kV - Typical Australian installation conditions*
AS/NZS 3500	*Plumbing and drainage (Set)*
AS/NZS 3500.0	*Plumbing and drainage - Part 0: Glossary of terms*
AS/NZS 3500.1	*Plumbing and drainage – Part 1: Water services*

AS 3500.1.1	*National plumbing and drainage - Part 1.1: Water supply – Performance requirements*
AS 3500.2.1	*National plumbing and drainage – Part 2.1: Sanitary plumbing and drainage - Performance requirements*
AS/NZS 3808	*Insulating and sheathing materials for electrical cables*
AS/NZ 3879	*Solvent cements and priming fluids for PVC (PVC-U and PVC-M) ABS and ASA pipes and fittings*
AS/NZS 4129	*Fittings for polyethylene (PE) pipes for pressure applications*
AS/NZS 4130	*Polyethylene (PE) pipes for pressure applications*
AS/NZ 4158	*Thermal bonded polymeric coatings on valves and fittings for water industry purposes*

(ii) Legislation:

Water Act 2000

Electricity Safety Act 2002

Work Health and Safety Act 2011

(iii) Other:

Queensland Government

Queensland Water Recycling Guidelines, December 2005

(iv) Authorities:

The rules and regulations of the relevant local electricity supply authority

The rules and regulations of the relevant local water supply authority.

The requirements of any other Authority having jurisdiction over the installation.

(2) Irrigation pipework

(a) Standards

All pipes shall be supplied, installed, and joined in accordance with the manufacturer's recommendations and all relevant, current Australian Standards.

(b) Class of pipe

(i) Main line pipes (pressurised) of nominal 80 mm diameter and larger shall be minimum Class 12 uPVC rubber ring jointed (RRJ) or PN12.5 (Poly pipe).

(ii) Main line pipes (pressurised) of nominal diameter less than 80 mm shall be minimum Class 12 uPVC solvent welded joint (SWJ) or PN12.5 (Poly pipe).

(iii) All lateral line pipes (non-pressurised) shall be minimum Class 6 (uPVC) or PN8 (Poly pipe), except for lateral line pipe work under road pavements which shall be Class 12 (uPVC) or PN12.5 (Poly pipe).

(iv) Supply line to a drinking fountain or a water tap shall be a minimum of 32 mm Class 12 uPVC or PN12.5 (Poly Pipe). Copper pipe is not acceptable.

(v) Copper pipe to a water meter, drinking fountain and water tap assemblies shall be minimum Type B.

(vi) All irrigation pipe work under pavements (road or otherwise) shall be encased in a conduit.

(c) Conduit crossings

(i) All conduits used to encase irrigation line pipes shall be 100 mm Class 9 PVC SWJ Pipe as standard unless otherwise approved by the Superintendent. Storm water or wastewater pipe used as conduit is not acceptable.

(ii) Conduit crossing ends shall be sealed with expanding foam to stop the ingress of soil and material from entering the conduit.

(iii) Conduit crossings within road reserves and medians are to have the outer 50 mm of conduit sealed with expanded foam, to stop the transportation of water through the conduit.

(iv) Where underground bores or conduits crossings have been installed, a stainless-steel tag shall be used to mark the start and finish of the conduit. The tag shall be a minimum of 38 mm diameter and 1.6 mm thick. It is to be nailed, glued, or set into the surface of the crossing. The marker shall be engraved with the words “Irrigation Water”, given a unique number, and recorded on the as constructed drawings.

(d) Pipe fittings

(i) All fittings for uPVC pipe shall be minimum Class 18 PVC SWJ.

(ii) All fittings for poly pipe shall be metric compression Plasson fittings.

(iii) All fittings for low density pipe shall be barbed type, with all joints fitted with stainless steel cobra clamps – or approved equivalent.

(iv) All threaded fittings, except sprinklers, shall be sealed using PTFE thread tape and Liquid Teflon.

(e) Pipe installation generally

(i) Interior of pipes shall be kept free of dirt and debris at all times.

(ii) Where pipe work is left unfinished during installation, the open ends of pipes shall be sealed off with plastic secured to the end of the pipe or have end caps fitted.

(iii) Pipes laid in a common trench shall be separated by a minimum of 100 mm.

(iv) Refer to Section SC6.4.3 Standard drawings SD-131, Figures 1 to 6 for pipe alignments for all irrigation works in road reserves.

(f) UPVC rubber ring jointed pipe – installation

(I.e., Main line pipes of nominal 80 mm diameter and larger).

(i) All uPVC rubber ring jointed pipe work shall be installed in accordance with the manufacturer’srecommendations and AS 2032.

(ii) All uPVC rubber ring jointed pipe work shall be laid in a minimum of 100 mm sand bedding and surround.

(iii) All connections and changes of direction horizontally and vertically in rubber ring joint (RRJ) pipe work shall be installed with concrete thrust blocks.

(iv) Thrust block design and size shall follow pipe manufacturers recommendations (“Thrust Block Design –Pressure Pipeline Fittings” Iplex uPVC Design Manual). Thrust blocks shall be 15 MPA concrete in accordance with AS 2032. All thrust blocks are to be cast in situ against undisturbed ground and shall have neatly formed sides.

(v) The ends of pipes used for rubber ring joint (RRJ) connections shall have a smooth chamfer 15 degrees to the outer edge and shall be free of all burrs and rough edges. Rubber rings and lubricant used shall be in accordance with the pipe manufacturer's recommendations.

(vi) Each pipe length shall be laid in the following direction; water flow runs from the socket end to the spigot end of the pipe, except for ring mains.

(vii) Trenches may be curved to avoid obstructions within the limits of the curvature of the pipe.

(g) UPVC solvent welded joint pipe installation.

(I.e., main line pipes of nominal diameter less than 80 mm or lateral line pipes).

(i) All uPVC Solvent welded joint pipe work shall be installed in accordance with the manufacturer'srecommendations and AS 2032.

(ii) All uPVC solvent welded joints shall be primed and cemented.

(iii) Primer and solvent cement shall conform to AS/NZ 3879.

(iv) Primer is to be "Priming Fluid (red)".

(v) Solvent is to be "Christy's PVC Red Hot Blue Glue" or approved Type "p" solvent cement.

(vi) All pipes shall be primed before cementing the joint.

(vii) Pipe ends shall be free of all burs and rough edges.

(viii) All uPVC solvent welded joints shall not be subjected to water pressure for at least 24 hours aftercementing the joint.

(ix) All mainline uPVC solvent welded joint pipes shall be laid in a minimum of 100 mm sand bedding and surround.

(h) Polyethylene pipe installation

(i) All polyethylene pipe work shall be installed in accordance with the manufacturer's recommendations and AS 2033.

(ii) Poly pipe shall be laid with sufficient allowance for contraction and expansion of the pipe.

(iii) Pipe ends shall be free of all burs and rough edges and shall be chamfered with the appropriate tool before jointing.

(iv) Polyethylene tapping saddles are only to be used to connect sprinklers and dripper tube to polyethylene pipe work.

(i) Trenching

(i) All pipe work shall be laid in trenches, except for:

1. pipes which are installed in underground conduits; or
2. pipes which are installed above ground due to obstacles I.e., bridges, walls, etc.

(ii) Trenches shall:

1. be sufficiently wide to allow adequate working clearance;
2. be excavated in straight lines between bends or pits;
3. have vertical sides and be a constant depth for the full length of the trench; and
4. be of adequate depth to allow for pipe bedding and adequate cover to the pipe as specified.

(iii) Trenches for multiple pipes shall be sufficiently wide to allow adequate working clearance and a minimum of 100 mm separation between pipes.

(iv) Pipes shall be firmly and evenly supported with bedding material or approved backfill material in the centre of the trench.

(v) Minor adjustment to the irrigation systems design layout will be permitted to clear undergroundobstructions.

(vi) Trenching machinery shall be avoided within 1 m of existing services. Hand trench to expose existing services, prior to connection or use of trenching machinery.

(vii) Cover to pipes

The minimum and maximum depth of cover to pipes shall be as noted in Table SC6.4.13.3.

Table SC6.4.13.3 - Depth of Cover to Pipes.

Pipe	Minimum	Maximum
Main lines in road reserves (UPVC and Polyethylene)	600 mm	750 mm
Main lines all other locations (UPVC and Polyethylene)	400 mm	600 mm
Lateral lines - all locations	300 mm	500 mm
Drinking fountain and water tap supply lines. (except in land fill sites)	300 mm	400 mm
Drinking fountain and water tap supply lines in land fill sites	450 mm	600 mm
Dripper tube (turf)	75 mm	100 mm
Dripper tube (garden)	Surface	Surface

Editor's Note - Depth of cover is defined as the distance from the top of the pipe to the finished surface level or from the top of the pipe to the underside of paving, concrete, or road pavement. Refer to Section SC6.4.3 Standard drawings SD-18.1 for Typical Pipe Trench details.

(j) Pipe bedding

(i) A minimum of 100 mm sand bedding and surround is required for:

1. all main lines;
2. all uPVC Rubber Ring Jointed pipes;
3. all pipes under road pavements;
4. all pipes laid on solid rock;
5. all pipes where rubble, rocks and/or debris is encountered in the trench;
6. all potable water lines; and
7. all electrical conduits.

(ii) Bedding sand shall be clean sand with rounded grains free of any rocks, debris and organic matter and graded such that 100 per cent passes a 4.75 mm sieve size.

(iii) Pipe work, other than those listed in Clause SC6.4.13.5 (2)(j) above may be laid without sand bedding, provided the trench is free of rubble, rocks and /or debris.

(iv) Pipe work, other than those listed in Clause SC6.4.13.5 (2)(j) above in locations where the natural earth contains rocks, debris and any materials that may damage pipes over time or where excessive ground movement is likely to occur shall be laid in a minimum of 75 mm sand bedding and surround.

(k) Approved backfill to trenches

(i) Excavated material may be used as backfill, provided that the material is free of rubble, rocks, debris,organic material and any sharp or solid objects and/or materials that may damage the pipe over time.

(ii) Where material excavated from the trench is unsuitable for backfill, clean sand, garden loam, shall be used as backfill.

(iii) Backfill to trenches shall be compacted with a wheel roll or plate compactor. Completed backfill is to be mounded 50 mm higher than the surrounding surface for the full length of the trench, to allow for further consolidation.

(iv) Backfill to trenches under road pavements and pathways shall be crusher dust material placed in 150 mm compacted layers.

(v) On completion of backfilling operations, all excess material is to be either reused on site where possible or shall be removed from the site.

(l) Exposed pipes

(i) Any exposed pipe shall be constructed of stainless steel or lagged copper and shall comply with AS/NZS 3500 standards for exposed pipe.

(ii) All above ground works are to conform to AS/NZS 3500.1, Section 5.7 “Support and fixing aboveground”.

(iii) Bracing around the pipes is to be lined with an appropriate material to prevent damage to the pipe.

(iv) Pipes are to be labelled “potable” or “non potable” in accordance with Australian Standards.

(m) Proximity to other services

Table SC6.4.13.4 below lists the separation required between water pipes and electricity and gas services. Separation for all other services shall be as outlined in AS/NZS 3500.1 Section 5.3 entitled “Proximity to other services”.

Table SC6.4.13.4 - Proximity to Other Services

Service	Separation
Electrical Cables with Warning Tape or Mechanical Protection (Water Pipes DN65mm and below)	100 mm
Electrical Cables with Warning Tape or Mechanical Protection (Water Pipes larger than DN65mm)	300 mm
Electrical Cables with no Warning Tape or Mechanical Protection	600 mm
Consumer Gas Pipe with Marker Tape 150mm above complying with AS2648.1 (Water Pipes DN65mm)	100 mm
Consumer Gas Pipe with Marker Tape 150mm above complying with AS2648.1 (Water Pipes larger than DN65mm)	300 mm
Consumer Gas with no Marker Tape or Mechanical Protection	600 mm

(3) Control systems

(a) Scope

This section covers the furnishing of all labour, materials, and services in connection with the fabrication, factory testing, delivery and site installation of the irrigation controller and associated cabinets.

(b) Network requirements

(i) Council operates an irrigation control system that consists of a Motorola Irrinet Supervisory Control and Data Acquisition (SCADA) System. This system is commonly known as the Irrigation Central Control (ICC). The ICC System communicates to irrigation controllers throughout the Council's region over UHF wireless telemetry communication networks.

(ii) All irrigation controllers shall be operated via the ICC System unless an alternative controller system is approved by the Superintendent.

(iii) Contractors are required to provide an approved irrigation controller to adequately service the proposed irrigation system. The controller shall provide for the number of stations including master valve and fertigation control valve required for:

1. the current irrigation system to be installed; and

2. defined future requirements of the controller.

(iv) Irrinet M Slave, Irrinet M and Irrinet ACE controllers by Motorola are the approved irrigation controllers.

(v) All irrigation controllers must be capable of communicating with the ICC System across the telemetry communication network. Each controller must be fitted with an approved radio transceiver and/or modem and external antenna.

The transceiver must have the correct frequency configuration to communicate on the network.

(vi) Each irrigation controller shall be allocated a logical address by Maintenance Services – Irrigation Design Unit for communications to the ICC System.

(vii) All irrigation controller system components shall operate within the ranges specified by the manufacturer.

(c) Irrigation controller selection

(i) Irrigation controllers are to be selected from Table SC6.4.13.5.

Table SC6.4.13.5 - Controller Selection List.

Controller Name	Power Type / Source	Valve Capacity
AC Irrinet M Slave 12 - 24	AC / 240 V Mains	12 to 24
AC Irrinet M Slave 36 - 48	AC / 240 V Mains	36 to 48
AC Irrinet M 12 - 24	AC / 240 V Mains	12 to 24
AC Irrinet M 36 - 48	AC / 240 V Mains	36 to 48
AC Irrinet ACE 24 - 48	AC / 240 V Mains	24 to 48
XR 1 - 4	DC / 6 V Solar	1 to 4
XR Plus	DC / 6 V Solar	1 to 8

(ii) AC powered irrigation controllers are the preferred option of the Superintendent. DC powered irrigation controllers are not acceptable unless approved by the Council.

(d) Operating environment – ambient conditions

(i) All equipment mounted inside cabinets and cubicles shall be suitable for operation in temperatures up to 60 °C. Measures shall be taken to ensure that high ambient temperatures and full load operation do not cause temperatures to exceed maximum allowed operating temperatures.

(ii) Since all cabinets are to be mounted outdoors, consideration shall be given to minimise heating by direct solar radiation.

(e) Irrigation controller specification – general

(i) General requirements

1. The irrigation controller cabinet and component parts shall conform in all respects to the highest standards of design and workmanship and appropriate requirements of the latest applicable state or local codes.

2. When mounting accessories to the back panel, use fine threaded tapped screws.

3. The irrigation controller cabinet shall be completely wired, and assembled, with all devices and controls installed as shown in Section SC6.4.3 Standard drawings SD-5.1 through SD-5.10 and SD-20.1through SD-29.1 so that the entire assembly is an operating unit ready for installation and the wiring of field devices.

4. Wiring shall meet the latest requirements of the AS 3000 and applicable workplace safety codes.

(ii) Wiring

1. All wire shall be 0.5mm²/PVC 105/ stranded, insulated for 600 V.

2. A "bootlace ferrule" shall be used on wires connected to terminals which have only a screw for securing the wire. Ferrules shall be properly crimped using a professional crimping tool.

3. All manufacturer terminal block wiring shall be restricted to the panel side of the blocks. The manufacturer shall connect no more than two wires to any terminal point. The field side of the terminal blocks shall be left completely free of wires and jumpers. Wiring on terminal blocks shall be so arranged that not more than one wire to the field side of any terminal point will be connected with the exception of the earth.

4. All multiple common connections shall be wired via bridging links on the terminal blocks.

5. Horizontal and vertical wiring between the terminal blocks and the devices shall be enclosed inducts except wiring between the ducts and the devices may run exposed for distances not exceeding 100 mm. Duct loading shall not exceed 75 per cent rated fill at any point.

6. All exposed wiring shall be formed neatly with square corners and where possible, grouped in packs. Each pack shall be bound with plastic ties and be substantially supported throughout its full length. Cabled wire is not acceptable.

7. Splicing of wires on electrical circuits is not acceptable.

(iii) Terminal block

Terminal blocks shall be provided for all wiring which exits the panel. All terminal blocks shall be mounted and of the colour as shown in Section SC6.4.3 Standard drawings SD-5.1 through SD-5.10 and SD-20.1 through SD-24.8.

(iv) Consumer power

1. The irrigation control cabinet shall be equipped with a (Clipsal 4CC6 or approved equivalent) enclosed consumer panel. Consumer power shall be wired direct into the consumer panel. The consumer panel shall enclose a neutral link and an earth bus with the panel structure connected to the bus to effectively earth the entire structure. A solder-less clamp type terminal lug shall be provided at the end of the earth bus for a 6 mm² stranded earth cable to be attached from the external earth stake.
2. Whenever the electrical diagrams indicate an earth for a circuit at the panel, a single wire for each circuit earthed shall be run independently to the earth bus and fastened thereto using a ring lug and a machine screw inserted in a tapped hole.
3. Earthing of the enclosure and back panel from the consumers panel shall be made using 4mm^2 stranded earth cable.
4. The consumer panel shall be wired with a main isolation switch an RCD/MCB and a suitably rated“ Isatrol" mains filter unit, din-rail mounted within the consumer panel to provide power to the GPOs. One double GPO and one single GPO are to be mounted on the face cover of the consumer panel. Care shall be taken when positioning the GPOs not to cover the access screwholes to the consumer panel.
5. Each device requiring 240 V AC power shall have an individual line plug and plug into an allocated GPO on the consumer panel.
6. Power will be supplied as a single-phase voltage at 50 Hz and 240 V ± 10 per cent.
7. All 240 V connections are to be tool proof and either housed in the consumer panel or behind a protective cover.

(f) Irrigation controller specifications (specific)

(i) Irrinet M Slave, Irrinet M and Irrinet ACE

1. Each controller’s maximum valve output is listed in Table SC6.4.13.5 including master and fertigation valves. The controller shall have as a minimum, two inputs from electronic pulse water meter and rain switch.
2. The general control voltage shall be 24V AC for controller outputs used for water valve operation.
3. The 24 VAC power is via the PELV system with common tied to earth.
4. The irrigation controller cabinet layout, dimensions and wiring are shown in Section SC6.4.3 Standard drawings SD-5.1 through SD-5.10 and SD-20.1 through SD 29.1.
5. The irrigation controller cabinet shall be a B&R NI (NI06062/S) or (NI06063/S) with dual key lock (NI030) or approved equivalent as shown within Section SC6.4.3 Standard drawings SD-5.1 through SD-5.10 and SD-20.1 through SD-29.1. The controller pole, mast and cross arms shall be coated with 2PAK Epoxy Paint in Heritage Green colour.
6. Control equipment shall be selected from the Preferred Equipment list - Controller and Telemetry Components within Section SC6.4.3 Standard drawings SD-5.1 through SD 5.10 and SD-20.1 through SD-29.1, unless otherwise specified by the Superintendent.
7. All firmware incorporated in CPUs and other intelligent modules shall be the latest released version.
8. The radio telemetry equipment involves the installation of the following equipment:

a) TX-3600 GME Transceiver with blind front panel, programmed with Parks Services frequencies;

b) YB6-61 Yagi Antenna, UNV2 mounting bracket and RG58 coax cable terminated with a N88N type male connector;

c) PS123 GME Power Supply or DC1224X Aeon UPS (for Irrinet M controllers) ;

d) IS50NX Surge Arrestor flange mounted with N type female connectors;

e) RG58 Coax Fly Lead terminated with N88 N type and BNC113 male connectors; and

f) Data cable connecting controller to transceiver.

9. The transceiver shall be mounted on the door such that the indicator lights are visible when the door to the panel is opened. The antenna cable and data cable are to be feed from the controller via the cabinet ducting towards the door hinge and onto the door bracket. The transceiver shall be mounted in such a way to allow for its easy removal. The mounting bracket is to be securely fastened to the back of the door. All cabling on the door shall be neat and fastened in place by cable ties, Section SC6.4.3 Standard drawings SD-26.2, SD-26.4 and SD-5.10 refers.

10. A Surge Arrestor shall be mounted on the cabinet earth lug and suitably earthed refer Section SC6.4.3 Standard drawings SD-27.1 and SD-5.10. The coax fly lead shall be connected from the transceiver BNC connector to the “Equipment” side of the surge arrestor. The coax cable from the antenna will enter the panel and be terminated on the “Antenna” side of the surge arrestor.

11. Before the transceiver is powered up a qualified radio technician shall fit the antenna coax plug and carry out a SWR / radio check and set the modulation level.

12. The “data cable” shall connect the controller to the transceiver and shall be secured and neatly run through the ducting.

13. PS123 GME Power Supply 240 VAC to 12 VDC is to be mounted on the door bracket to supply power to the Transceiver and Interposing Relays refer Section SC6.4.3 Standard drawings SD-5.5.

14. DC1224X Aeon UPS (uninterrupted power supply) 240V AC to 12V DC is to be mounted on the door bracket to supply power to the Irrinet CPU memory and Transceiver, refer Section SC6.4.3 Standard drawings SD-20.1 through SD-29.1.

15. A separate 24V AC power supply shall be provided as shown within Section SC.4.3 Standard drawings SD-5.1 through SD-5.10 and SD-20.1 through SD-29.1:

    a) Irrinet M, Irrinet M Slave and Irrinet ACE controllers require 1 Powertech 240 V/24 V 150 VA Transformer part No. MP3045 to be direct mounted to supply power to the controller and field solenoids.

16. The controller shall have two conduits connecting the cabinet to the ground. The following conduit types and sizes shall be used:

    a) M.D. 50 mm electrical conduit (24 V Control Cable); and

    b) H.D. 25 mm electrical conduit (240 V Power Supply).

17. A Mini-Clik II Rain Switch or approved equivalent is to be installed on the controller pole. Construction details are given in Section SC6.4.3 Standard drawings SD-29.1. The device is to be set on a 13 mm setting.

(ii) Piccilo XR

1. The output control voltage used is a DC Pulse through a 2-wire circuit suitable for activating DC latching coils used for water valve operation - Hunter ICV with DC Coil option or approved equivalent. With the Piccilo XR output voltage adjusted to 18 V (from the factory default of 12 V).
2. The controller assembly is powered by a 6-volt sealed lead acid battery which is charged via a solar panel and regulating semiconductors. Section SC6.4.3 Standard drawings SD-4.2.
3. The irrigation controller cabinet layout, dimensions and wiring are shown in Section SC6.4.3 Standard drawings SD-4.1 through SD-4.4.
4. The Irrigation controller cabinet shall be a B&R NI (NI03021/S) with single key lock (NI030) or approved equivalent as shown within Section SC6.4.3 Standard drawings SD-4.1 through SD-4.4. The controller pole, mast and cross arms shall be coated with 2PAK Epoxy Paint in Heritage Green colour.
5. Control equipment shall be selected from the Preferred Equipment list - Controller and Telemetry Components within Section SC6.4.3 Standard drawings SD-4.5, unless otherwise specified by the Superintendent.
6. All firmware incorporated in CPUs and other intelligent modules shall be the latest releasedversion.
7. The radio telemetry equipment involves the installation of the following equipment:
    a) Qty 1, CD51 Whip Antenna (cut to wavelength) with 0.5 m of RG58 coax cable terminated bya SMA type male connector;
    b) Qty 1, Antenna Mounting Bracket; and
    c) the radio telemetry component is integrated within the XR Controller unit, so no externaltransceiver is required.
8. The antenna coax SMA male plug shall be connected into the XR Controller SMA socket mounted on the top of the unit.
9. Before the XR Controller is powered up a qualified radio technician shall fit the antenna coax plug and carry out a SWR / radio check on site.
10. A Kyocera Mini Module Solar Panel as detailed in Section SC6.4.3 Standard drawings SD 4.5 shall be fastened to the top of the enclosure refer Section SC6.4.3 Standard drawings SD-4.3. An external grade silicon base sealant shall be applied to the solar panel perimeter to maintain the enclosure IP rating.
11. The regulator components shall be installed as detailed in Section SC6.4.3 Standard drawing SD-4.2 and tested by an electronics technician prior to final connection of the battery and XR units.
12. A 6 V 12 AH SLA Battery is placed inside on the bottom of the enclosure and connected to the terminal blocks. Refer Section SC6.4.3 Standard drawings SD-4.1 and SD 4.2.
13. The controller shall have one 25 mm conduit connecting the cabinet to the first electrical pit.

(g) Controller location

The final location of the controller shall be determined by taking into consideration all of the following factors:

(i) radio path tests (to be carried out by a qualified radio technician) to ensure reliable communications from the controller to the ICC System Base Station;

(ii) the location shall be clear of large trees or structures that may interfere with the performance of radio communications, or solar panel. In newly planted areas the location shall make allowance for future tree growth;

(iii) safe 24-hour access for maintenance, by maintenance services personnel and equipment;

(iv) the location shall allow access by motor vehicle and elevated platform (antenna servicing); and

(v) the Controller shall not be installed less than 3 m from a roadway unless approved by the Superintendent.

(h) Cabinet installation

The pre-assembled Controllers shall be installed in the ground as follows:-

(i) The pre-assembled Controller cabinet support post shall be embedded in a 200 mm diameter x 600 mm deep hole with a 400 mm deep concrete footing (N25 concrete minimum). The concrete shall be poured up to the underside of the conduits entering the support post. Covering the conduits in concrete is not acceptable. The Cabinet shall be installed at a height of 1200 mm from the finished ground level to the underside of the cabinet (1090 mm for XR controllers Refer Section SC6.4.3 Standard drawings SD-4.4).

(ii) XR Controller Cabinet is to be orientated with the door side facing north to maximise the absorption of solar radiation into the solar panel, unless approved by the Superintendent.

(i) Controller cabinet and controller wiring

(i) All conduits shall be terminated at the controller cabinet with a suitable conduit adaptor. All conduits shall be sealed with an external grade Butyl Mastic sealant, such as “Selleys Butyl Mastic” or similar approved to a depth of 25 mm into the conduit to prevent vermin entering the controller cabinet.

(ii) Earth stakes shall be located in the electrical pit adjacent to the controller. The location of the earth stake is to be indicated on the as constructed drawing.

(iii) Earth stake connections are to be sealed with cold gal paint.

(iv) All field wired cables entering the controller cabinet shall be made secured – in this instance only by the application of sealant to the conduit end inside the enclosure (see Clause (i) (i) above). From this point on, the double insulation shall be removed from the cable for ease of wiring to the terminal blocks.

(v) All single insulated cables inside control cabinets shall be loomed together and cable tied in a neat orderly manner to the panel so that the connections into the terminal strip are not stressed.

(vi) All cables inside the controller cabinet shall be of sufficient length to ensure that all cores will reach their termination point without any stress or joining of cables.

(vii) All field cables inside the controller cabinet shall be of sufficient length to ensure that all cores will reach the upper and lower most termination points without any stress or joining

of cables.

(viii) All cables to be connected within the controller cabinet shall be terminated with a bootlace ferrule, CABOC BLP 150 or similar approved. Pin lugs are not acceptable.

(j) Field electrical wiring

(i) Cable types

1. All electrical cabling shall conform to current Australian Standards.

2. All cables shall be Tyflo multi-core irrigation cables or similar approved with a minimum core size of 1.5 mm. Table SC6.4.13.6 details cable specifications.

Table SC6.4.13.6 - Multicore Cable Specifications.

Nominal core dia.	Conductor no. and size	Amp rating	Resistance Ohms/Klm	Number of cores
1.5 mm	7/0.50	16	13.6	3,5,7,9,13
2.5 mm	7/0.67	23	7.4	2,7
4 mm	7/0.85	30	4.6	2

3. All cables shall have an outer sheath of flexible 75 C PVC to AS/NZS 3808, over an Inner core of a sheath of HDPE, over a multi-strand plain copper wire.

4. Inner cores are to be readily available in 13 colours namely- Black, Blue, Green, Dark Brown,Brown, Grey, Light Blue, Orange, Pink, Red, Violet, White and Yellow.

(ii) Cable installation

1. A 7 core, cable shall be run continuously from the controller to the water meter assembly solely for the operation of Master Valve, Pulse Meter and Fertigation. The black core shall be common, red core shall be Master Valve control, brown core shall be Fertigation control and run to the Fertigation Venturi Point and the blue and white shall be Pulse Meter and Pulse Meter common, respectively.

2. An additional 20% of the total number of cables or 2 extra cores (whichever is the greater) shall be provided as spares. Designated spares shall run from the controller to the furthest most point from the controller in the cable run. The spares are to be marked at the controller. At the furthest point all spares shall be connected together and sealed with heat shrink so that a continuity test can be performed at the controller to confirm the total number of spares.

3. All extra low voltage cables shall be installed inside a conduit. The conduit size used shall be a minimum size of 50 mm or 2.5 times the combined size of all the cables being installed, whichever is the greater.

4. The single insulation on the cable core shall not be cut or damaged when the outer sheath (double insulation) is removed. All cables shall have the insulation removed from the cores using appropriate cable strippers. Use of a knife or other sharp blade is not acceptable practice.

5. Cables shall be continuous between electrical inspection pits. Cable joints located between electrical inspection pits are not acceptable. Cable joints shall be kept to a minimum and shall only occur at valve take off points.

6. Where required each individual cable shall be joined using the appropriately sized insulated crimp links, to maintain a double layer of insulation at the joint after the heat shrink is installed and shall be installed with a professional ratchet type crimping tool.
7. Bare conductors shall not be exposed.
8. Each individual cable joint shall be waterproofed by using ES-2 resin filled heat shrink three times the length of the insulated crimp link.
9. Multiple cables shall not be joined or heat “shrinked” together.
10. All cut unused cables (spares) shall be sealed using ES-2 resin filled heat shrink.
11. Cable markers shall be attached to each cable at every electrical inspection pit indicating the individual cable number as shown on the design plan; refer Section SC6.4.3 Standard drawing SD-7.2. Cable markers shall be round 38 mm diameter aluminium identification tags commercially available. Numbering shall be clearly stamped onto one side of the tag using a punch set with 13 mm high numerals. Tags shall be fastened to the appropriate cable using a quality grade plastic cable tie attached at the mid-point of the cable loop.
12. The Black cable shall be used as the designated common.
13. All spare cable in electrical inspection pits shall be left full length, individually sealed with heatshrink and grouped together.
14. All continuous cable that passes through an electrical inspection pit shall have a loop of at least 1.5m in length and be neatly coiled and tied.
15. A draw wire is to be left in the conduit from the controller cabinet to the first electrical inspection pit.
16. All electrical cable locations shall be recorded on the as constructed drawings.

(iii) Electrical inspection pits

1. Electrical inspection pits shall be heavy duty rectangular with rounded ends and fitted with aprecast concrete lid, type P1 or P2.
2. The first electrical inspection pit shall be located a maximum of 1m from the controller cabinet support base. A draw wire together with the electrical cables is to be installed in the conduits from the controller to the first electrical pit to allow for future works.
3. Electrical inspection pits shall be located adjacent to valve boxes and offset from the main irrigation line a maximum of 200 mm as shown in Section SC6.4.3 Standard drawing SD-17.2 (Plan View).
4. Electrical inspection pits shall be located at changes in direction and no more than 50 m spacing.
5. Electrical inspection pits shall be installed so that the top of the pit is flush with the finishedsurface level and matches the slope of the finished surface level.
6. The location of all electrical inspection pit locations shall be recorded on the as constructed drawings.
7. All conduits shall enter at the end of an electrical pit. Side entry of conduits into electrical pits is not permitted.
8. All conduits shall enter an electrical pit at no greater than 45 degrees of the horizontal centre.

9. Electrical pits shall not be installed in drainage swales or places where water is collected during rainfall and irrigation.

10. Electrical pits shall not be installed less than 3 m from the road kerb, unless approved by the Superintendent.

11. An earthing stake is to be provided in the inspection pit nearest to the controller cabinet.

(iv) Electrical conduits

1. All electrical conduits shall conform to current Australian Standards.

2. All conduit (extra low voltage electrical) buried in ground shall be Grey M.D.

3. All electrical conduits that are exposed above ground shall have a protective outer sheath of polyethylene pipe rating PN12.5. The sheath is to encase the conduit for the entire length ofconduit above ground and for a depth of 150 mm minimum below ground.

4. All electrical conduits that are exposed above ground shall be fixed in place so that they arevertical and shall be secured firmly to the accessory.

5. Electrical conduit above ground shall be adequately secured to avoid damage by grass cutting operations.

6. All electrical conduit ends shall be neatly cut and free of burrs or rough edges.

7. The final 500 mm of conduit entering an electrical inspection pit shall be M.D. corrugated flexible conduit, which is to be connected to the M.D. PVC Conduit by a Socket. Section SC6.4.3 Standard drawing SD-17.2 (Electrical Pit), gives a typical construction drawing of the assembly.

(v) Electrical conduit trenching

1. All electrical conduits shall be laid in trenches and bedded in sand.

2. Low voltage conduits (240 V) shall be installed with continuous electrical warning tape laid over the conduit for the entire length of the trench.

3. Low voltage conduits (240 V) shall not be installed in the same trench as irrigation lines.

4. Extra low voltage conduits (24 V) installed in the same trench as irrigation lines shall be bedded in sand and separated from the irrigation lines by a minimum distance of 100 mm.

5. Depth of cover to electrical conduits from finished surface level or from the underside of finished pavement level (e.g., pavers or concrete) shall be:

   a) 300 mm minimum - for extra low voltage cables (24 V); and

   b) 600 mm minimum - for low voltage cables (240 V). Refer section SC6.4.3 Standard drawings SD-18.1.

6. Electrical conduits under roadways shall be a minimum 50 mm M.D. Electrical conduit encased in a 100 mm Class 9 PVC Pipe.

(4) Water meter assembly

(a) Design and installation

(i) Water meter assembly components vary, as follows:

1. For drinking fountains and water taps (potable water) the water meter assembly includes:

a) isolation valve; and

b) mechanical water meter (supplied by Council).

2. For irrigation, the water meter assembly includes:

a) isolation valve;

b) mechanical water meter (supplied by Council);

c) master valve and electronic flow meter unit;

d) RPZ back flow prevention device with two isolation valves;

e) screen filter;

f) lockable cover;

g) cable and conduit; and

h) protective bollards (depending on location).

Table SC6.4.13.7 - Allowable Water Meter Assembly Component Size Combinations

Water Service	Townsville Water Water Meter	Irrigation Water Meter	Backflow	Master Valve
25 mm	25 mm	32mm Arad Multijet (1 pulse/10L)	25 mm	25 mm Hunter ICV*
32 mm	32 mm	32mm Arad Multijet (1 pulse/10L)	32 mm	25 mm or 40mm Hunter ICV*
50 mm	50 mm	Include in Master Valve (1 pulse/10L)	50 mm	50 mm Ultraf Hydrometer
80 mm	80 mm	Include in Master Valve (1 pulse/10L)	80 mm	80 mm Ultraf Hydrometer
100 mm	100 mm	Include in Master Valve (1 pulse/100L)	100 mm	100 mm Ultraf Hydrometer

* External Master Valve

3. All water meter assemblies with a 25 mm and 32 mm Water Service are to have a master valve external to the main assembly. Refer to Section SC6.4.3 Standard drawings SD-10.3 and SD-10.4.

4. Water meter assemblies with a water service sized 50 mm, 80 mm and 100 mm are to have a master valve as part of the main assembly. Refer to Section SC6.4.3 Standard drawings SD-10.1 and SD-10.2.

(ii) Water meters

1. All water meters and pipe work from the town mains to the water meter shall be supplied and fitted by Townsville Water.

2. The water meter type is selected by the following criteria:

   a) for drinking fountains and water taps a standard mechanical water meters shall be used.

   b) for irrigation, refer to Table SC6.4.13.7 for water meter selection relative to the water service size.

(iii) Master valves

1. All irrigation systems shall be fitted with a master valve.

2. The master valve is to be selected by the following criteria:

   a) all water service assemblies sized 25 mm and 32 mm shall have an external master valve installed in a valve box and shall be fitted to the copper tail pipe of the backflow device. Refer to Section SC6.4.3 Standard drawings SD-10.3 and SD-10.4 for installation details; and

   b) all water service assemblies sized, 50 mm, 80 mm and 100 mm shall be fitted with an assembly mounted master valve. The master valve is to consist of a flange mounted Ultraf Hydrometer including water (flow) meter module as detailed in Table 5 and 24V AC Solenoid actuator; or approved equivalent. Refer to Section SC6.4.3 Standard drawings SD-10.1 and SD-10.2 for installation details.

(iv) Backflow devices design and installation

1. Backflow prevention is to conform to AS 2845.1, AS 2845.2 and AS 2845.3.

2. The Backflow device shall be selected on the required size:

   a) 25 mm, 32mm, and 50 mm - Tyco Backflow System RP03 or similar to the following specification. The assembly shall be connected with the “ring and tail” to allow easy removalor replacement of the device in accordance with AS/NZS 3500.1. Main valve and internals shall be of stainless-steel construction and to have pressure rating of 1600 kPa and a temperature rating of 90ºC. All internal parts and elastomers are to be accessible through a top entry point of the main valve to allow inline maintenance. Valve shall also be fitted with test points with BSPT threads to allow testing to AS 2845.3; and

   b) 80 mm and 100 mm - Tyco Backflow System RP03 or similar to the following specification.The main valve shall be constructed from ductile iron and coated with Rilsan Nylon 11 to AS/NZ 4158. All internals shall be constructed from stainless steel and to have pressure rating of 1600 kPa and a temperature rating of 60ºC. Main valve body shall not form part of the wetted check valve sealing area or mechanism. All internal parts and elastomers are to be accessible through a top entry point of the main valve to allow inline maintenance. Valve connection shall be flanged to AS/NZS 4087. Valve shall also be fitted with test points withBSPT threads to allow testing to AS2845.3.

3. The velocity through the backflow device shall not exceed 2.2 m/s.

4. All backflow devices shall be reduced pressure zone (RPZ) rating.

5. All backflow devices sized 25 mm, 32 mm, and 50 mm shall be fitted with a locking mechanism, which prevents the two isolation valves and the three test cocks from

unauthorised opening. The backflow device is to be lockable at a single point. A Council standard series A padlock is to be fitted to the locking mechanism.

(v) Isolation valves

1. All isolation valves fitted to the water service assembly shall be tested and approved to AustralianStandards.
2. All isolation valves fitted to the water service assembly shall be selected on the following criteria:
    a) all water meter assemblies sized 25 mm, 32 mm and 50 mm shall be fitted with brass ballvalves; and
    b) all water meter assemblies sized 80 mm and 100 mm shall be fitted with resilient seated gate valves.

(vi) Strainer

All water meter assemblies shall be fitted with a brass strainer immediately downstream of the isolation valve and upstream of the back flow device. Refer Section SC6.4.3 Standard drawings SD-10.1 to SD-10.4 for details.

(vii) Water meter assembly installation

1. The water meter assembly shall be supported by the appropriate size Support Stands as detailed in Section SC6.4.3 Standard drawing SD-10.5 and set into a concrete footing as detailed Section SC6.4.3 Standard drawings SD-10.1 to SD-10.4. A minimum distance of 300 mm from the underside of the assembly to the finished ground level is required.
2. A lockable stainless steel sheet metal cover shall be fitted over the master valve/hydrometer/flow meter to prevent vandalism and weather damage.
    a) 25 mm, 32 mm, the cover shall be held in place using U-bolts; and
    b) 50 mm, 80 mm, and 100 mm, the cover shall be fastened between each set of tightenedflanges, using flange bolts.
3. Each cover shall be locked using a 40 mm KA1 series lock.
4. A minimum of two recycled plastic bollards shall be provided at each water meter assembly as directed by the Superintendent, to protect the assembly from vehicle damage, except in garden beds.

    Bollards shall be nominal 100 mm diameter blue recycled plastic, embedded 450 mm minimum into a 350 mm diameter concrete footing. The top of the bollards shall be 900 mm above finished ground level.
5. All cables running from the water meter to the ground shall be encased in a protective outer sheath of polyethylene pipe rating PN12.5. The conduit shall be firmly installed vertical to theground so as not to be easily damaged by grass cutting operations.
6. Copper pipes shall be Type B.
7. All fittings to the backflow device shall be either copper or brass. PVC or Poly fittings are notacceptable.

(b) Valve assembly

(i) Design and installation

1. The valve assembly includes:

a) solenoid valve;

b) ball valve;

c) brass barrel union; and

d) valve box.

2. Refer Section SC6.4.3 Standard drawings SD-10.6, SD-14.3 and SD-14.4 for standard details. Valves shall be connected to the main line via a tee.

(ii) Solenoid valves

1. Refer Section SC6.4.3 Standard drawings SD-10.6, SD-14.3 and SD-14.4 for solenoid valve assembly details.

2. Solenoid valves used shall be sized in accordance with Table. SC6.4.13.8.

Table SC6.4.13.8 - Approved Solenoid Valves

Manufacturer	Model	Size	Maximum Flow Rate (Litres per Minute).
Hunter	ICV	25 mm	100
Hunter	ICV	40 mm	250
Hunter	ICV	50 mm	360
Hunter	ICV	80 mm	700

3. Electronic solenoids for AC systems shall be 24-volt coils.

4. Electronic solenoids for DC systems shall be 12-volt 2 wire latching coils.

5. Solenoid valves shall be wired in the following order:

a) the first controller output shall be assigned to the master valve control;

b) stations are to be wired to the controller outputs from output 2 on. Station 1 (Controller output 2) is to be located on one side of the site. The last station is to be located on the opposite side of the site. The controller outputs are to follow a logical geographical patternfrom one side to another; and

c) the same wire colour shall be maintained along the entire length of the cable run betweenthe controller and each individual solenoid valve.

6. Only one valve shall be allocated per controller output.

7. Doubling up of stations on the same output is not allowed.

8. Valve boxes shall not be installed within 3 m of the road kerb unless approved by the Superintendent.

9. The distance from a valve to the first sprinkler or first drip emitter shall not exceed 50 m.

(iii) Gate and ball valves

1. A ball valve shall be installed on the upstream side of the solenoid valve. A brass barrel unionshall separate the ball valve from the solenoid valve to allow for ease of maintenance. Refer to Section SC6.4.3 Standard drawings SD-10.6, SD-14.3 and SD 14.4.
2. Ball valves shall be tested and approved to AS 3500.1.

(iv) Valve boxes

1. The valve assembly is to be located in a heavy-duty lockable valve box fitted with a stainless steel lock-down bolt in the lid.
2. Valve boxes shall be heavy duty boxes used are to be of adequate size to ensure that there is sufficient space around the valve assembly to allow for ease of maintenance.
3. Valve boxes shall not require removal to facilitate maintenance of the valve assembly.
4. All valve assembly boxes shall be:
    a) supported on bricks so that the box does not rest on any pipes;
    b) installed so that the top of the box is flush with the finished turf surface level for turf areas, or 50 mm to 100 mm above the finished mulch surface level for garden areas;
    c) installed so that the clearance from the underside of the valve box lid to the top of the stem of the valve is; 150 mm maximum – 50 mm minimum for non-drip valves and 75 mm maximum – 50 mm minimum for drip valves, refer Section SC6.4.3 Standard drawings SD-10.6, SD-14.3, and SD-14.4;
    d) installed so that the clearance from the underside of the valve housed within the valve box to the bottom of the box is at least equal to or greater than 50 mm;
    e) the pipe holes shall be sealed with Geofabric around the openings to prevent the ingress offoreign material in the valve box;
    f) cutting of valve boxes for entry/exit of pipe work shall be keep to a minimum, boxes cannot be cut higher than 1/3 its height. Over cut boxes are not acceptable; and
    g) installed in association with its housed components so as not to require excessive cutting of the valve box to the satisfaction of the Superintendent.
5. All valve box lids shall be clearly marked with the identification of the contents using the followkey:
    a) IV = Isolation Valve;
    b) MV = Master Valve;
    c) A1 = Controller A Station 1 (Refer Section SC6.4.3 Standard drawings SD-8.1) for valve key; or
    d) 3-digit DTMF number as supplied by the Superintendent, for example “045” identifying the Irrinet System number.
6. Valve box lids shall be engraved by using a 50 mm to 75 mm high Signet 14474 / 14494 zinc Stencil Set or approved equivalent as a template. The engraving finish shall be evenly 1.5 mm deep at its deepest point and between 4 mm to 8 mm wide by using an engraving power tool fitted with aspherical engraving bit. The finished engraving

shall then be painted with a Signet 12205 White Marker or approved equivalent. Note excessively deep engraving will weaken valve box lids and is not acceptable.

7. No valve boxes shall be installed in drainage swales or places where water is collected duringrainfall.
8. Stainless steel re-enforcing plates may be fitted to valve box lids to repair damaged threads only.
9. Conduit connecting valve boxes with electrical inspection pits and other valve boxes is to be M.D. corrugated flexible conduit of a minimum 500 mm and maximum 1500 mm in length. Section SC6.4.3 Standard drawings SD-17.2 gives a typical construction drawing of the assembly.

(v) Valve nest enclosures

1. Refer to Section SC6.4.3 Standard drawings SD-33.1 through SD-33.4 for valve nest enclosure details.
2. Valve nest enclosures may be installed where groups of more than three valves can be located together.
3. Allowance must be made for larger lateral pipe sizes to offset increased friction losses wherelonger lateral pipe lengths are required.
4. Allowance must be made for increase lateral sizes and quantity leaving the one location.
5. Where three or more laterals leaving a valve nest cover share a common trench, bedding sandmust be used to back fill trenches.
6. Lateral pipes leaving a valve nest cover must be run parallel in trenches (not twisted).
7. Valves inside a valve nest cover must be clearly identifiable via round 38 mm diameter aluminium identification tags commercially available. DTMF numbering shall be clearly stamped onto one side of the tag using a punch set with 13 mm high numerals. Tags shall be fastened to the appropriate solenoid valve using a quality grade plastic cable tie.
8. Electrical cables shall be cable tied to each solenoid valve control valve.
9. Enclosures shall be fitted with a pad lock and keyed to fit Council “F” series.
10. Solenoid valves shall be connected to a common copper manifold via individual brass barrel union and ball valve.
11. Copper manifolds (from 40 mm to 80 mm) must be of sufficient size to allow multiple stations to run simultaneously in program where required.
12. Copper manifolds connecting to PVC mainline shall be done via Cop-A-Mate flange or approved similar, installed 25 mm above ground level.
13. Copper manifolds connecting to Poly mainline shall be done via metric female compression fitting installed 25 mm above ground level.
14. Install Valve Nest Cover using 10mm 316 S.S dyna bolts fastened to 200 mm diameter by 300 mm deep concrete footings poured on site.
15. Top of concrete footings shall be installed level and 25 mm above finished ground level.

(5) Sprinklers, turf valves, and drip irrigation

(a) Sprinkler design

(i) Sprinklers used shall be in accordance with Table SC6.4.13.9.

Table SC6.4.13.9 - Approved Sprinklers

Manufacturer	Model	Type
Hunter	PGP	Gear
Hunter	MPR	Rotating Nozzle**
Hunter 120		
Toro	570	Static
Rainbird	3500	Gear
Rainbird	5000 Plus	Gear
Rainbird	5505	Gear
Rainbird	6504	Gear

** Use on Toro 570 Body.

(ii) Sprinkler uniformity shall not exceed a scheduling coefficient of 1.3 (5 per cent Window). Section SC6.4.3 Standard drawings SD-19.1, provides a definition of the scheduling coefficient and the process for calculation.

(iii) Where possible, individual sprinkler stations shall be fitted with either all full circle sprinkler arcs or allpart circle sprinkler arcs.

(iv) All sprinklers on the same valve shall provide “matched precipitation”. The ratio of water supplied shall be even across all arcs of coverage. Sprinklers of different pressure and / or precipitation rate on the same station are not acceptable.

(v) The variation in flow between any sprinklers on a single station is not to exceed 10 per cent.

(vi) All sprinklers are to be run at the manufacturer’s recommended pressure.

(vii) All sprinkler heads on each individual station shall be the same type.

(viii) Locations which are susceptible to low head drainage shall be fitted with either internal check valves, or Hunter or similar approved external check valves.

(ix) No water shall be applied by design to locations where over spray is undesirable, (I.e., adjacent non-irrigated areas, roads, footpaths, private property etc.). The manufacturer’s published throw distance shall govern for design purposes.

(x) On roadway corners no water shall be applied by design to the road pavement whilst no unirrigated areasshall exceed 1m from the road edge. The manufacturers published throw distance shall govern. Examples of acceptable sprinkler layouts are given in Section SC6.4.3 Standard drawings SD-16.1.

(xi) All static sprinklers are to be fitted with “fixed pattern” nozzles.

(xii) Sprinklers are to be designed and installed in such a way that no electrical boxes, control cabinets, transformers, meter assemblies and the like are hit by direct water streams.

(b) Sprinkler installation

(i) No sprinklers shall be fitted until all main lines, lateral lines and risers have been flushed clean.

(ii) Sprinklers shall be placed 150 mm clear from walls, garden edges, pathways and the back face of concrete kerbs or concrete garden edges.

(iii) sprinklers shall be installed as detailed in Section SC6.4.3 Standard drawings SD-12.1 Figure 2, slightly above the finished surface level.

(iv) Sprinklers shall be installed plumb unless placed on a slope in which case they shall match the slope of the surface.

(v) Where directed by the Superintendent sprinklers in grassed areas shall be installed with a sod of turf (300 mm square) placed around them at the finished surface level to help stabilise the sprinkler.

(vi) Sprinklers shall be connected to pipes (lateral lines) via either a tapping saddle or a BSP/F Tee and a flexible swing hose riser. All swing hose risers shall face downstream of the solenoid valve. Refer to Section SC6.4.3 Standard drawings SD-12.1 Figure 1.

(vii) In locations where soils may be of a corrosive nature, 316 stainless steel bolt and nuts shall be used on all tapping saddles.

(viii) The flexible swing hose riser used shall be either:

1. 25 mm safety yellow industrial hose, with nylon type elbows secured with stainless steel hose clamps; or

2. HR Products E-Z riser tube and E-Z riser elbows. (For sprinklers with 15 mm and 20 mm inlets).

(ix) Nozzle diffuser screws shall not reduce the wetted throw of a sprinkler by more than 20 per cent of the undiffused radius of a sprinkler.

(c) Bollard sprinkler installation

(i) Bollard sprinklers shall be installed where approved by the Superintendent in locations where sprinklers may be obstructed by plants or plant growth.

(ii) Bollard sprinklers shall be assembled and installed as detailed in Section SC6.4.3 Standard drawings SD-12.2.

(d) Turf valves

(i) All turf valves shall be Plasson.

(ii) Turf valves shall be installed with an articulated riser connected to the main line via a tee coupling. Connecting turf valves to main line with tapping saddles is not allowed.

(iii) Turf valves that are to be used as a hose watering point for garden establishment shall be installed in a valve box.

(iv) Turf Valves Systems where sprinklers are directly inserted into the turf valves may be installed without a valve box flush with the soil surface.

(v) Turf valves located under valve box lids shall have the lid of the valve box clearly marked with anengraving tool and paint with the letters “TV”.

(e) Dripper irrigation design and installation

(i) All drip irrigation systems shall be installed with an RPZ backflow device.

(ii) The length of the drip tube shall be determined, based on all drippers along the line having sufficient pressure to operate 100 kPa above the pressure compensation point as nominated by the dripper manufacturer. The maximum allowable inlet pressure shall be 300 kPa.

(iii) All drip tube used shall be Netafim Uni Ram 16 - 0.4 m spacing @1.6 lph or approved equivalent.

(iv) The maximum spacing for drip tube is as shown in Table SC6.4.13.10.

Table SC6.4.13.10 - Dripper Spacing

Soil Type	**Location**	
	Grassed areas	**Gardens**
Loam and Clay Soil	400mm maximum	500 mm maximum
Sandy Soil	300mm maximum	400 mm maximum

(v) Refer Section SC6.4.3 Standard drawings SD-14.1 and SD-14.2 for typical drip irrigation details.

(vi) Pressure compensation shall be fitted to each individual drip irrigation station. The devices used shall be retro fitted to the solenoid valve. The following two options are acceptable:

1. Hunter Accu-Set pressure regulator, refer Section SC6.4.3 Standard drawings SD-14.3; and

2. inline pressure regulation device as specified by the Superintendent, refer to Section SC6.4.3 Standard drawings SD-14.4.

(vii) A 120 mesh Disc Filtration system shall be installed immediately up stream of the solenoid valve in accordance with the manufacturer's specifications to ensure that the correctly sized filtration system is used. The following two filtration systems are acceptable:

1. Netafim Tech Filter, (rated at 120 mesh by Netafim); and

2. Arkal 120 mesh Disc Filter fitted into a Netafim Tech filter housing, may be used during construction and for a period no greater than 1 month after installation of the drip tube.

(viii) The filter, pressure regulator valve and solenoid valve assembly shall be installed in a valve box. Barrel Union/s shall be fitted to allow for easily removal of the filter, refer section SC6.4.3 Standard drawings SD-14.3 and SD-14.4. The order of component installation from upstream to downstream is to be Barrel Union,Filter, Barrel Union, Solenoid valve and Pressure Regulator. The fitting of these devices and the size of the valve box shall allow for:

1. the filter cartridge to be easily serviced and changed; and

2. the pressure regulator to be easily adjusted and serviced.

(ix) Drip tube shall be installed:

1. in turf with 75 mm cover to the finished surface level.
2. drip tube laid on the surface shall be fitted with holding pins placed every 1.5 m along the tube. Holding pins are to be constructed from 2.3 mm minimum diameter Stainless Steel wire of 304 grade. Refer to Section SC6.4.3 Standard drawing SD-15.1 for details.

(x) Drip tube shall not be installed:

1. directly into heavy clay or rocky soils where conditions may cause damage to the drip tube. In these soil types, the drip tube must be installed between a 50 mm surround of imported loan soil; and
2. in areas subject to significant vehicle traffic, where these conditions would cause damage to the drip tube.

(xi) All dripper lines shall terminate to a flushing manifold on the downstream side of the line. The head loss in the manifold shall be sized to lose no more than 1 m based on twice the flow rate of the flow during normal operation. Each flushing line shall be fitted with a ball valve and 1 m of industrial vacuum and delivery hose. The ball valve shall be installed to provide easy operation. The ball valve shall be positioned in the valve box to prevent the industrial vacuum and delivery hose from kinking. The hose is to be held inplace with a stainless-steel hose clip. See Section SC6.4.3 Standard drawings SD-14.1 and SD-14.2 for component layouts. The valve box shall be sized as follows:

1. 25 mm ball valve – Carson or equivalent round valve box; and
2. 40 mm and 50 mm ball valves – Carson or equivalent rectangular valve box.

(xii) All high point(s) in the dripper layout shall be fitted with a Bermad vacuum relief valve (Model ARV). The vacuum valve is to be installed in a valve box. A section of drip tube shall cross connect all drip tubes to the vacuum relief valve. The vacuum relief valve shall not be fitted to the supply manifold. See Section SC6.4.3 Standard drawings SD-14.1 and SD-14.2 for a typical installation.

(xiii) Netafim HCNL drip tube and/or Hunter adjustable check valves (or approved equivalent) shall be fitted if the fall in the drip irrigation system exceeds 3 m. Each side of the check valve shall be fitted with independent Flushing Valves and Vacuum Relief Valves. The check valves shall be set to 3 m. The two methods for installation of the check valves are:

1. check valves fitted to each drip tube; and
2. check valves fitted to both the supply manifold and the flushing manifold.

(xiv) Each drip irrigation station shall be fitted with operation indicators. The operation indicators consist of a Toro 570 100 mm pop-up sprinkler fitted with an SST nozzle set to zero flow, sealed with silicon and installed level with the ground. The operation indicators are to be installed in a garden bed or next to atree (not be a tripping hazard) and be visible from the drip valve assembly. Additional operation indicatorsshall be installed at the ends of each station and connected using a HR Products E-Z riser tube and 15mm E-Z riser elbows.

(xv) Prior to the installation of the drip irrigation system the area to be drip irrigated shall be soaked with water and allowed to dry. Any resulting subsidence or soil shrinkage shall be filled with soil up to the finished surface level. The process of soaking with water and filling to a finished surface shall be repeated until the required surface level is achieved. Drip tubes may then be laid with the correct cover.

(xvi) On slopes the drip irrigation tubes shall following the contour lines of the area.

(xvii) “Snaking” of dripper lines shall be avoided.

(xviii) The minimum size of the header manifold is to be 25 mm low density poly pipe.

(xix) Drip tube shall be laid in straight runs inside roundabouts.

(xx) No drip tube shall be installed within 150 mm from walls, garden edges, pathways and the back face of concrete kerbs or concrete garden edges.

(xxi) Drip tube shall only be connected to low density poly pipe 25 mm and 32 mm using FI Tees and Netafim elbow adapters (3/4 inch to 17 mm) with all low-density pipe fittings clamped using Cobra stainless steel clamps or similar approved type. The use of quick start connectors is not approved by Council.

(xxii) Drip tube shall only be connected to PN 6.3 Poly Pipe using poly tapping saddles and Netafim elbow adapters (3/4 inch to 17 mm). The use of grommet connectors is not approved by Council.

(xxiii) In locations where soils may be of a corrosive nature, 316 stainless steel bolt and nuts shall be used on all tapping saddles.

(6) Drinking fountain and water tap.

(a) Drinking fountain

(i) A drinking fountain assembly includes:

1. bowl - cast alloy, powder coated white;
2. turret - Ex 219 OD stainless steel tube powder coated "Heritage Green";
3. tap - BUB228C cam action Enware;
4. bubbler - Enware Type 61 push button bubbler with 3/8th - 1/2"x 3" male BSP tail;
5. copper tube connection – 13mm Annealed Copper;
6. isolation valve;
7. precast concrete plinth base;
8. precast concrete pipe and aggregate backfill;
9. potable water supply line and water meter; and
10. Section SC6.4.3 Standard drawings SD-32.1 contains the construction drawings for the fountain assembly.

(ii) All pipe work to a drinking fountain shall comply with AS 3500. All pipe work installation to a drinking fountain, shall be carried out by a licensed plumber.

(iii) The supply line to a drinking fountain shall be a “standalone” potable water line with its own water meter. Pipe work shall be a minimum 32 mm PN12.5 Poly Pipe (from meter to isolation valve) laid in a trench with sand bedding and surround to the pipe and with 300 mm minimum cover over the pipe. Drinking fountains and water taps may be installed on the same potable water line.

(iv) The drinking fountain turret shall be installed on a precast concrete plinth base set on top of a 600 dia x 1.2m long reinforced concrete pipe embedded into the ground and backfilled with 20 mm aggregate for drainage. Details of the base are given in Section SC6.4.3 Standard drawing SD-32.2. Alternately, the drinking fountain may be connected into an

existing sewer drainage line.

(v) The drinking fountain shall be isolated by a 15 mm ball valve. The isolation valve shall be located a nominal 600 mm from the drinking fountain adjacent to the concrete plinth base and shall be installed in a circular valve box.

(vi) The drinking fountain tap, and bubbler shall be connected to the isolation valve with a flexible stainless-steel hose.

(vii) All bolts, screws and masonry anchor bolts fitted to the drinking fountain assembly shall be stainless steel.

(viii) On completion and at commissioning of the drinking fountain the pressure shall be adjusted so the stream of water exiting the bubbler does not spill over the bowl

(ix) Refer standard drawing for drinking fountain assembly.

(b) Water tap

(i) A water tap assembly includes:

1. tap with vacuum breaker;
2. stainless steel support post;
3. concrete splash pad; and
4. potable water supply line and water meter.

(ii) All pipe work to a water tap shall comply with AS 3500. All pipe work installation to a water tap shall be carried out by a licensed plumber.

(iii) The supply pipeline to a water tap shall be a “standalone” potable water line with its own water meter. Pipe work shall be a minimum 32 mm PN12.5 Poly Pipe (from the meter to copper tail pipe) laid in a trench with sand bedding and surround to the pipe and with 300 mm minimum cover over the pipe. Water taps and drinking fountains may be installed on the same potable water line.

(iv) Tap shall be a 15mm brass hose cock or similar approved connected to a 20 mm copper tail pipe installed inside the support post.

(v) Support posts shall be 40 mm x 40 mm x 1.6 mm stainless steel SHS fitted with a plastic cap and cast 350 mm minimum into a 350 mm dia. x 450 mm deep concrete footing.

(vi) Splash pads shall be either:

1. 600 mm square x 100 mm thick N25 concrete cast insitu; or
2. 600 mm square x 50mm thick precast concrete.

(vii) Refer standard drawing for water tap assembly.

(c) Fertigation

A fertigation point consisting of 25 mm tested ball valve connected to the irrigation main line close downstream from the back flow assembly must be installed unless advised by the Superintendent. The fertigation point is tobe housed in a round enclosure with the lid marked “FRT” for identification.

(7) Effluent reuse systems

(a) Design and installation

(i) All works must comply with the *Queensland Water Recycling Guidelines*, current health and safety, environmental and related acts.

(ii) Effluent reuse irrigation systems shall have:

1. sprinklers fitted with lilac ID caps;
2. lilac coloured drip tubing;
3. lilac coloured valve box lids;
4. mainline and lateral pipe material (plastic) shall be lilac in colour or contain a lilac strip;
5. all above ground pipe work shall be lilac coloured and/or clearly labelled “Recycled Water”, “Non-Potable Water”; and
6. minimum separation of pipe work for potable and recycles water systems shall be maintained at 300 mm for below ground pipe work and 100 mm for above ground pipe work.

(8) Installations located in landfill sites

(a) Trenching in landfill areas

When excavating in landfill sites or areas containing rock the trench shall be excavated to a minimum depth of 600 mm.

(i) All trenching material removed from the trench shall be removed to the local refuse dump.

(ii) All trenching spoil shall be totally removed from the surrounding surfaces and site and inspected by the Superintendent.

(iii) Bedding sand shall be used to backfill to 200 mm below finished soil level. The final 200 mm shall be filled with an approved loam.

Development manual planning scheme policy (PSP)
SC6.4.14 Public utilities and building over/near services

Index

SC6.4.14.1 Introduction

(1) Purpose
(2) Scope
(3) Consultation
(4) Reference and source documents

SC6.4.14.2 Public lighting (urban, urban Residential, and rural)

(1) Public lighting general
(2) Road lighting general
(3) New subdivision marketing banners on light poles

SC6.4.14.3 Utility services

(1) All utility services to be underground
(2) Alterations to existing services
(3) Telecommunication cabinets and electricity supply pillars
(4) Electricity supply general
(5) Gas supply
(6) Traffic signals

SC6.4.14.4 Building over/near services

(1) Introduction
(2) Restricted development
(3) Allowable development over or adjacent to sewerage services
(4) Allowable development over or adjacent to stormwater services
(5) Clearances
(6) Relocation of services
(7) Access to services

SC6.4.14.5 Conduit assessment

(1) CCTV inspection
(2) Qualifications of CCTV operators and supervisors
(3) Site establishment
(4) Inspection report
(5) Inspection software
(6) Data ownership

SC6.4.14.6 Construction

SC6.4.14.7 Verification of existing services

SC6.4.14.1 Introduction

(1) Purpose

The purpose of the public lighting, utility services, and building over/near services section is to provide standards, advice and guidelines for the design, installation and construction of public lighting and utility services, and building over/near existing services.

(a) Public lighting

Public lighting is provided to:

(i) allow for the use of and safe movement in public spaces;

(ii) provide improved safety and security for the community at night; and

(iii) enhance the public amenity.

(b) Utility services

A purpose of a road reserve is to provide a corridor for the delivery of utility services such as water supply, sewerage, gas, telecommunications (including future telecommunications) and electricity, to all properties fronting the road, street, or rear lane. The verge or footpath area between the road reserve boundary and the edge of the roadway provides the space for these service corridors and these guidelines are designed to achieve the following aims:

(i) provide a convenient location for the installation and safe access to all utility services for maintenance and retrofitting purposes;

(ii) provide a corridor for street furniture including road lighting poles;

(iii) minimise possible conflict with other underground services; and

(iv) provide an opportunity for street landscaping.

Council standard drawings (Section SC6.4.3 Standard drawings) for service corridors provide details of utility alignments within the footpath/verge and should be read in conjunction with Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.1 Geometric road design.

(2) Scope

(a) Public lighting includes:

(i) road lighting (urban, urban residential, and rural);

(ii) lighting for footpaths and cycle paths;

(iii) lighting for parks;

(iv) lighting for sports grounds and sports complexes;

(v) lighting for public buildings;

(vi) lighting for off-street car parks; and

(vii) feature lighting which may include bollards and in ground lighting.

(b) Utility services include (but are not limited to):

(i) reticulated water supply;

(ii) reticulated sewerage supply;

(iii) sewage pressure mains;

(iv) reticulated gas supply and its supporting infrastructure;

(v) reticulated telecommunications network, including future services (fibre optic);

(vi) reticulated electricity, both underground and overhead supply;

(vii) lighting networks, including road, open space, community facilities and off-street parking; and

(viii) traffic signals.

(3) Consultation

Developers and applicants are encouraged to consult with Council and the relevant servicing authority and determine any requirements these authorities may have before undertaking any detailed design.

Developers should obtain service plans from all relevant public utility authorities and organisations whose services may exist within the area of the proposed development. These services are to be plotted on the relevant drawings including the plan and cross-sectional views.

If there is an expectation that an application may have higher servicing demands, details of these additional demands should be provided to Council and the servicing authority.

(4) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(a) Council requirements and drawings:

Section SC6.4.2 Development application guidelines

Editor's Note - This policy section is to be read in conjunction to Section SC6.4.2 "Development application guidelines" for advice and guidelines relating to development applications to assist applicants in achieving Council's design objectives.

SC6.4.3 Standard drawings

SC6.4.6 Roadworks and traffic control

(b) Australian Standards:

AS/NZS 1158 *Lighting for roads and public spaces (set)*

AS/NZS 1596 *The storage and handling of LP gas*

(c) Other:

Australian Government, *Disability Standards for Accessible Public Transport 2002*

Electricity Act 1994

Electrical Safety Act 2002

SC6.4.14.2 Public lighting (urban, urban residential, and rural)

(1) Public lighting general

There are a number of types of public lighting infrastructure which meet a range of different needs. Infrastructure associated with public lighting generally consists of poles, outreach arms, lamps, luminaires, photoelectric cells, switch gear, footings, and connections to a supply. The size and type of lighting infrastructure will be determined by the size and type of the use, the intensity of lighting required, remoteness from supply and the time of operation.

All lighting designs must be prepared and certified by an appropriately qualified Registered Professional Engineer of Queensland prior to submission to Council with a development application. Lighting installation works must also be certified by an appropriately qualified Registered Professional

Engineer of Queensland following completion and prior to acceptance by Council.

Road and public space lighting must be designed in accordance with AS/NZS 1158 and Energy Queensland's requirements.

(2) Road lighting general

Lighting infrastructure (including poles, switch boards, and other infrastructure) must be of a design suitable to be accepted for ownership by Energy Queensland and billed to Council under a Tariff 71 rate 2 Tariff. The luminaires should be as shown on the Energy Queensland 'load table' and suitable for ownership by Energy Queensland, also billed to Council under Tariff 71 Rate 2. If alternative street lighting design, which is suitable for billing under a metered tariff or acceptable to Energy Queensland under Tariff 71 Rate 3, is proposed, this must be specifically agreed to by Council.

All lighting in new residential areas must be LED lights acceptable to Energy Queensland for billing under Tariff 71 rate 2.

If other road lighting infrastructure is preferred by a developer for aesthetic or other reasons including for environmental protection, which the developer expects to hand to Council for ongoing maintenance, justification must be provided on how this will fit into any lighting master plans for the area. Without approval Council gives no guarantee that this infrastructure will be adopted by Council, and if it is adopted, that it will be maintained in that form. Any "non-standard" road lighting would be on a Rate 3 Tariff. Metered Tariff connections are generally not acceptable.

Editor's Note - Council does not support shading of lights on the basis that it would be a penalty to road users, particularly cyclists and pedestrians.

(a) Road lighting in rural areas

Flag lighting is to be provided at:

(i) all intersections on roads;

(ii) on curves where the advisory speed through the curve is 15 km/h lower than the gazetted speed limit of the road; and

(iii) at the ends of cul-de-sacs.

Lighting on roads under the control of the Department of Transport and Main Roads must be designed to meet their requirements.

(b) Road lighting in rural residential areas

Lighting must be provided in accordance with the relevant sections of AS 1158.

Flag lighting shall be category PR5 and shall be provided at:

(i) all intersections on roads;

(ii) on curves where the advisory speed through the curve is 15 km/h lower than the gazetted speed limit of the road; and

(iii) at the ends of cul-de-sacs.

Lighting on roads under the control of the Department of Transport and Main Roads must be designed to meet their requirements.

(c) Road lighting in urban areas

Lighting must be provided in accordance with the relevant sections of AS 1158 and the following:

(i) Category V3 Lighting on arterial and sub arterial roads;

(ii) Category V5 Lighting on major collector streets;

(iii) Category PR3 Lighting on, access Streets, access Places, industrial streets, and commercial precincts unless otherwise determined by Council, E.g., higher lighting levels to assist with CCTV surveillance; and

(iv) lighting in public transport infrastructure (compliance to the *Disability Standards for Accessible Public Transport 2002*).

Lighting designs shall comply with AS1158.3 Clause 3.1.3.4 in relation to "Obtrusive Spill Lighting" onto adjoining properties.

(d) Lighting for bicycle, pedestrian, and shared paths

Lighting Category PP1-PP5 or bicycle, pedestrian and shared paths as advised by Council after consideration of location, hours of use and risk to the public.

(e) Lighting for parks

Lighting requirements for parks will be determined by Council based on where the park fits into the hierarchical structure. A point of supply is required to most parks, and where required, the precise location of the supply will be advised by Council. This lighting may have a sub metered supply.

(f) Lighting for sports grounds and sports complexes

Lighting requirements for sports grounds and sports complexes will be determined by Council based on where the park fits into the hierarchical structure.

A point of supply is required to most parks, and where required, the precise location of the supply will be advised by Council.

(g) Lighting for public buildings and spaces

Lighting requirements for public buildings and spaces will be determined based on a risk assessment considering location, time of use, number of people, relevant building codes and AS/NZS 1158.

(h) Lighting for off-street carparks.

Lighting must be provided in accordance with the relevant sections of AS 1158. A point of supply is required to most off-street carparks. Lighting shall be provided in accordance with the lighting masterplan for the area, unless otherwise approved by Council. This lighting must have its own separate metered point of supply.

(3) New subdivision marketing banners on light poles

It is common practice for developers to place marketing banners on light poles along local roads within the boundary of the new subdivision. Banners are lightweight and made of a non-rigid material.

The developer must obtain approval from Ergon Energy to erect marketing banners on light poles and comply with all Ergon Energy conditions. Banners on light poles must not be a driver distraction on the road or at an intersection. Banners must not interfere with an official traffic sign, distract a driver's attention at a critical time, obscure the drivers view of a road hazard, give instructions to stop, imitate an official traffic sign, nor be an obstruction to the road or a hazard to all other road users. A high level of safety for road users must be maintained.

At the time of on maintenance Council may accept the marketing banners on light poles, but the developer must indemnify Council for all matters arising from the banners erected on light poles. The banners may remain on the light poles for twelve (12) months. If banners are required beyond this

time, then the developer must submit a request to Council for a twelve (12) month extension of time. Council may request the developer to remove any marketing banner on any light poles at any time.

Editor's Note – there may be additional related requirements in Subordinate Local Law No. 1.4 (Installation of Advertising Devices) 2011.

Council will not give consent for advertising banners to be placed on streetlights that are owned and maintained by Council.

SC6.4.14.3 Utility Services

(1) All utility services to be underground.

All services to new developments must be constructed underground unless otherwise approved by Council. Layout plans for all service installations must be submitted to Council as part of the development application.

(2) Alterations to existing services

Care should be taken during the design to avoid other existing underground services, and where this is unavoidable it will be the developer's responsibility to undertake the necessary alterations to the satisfaction of the asset owner at the developer's cost.

Where it is necessary to install conduits under existing roads, this installation must be undertaken by boring unless otherwise approved by Council.

(3) Telecommunication cabinets and electricity supply transformers, pillars

The proposed location of on street telecommunication cabinets and electricity supply transformers, and pillars must be shown on plans and be located clear of access driveways to properties, and clear of any water and gas services in accordance with any requirements of the relevant authority.

(4) Electricity supply general

An overhead supply approved by the relevant energy authority where in the rural residential zone, special purpose zone or high impact industry zone or where on a lot of less than 2,500 m^2 within an area where the existing supply is overhead is acceptable.

In exceptional circumstances, remote access properties in the rural zone may be permitted to provide an electricity supply that is not connected to the grid. It shall be demonstrated by the applicant that an adequate and reliable supply that maintains standards for safety, environmental, health and amenity is achievable.

Acceptable alternatives may include solar or other similar self-generating system.

Electricity and/or telecommunications services must be designed in accordance with the relevant utility provider's guidelines, as well as designed to accommodate and have the load and augmentation capacity to integrate Council's Future City electricity supply-demand options (including ring mains, distributed solar, batteries, electric vehicles and dynamic sensors, metering, switching and load balancing (flow) devices), i.e. aligned with TCC Smart Infrastructure and Sustainable Energy Framework.

Electricity design plans submitted to Council with an RPEQ certification are only accepted by Council to permit the utility provider (E.g., Energy Queensland) to formally approve the design.

In the construction phase only conduits for both electricity and telecommunications utilities are installed, with the relevant utility provider installing the actual service after the works are complete.

(5) Gas supply

Where it is proposed to provide a reticulated gas supply to a development, the gas service pipe must be installed in the verge or footpath on the alignment shown on Section SC6.4.3 Standard drawings.

If a storage cylinder is proposed as part of the development, the cylinder must be installed and maintained on a separate freehold parcel of land in accordance with all safety regulations contained in the AS/NZS 1596 *The storage and handling of LP gas*. Details for servicing the gas cylinder must be provided to Council as part of the development application.

(6) Traffic signals

The design of a traffic signal installation must be undertaken by an appropriately qualified and competent Registered Professional Engineer Queensland (RPEQ) who has relevant experience in signal design.

Compliance with the statutes and regulations applicable for road use in Queensland is mandatory.

The design of traffic signals shall comply with the following:

(a) Manual of uniform traffic control devices (Queensland);

(b) Department of Transport and Main Roads standards and MRTS specifications for electrical and ITS;

(c) Austroads Standards; and

(d) Australian Standards.

The design of traffic signals and signal sequencing is to be based on existing and projected future traffic volumes determined through a traffic impact assessment (TIA) prepared by a qualified traffic engineer.

Where required the developer shall hold discussion with and obtain approval of the Department of Transport and Main Roads for the intersection layout and design of the signals system.

Where required, traffic signals shall be provided with CCTV camera/s and be connected to the TMR control centre via telemetry.

SC6.4.14.4 Building over/near services

(1) Introduction

(a) Purpose

This section outlines Council's standards and guidelines for building over or adjacent to Council's services. This document will supplement the Queensland Development Code (QDC) *Mandatory Part 1.4 – "Building over or near relevant infrastructure"* and identifies and provides additional guidance about any information that may be required to support a development application. This section does not replace or override any aspect of the QDC.

(b) Scope

This section applies to all building work proposed to be carried out over or near to a Council service or underground asset.

(c) Principles

The construction and erection of a structure or the creation of a residential allotment over or near to a Council service must be carried out in a way that ensures that:

(i) the function of the service is not adversely affected;

(ii) no additional load is placed on the service without Council approval; and

(iii) maintenance access (at all times) to the service is not interfered with or restricted.

Developers should obtain service plans from all relevant public utility authorities and organisations whose services may exist within the area of the proposed development. These services are to be plotted on the relevant drawings including the plan and cross-sectional views.

(2) Restricted development

(a) Without exception, Council will not permit building a structure over or near to:

(i) sewer pressure mains and overflow pipework; or

(ii) gravity sewer trunk mains; or

(iii) sanitary drainage connection points; or

(iv) water supply mains; or

(v) stormwater drainage conduits (pipes or culverts) with a capacity of less than 2% average exceedance probability (AEP) or stormwater pipelines with an internal diameter of less than 375 mm; or

(vi) open drainage channels or overland drainage paths.

(3) Allowable development over or adjacent to sewerage services

(a) Council may permit building a structure over or near to the following sewerage services:

(i) gravity sewer mains, other than gravity trunk mains excluded under Clause SC6.4.14.4 (2) The applicant is to carry out an internal closed circuit television inspection of the main and submit it to Council, prior to commencing any construction activities over or adjacent to the sewer. Post construction internal closed circuit television inspection is required to confirm no damage to the sewer as a consequence of the construction activities.

If the main is assessed to be in poor condition or liable to damage from the proposed construction, the applicant may be required to replace the main to the satisfaction of Council prior to commencement of any construction activities over or adjacent to the sewer; and

(ii) sewer maintenance holes in commercial or industrial buildings:

If approved, the chamber is to be raised to the floor level of the building. Maintenance holes must be sealed against gas leaks, bolted down, and kept clear of obstructions for maintenance access by Council at all times.

(4) Allowable development over or adjacent to stormwater services

(a) Council may permit building a structure over or near to the following stormwater services:

(i) drainage conduit with a minimum 2% AEP and with an internal diameter greater than 375 mm. The applicant must carry out an internal closed-circuit television inspection of the stormwater conduit and submit it to Council, prior to commencing any construction activities over or adjacent to the stormwater conduit. The applicant may be required to replace the main to the satisfaction of Council prior to commencement of any work If the stormwater conduit is assessed to be in poor condition or liable to damage from the applicant construction activities over or adjacent to the stormwater conduit. Council may permit a driveway or temporary or light steel framed structure to be constructed over a storm water drain where:

1. maintenance access to the drain can be retained;

2. the drain does not also form part of an overland flow path; and

3. no other option is available.

(5) Clearances

The following minimum clearances apply for structures permitted to be built over or adjacent to a service:

(a) a minimum clearance of 250 mm must be maintained between the outside edge of the service footprint and the nearest projection of the foundation of the proposed structure, excluding swimming pools. Swimming pools must be located to achieve a minimum clearance of 600 mm vertically and 1 m horizontally to the outer edge of the service footprint;

(b) a minimum horizontal clearance of 1.2 m must be maintained between the outer face of the service and the nearest point of the foundation of the structure;

(c) the foundation of any structure, excluding a swimming pool, located within the zone of influence must extend a minimum of 300 mm below the projected zone or on solid rock. Pier and beam footings are generally acceptable;

(d) a minimum clear vertical space above a sewer manhole of 2.4 m must be maintained above the finished ground surface level for access purposes;

(e) a minimum horizontal clear space of 2.0 m must be maintained between structure and connection point on sewer, connection point on sewer refers to oblique branch (OB), vertical jump-up (VJU) and centre line of sewer maintenance structure; and

(f) a minimum horizontal clear space of 2.0 m must be maintained between structure and outside face of gravity trunk sewer.

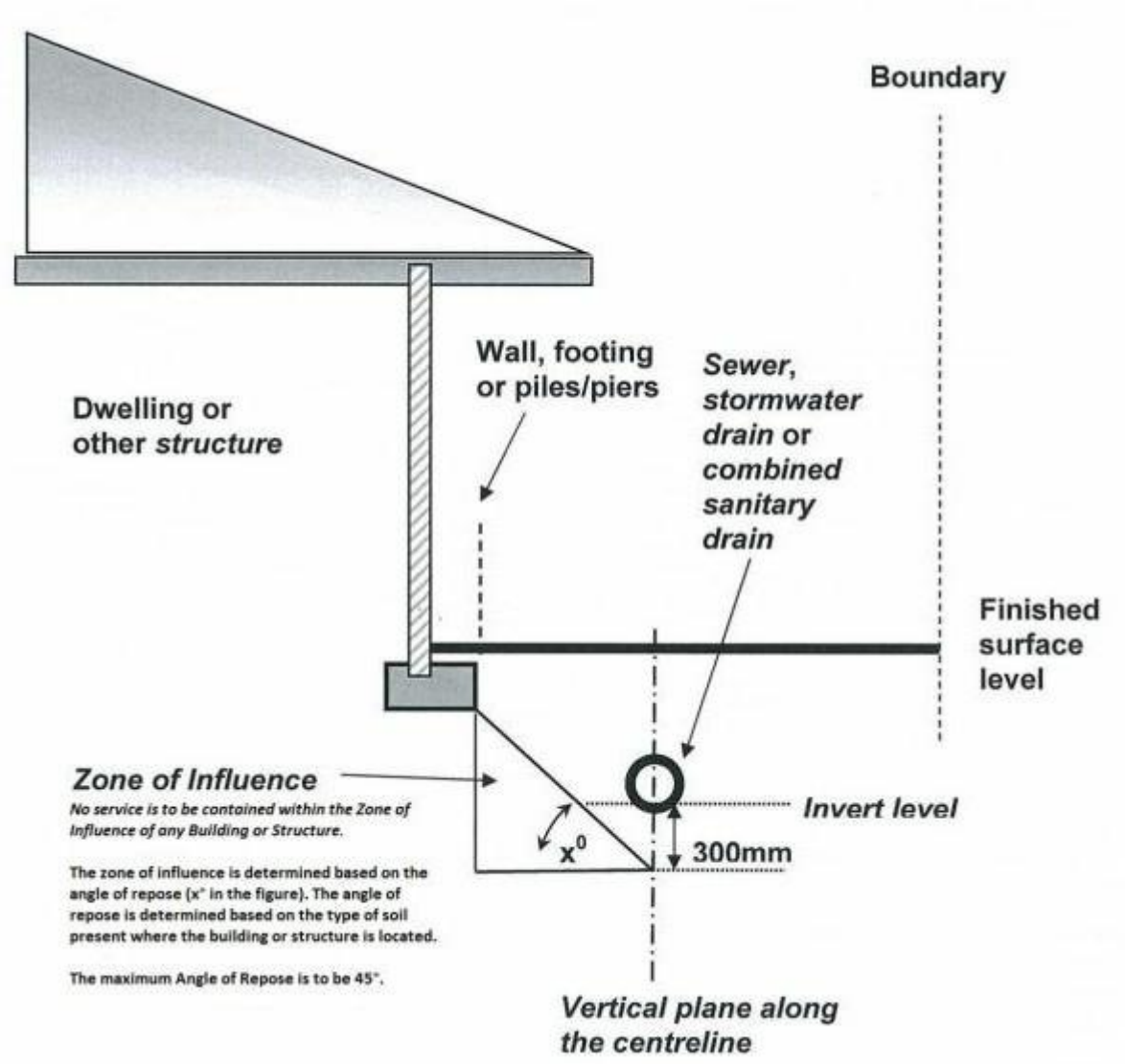


Figure SC6.4.14.1 - Zone of Influence

(6) Relocation of services

(a) Council will require that a service is relocated at the developer's expense where:

(i) no other site is reasonably available for the location of the proposed structure; and

(ii) the proposed structure is in conflict with, or likely to cause damage to, a Council service.

(b) If Council in its absolute discretion considers it necessary for a service to be relocated as a consequence of a proposed development, the re-design must consider:

(i) the feasibility of redesign or relocation;

(ii) terrain;

(iii) cost;

(iv) importance of the service; and

(v) suitability for future maintenance access.

(7) Access to services

(a) Council must be able to reach sewerage assets. Access to and working space around surface fittings and access points is required for routine operation and maintenance. Council may also require construction and excavation space for repair or renewal.

(b) Access to sewer maintenance structures shall be an unobstructed passageway with a minimum width of 1 m and minimum clear headroom of 2.4 m. A maintenance vehicle must be able to park not more than 50 m from the maintenance structures.

SC6.4.14.5 Conduit assessment

Conduit assessment of sewer and stormwater lines is required before the acceptance of these assets “on maintenance” (the defects liability period) or prior to the assessment of any development application (including a Building over Services application) which may impact upon a sewer or stormwater asset. Assessments may be required by Council prior to assessment or be conditioned by a development approval as part of construction. Inspections must be undertaken by means of closed-circuit television (CCTV) inspection and submission of the resultant video and assessment report.

Any development which proposes to construct a structure, building or undertake earthworks in the vicinity of or within the “zone of influence” of an existing conduit may be required to identify the condition of the conduit for assessment of serviceability and structural compatibility with the proposed development work. Any upgrading or replacement determined by Council will be carried out at the developer's expense prior to the commencement of any development works.

(1) CCTV inspection

(a) Sewer

(i) Major developments (refer to Clause SC6.4.2.2(1)):

1. immediately prior to commencement of the defects liability period and following the total completion, cleaning, and testing of the asset; and

2. if defects are identified they must be rectified, and the sewer, for the entire length between the upstream and downstream maintenance holes (MHs), must be assessed again prior to completion of the defects liability period.

(ii) Minor developments (refer to Clause SC6.4.2.2(2)):

1. systems containing two or more sewer lengths, or systems containing sewer lengths that exceed a combined service length of 60 m measured centre to centre between manholes require assessment immediately prior to commencement of the defects liability period and following the total completion and cleaning of the asset;

2. if defects are identified they must be rectified, and the sewer, for the entire length between the upstream and downstream maintenance holes (MHs), must be assessed again prior to completion of the defects liability period; and

3. where a defects liability period does not apply, CCTV assessment is mandatory prior to acceptance.

(b) Stormwater

(i) inter-allotment systems located on private property are exempt;

(ii) rubber ringed jointed pipe systems with flexible joints immediately outside chambers (includes PVC and Polythene pipe systems) will be visually assessed and are exempt subject to the system presenting defect free;

(iii) CCTV assessment of flush end RCP pipe systems is mandatory;

(iv) major developments (refer to Clause SC6.4.2.2(1)):

1. Immediately prior to commencement of the defects liability period and following the total completion and cleaning of the asset; and

2. prior to completion of the defects liability period.

(v) minor developments refer to Clause SC6.4.2.2(2)):

1. systems exceeding a service length of 60 m require assessment immediately prior to commencement of the defects liability period and following the total completion and cleaning of the asset; and

2. where a defects liability period does not apply, CCTV assessment of the system is mandatory prior to acceptance.

(2) Qualification and training of CCTV operators and supervisors

The assessment must be undertaken by a suitably trained and qualified Contractor, in accordance with the relevant sections of the current version of Water Services Association of Australia's *Conduit Inspection Reporting code of Australia* (WSA05) and the results are to be submitted to Council in CD, DVD or any digital storage device acceptable to Council accompanied by a written condition assessment report to be approved in writing by Council prior to the issuance of any Development Approvals.

In the event of non-compliance in preparation and submission of the conduit assessment, Council may require the developer to re-perform the inspections and re-submit. All costs incurred conducting these additional conduit assessments will be the responsibility of the Contractor.

(3) Site establishment

The Contractor is responsible for the following requirements:

(a) any necessary approvals from statutory authorities in order to complete the required work;

(b) any temporary electric light, power installations and water supply including all charges incurred;

(c) public notification if necessary

Contractor must notify affected residents/adjacent property owners/commercial business owners and Council (including if the area to be closed is public open space). Additional requirements may be necessary if closures are to be over an extended period of time. Notification is required prior to commencement of work;

(d) plans of existing services are to be verified by the Contractor. Council does not guarantee the accuracy of the information on these plans;

(e) environmental management plan

If necessary, the Contractor must prepare and implement a site-specific environmental management plan, for inspections which would involve interference to live services E.g., sewer line which poses an environmental risk. The Plan must detail activities and measures to

ensure that the inspection is performed in a manner which minimises risk of causing environmental nuisance or harm;

(f) reinstatement

clean-up, repair and reinstate any areas affected or impacted by the works, at their own cost;

(g) maintaining the service in all conduits being inspected;

(h) pipe cleaning

Conduits being inspected must be sufficiently clean to allow proper visual identification of existing defects. The proper disposal of debris from the cleaning shall be the responsibility of the Contractor;

(i) traffic management

Where the diversion of vehicular and pedestrian traffic is required, the Contractor is responsible for implementing an appropriate traffic management plan; and

(j) occupational health and safety

The Contractor is required to comply with all statutory and other current regulations relating to occupational health and safety.

(4) Inspection report

The production of reports (including mandatory information), detailing the condition of surveyed conduits, all coded and scored to standards that satisfy the requirements of current WSA05 Code.

(5) Inspection software

The preferred software for use in reporting on conduit inspections is the current version of WinCam, set up to report as per the current WSA 05 code. If a Contractor proposes to use alternative software, a full detail of the software must be provided to Council for approval which includes the capabilities must be provided and must be fully compatible with the WinCam software.

(6) Data ownership

Full ownership of the survey and report data including intellectual property rights to the digital visual records and its contents must be with Council.

SC6.4.14.6 Construction

All construction of development works undertaken over or near existing services shall be carried out in accordance with the requirements of the following SC6.4 Development manual planning scheme policy sections:

Section SC6.4.6 Roadworks and traffic control;

Section SC6.4.7 Clearing, grubbing and earthworks;

Section SC6.4.8 Stormwater management;

Section SC6.4.11 Water and sewerage; and

The requirements of relevant statutory authorities.

SC6.4.14.7 Verification of existing services

Applicants must physically locate, and level services impacted by proposed construction prior to commencing any works on site.

The applicant must carry out an internal closed circuit television inspection of impacted stormwater conduits, and sewers, and submit it to Council, prior to commencing any construction activities over or adjacent to the service.

Internal closed-circuit television inspection of impacted stormwater conduits, and sewers, must be undertaken on completion of construction and submit it to Council to ensure existing impacted services are not damaged.

Development manual planning scheme policy (PSP)
SC6.4.15 Steep land development

Index

SC6.4.15.1 Introduction

(1) Background
(2) Development on steep slopes
(3) Servicing
(4) Sustainability
(5) Economic
(6) Development application advice

SC6.4.15 1 Introduction

Editor's Note - This section is to be read in conjunction with the following sections of the planning scheme policy:

Section SC6.4.2 Development application guidelines

Section SC6.4.6 Road works and traffic control

Section SC6.4.7 Clearing, grubbing and earthworks

Section SC6.4.8 Stormwater management

Section SC6.4.9 Stormwater quantity

Section SC6.4.10 Stormwater quality

Section SC6.4.11 Water and sewerage

Section SC6.4.16 Geotechnical investigations

Section SC6.4.17 Structures

Section SC6.4.18 Concrete works

Section SC6.4.23 Construction management, quality management, inspection and testing

Section SC6.4.24 Acceptance of completed works

(1) Background

(a) Development on steep land requires specific considerations for design, in particular geotechnical considerations, as well as safety, servicing, environmental and economic considerations.

(b) The stability of land which is steep, erosion prone, prone to slip and other geotechnical problems can be adversely affected by the following actions or development:

(i) earthworks (filling and excavation);

(ii) vegetation clearing;

(iii) construction of buildings and other structures (retaining walls);

(iv) construction of roads and driveways;

(v) on-site disposal of wastewater; and

(vi) changes to the existing flow of surface or groundwater.

Inappropriate development on land subject to landslide hazard can result in significant risk to people and property on the subject site, on surrounding land, and land down slope of the site. To ensure that these matters are appropriately considered when making decisions, geotechnical investigations are required, and appropriate design solutions implemented. In some circumstances development should be avoided.

(c) This section provides guidelines and advice for undertaking development on steep land and the application of suitable design practices and design considerations.

Editor's Note - This policy section should also be read in conjunction with the AGS (2007e), *The Australian GeoGuides for slope management and maintenance*, Australian Geomechanics Society, *Australian Geomechanics*, Vol 42, No 1 and the planning scheme policy section SC6.4.16 Geotechnical investigations.

(d) Wherever practical to do so, best practice techniques for construction and development techniques are expected to be demonstrated.

(e) In a broad sense, development should seek to achieve the following objectives:

(i) avoid unstable or hazardous sites and protect lives and property from hazardous conditions such as rock falls, excess stormwater run-off, erosion, etc;

(ii) be designed to minimise infrastructure maintenance requirements and costs to the

community and residents;

(iii) provide practical and safe access for residents, visitors, and service providers;

(iv) complement the scenic hillside character of the surrounding area by integrating unique or special natural features such as landforms, rock outcroppings, existing trees and vegetation, water features, hilltops and ridgelines and avoid further expansion onto scenic features, particularly ridgelines;

(v) minimise the footprint of development during and after construction;

(vi) protect wildlife habitat, corridors, and environmentally sensitive areas; and

(vii) be compatible with existing adjacent development.

The creation of good amenity, when viewing the development from streetscapes and surrounding areas,should be a key consideration in all designs to avoid development on steep slopes that is visually dominant.

(2) Development on steep slopes

As a general and overall consideration, the design of development on steep land should consider the following.

(a) Major considerations in relation to safety are:

(i) landslide risk; and

(ii) debris flow.

(b) The siting and design of development and infrastructure and any associated operational works should not increase the extent or severity of any landslide hazard or present any unacceptable risk to life, property, the community, or the environment. Risks may arise internally or externally to the site or affect the subject site or adjacent sites.

(c) Safety of the development should be addressed though appropriate investigations and design.

Editor's Note - The preparation of a site-specific geotechnical investigation is to be undertaken in accordance with Section SC6.4.16 Geotechnical investigations.

(d) The findings, recommendations and specific works of the geotechnical investigation report must be implemented and complied with to ensure that the risk level for the development will be no more than "low" in accordance with Section SC6.4.16 Geotechnical investigations. If required to achieve a risk level of "low', such works must certified by a suitably qualified person.

Editor's Note - Risk level "low" in accordance with *Landslide Risk Management*, Australian Geomechanics Volume 42 No 1 March 2007.

(e) Any recommendations contained in the geotechnical investigation report must be adopted in the final approved design.

(3) Servicing

(a) Development should provide for the safe and efficient servicing of the site by appropriate infrastructure and minimise ongoing costs to the final user and community. Specific designs for earthworks, roads, drainage, water and sewerage, water quality treatment, and site access may need to be demonstrated at an earlier stage than comparable developments on flatter land.

(b) Stormwater in particular should be controlled and conveyed in a manner that mitigates potential problems and emulates the area's natural water cycle, rather than shifting increased flows and issues downstream. Post development flows must not exceed pre-development flows. Particular attention should be paid to designing practical and robust inter-allotment

drainage systems. Groundwater flows should also be a key consideration in relation to drainage systems and the potential for landslide risk.

(c) Any public infrastructure developed should not result in unsustainable increases in infrastructure operation and maintenance costs relative to the number of rateable units created (e.g., high level water systems, high maintenance drainage systems). Retaining walls in road or drainage reserves are discouraged and will only be accepted in exceptional circumstances where there is a demonstrated benefit to the protection of public infrastructure. All retaining structures must be certified by an RPEQ and constructed of material that ensures public safety and minimised maintenance costs for the design life and should be designed for a design life of at least 60 years and achieve good streetscape amenity.

Refer to Section SC6.4.17 Structures for more details

(d) Road geometry should be designed in accordance with Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.1 Geometric road design, and Austroads with particular attention to grades, property accesses, design speeds and sight distances to ensure the safety of all road users. Where variations are sought to Council's standards strong justification must be given to support the application. Long distances of steep roads or sharp curves without adequate sight distances or turning paths will not be approved. Road aesthetics are valued as a significant contributor to the character and quality of development and should be a key consideration.

(e) Access to all properties must be safe and functional. The design of the accesses must be shown in the overall development design to ensure the safety, practicality and impact on the public and private domains. Lot levels should reflect the requirement of accesses to meet minimum grade requirements and allow for additional near level on-site parking for visitors, service vehicles and other parking needs. Access designs should be in accordance with the Section SC6.4.5 Road network infrastructure, Clause SC6.4.5.4 Driveways. Where lot accesses may be problematic to construct later, they should be constructed with the roads.

(f) Pedestrian, cyclist, and public transport infrastructure design should also be considered at the overall development design as these means of movement are often restricted on steep lands. Alternate facilities to standard road routes and footpaths (e.g., pedestrian connection stairs) may require special design considerations due to grade and safety needs. Residential streets should be designed to create low speed environments and to facilitate and encourage pedestrian and cyclist use. Refer to Section SC6.4.4 Active transport infrastructure for further details.

(4) Sustainability

(a) Hillside development can add its own positive character to a particular locality, however, it can also have negative impacts on the natural and built environment. Development should seek to maintain or enhance positive site characteristics and should maintain or enhance the natural qualities of hillsides (e.g., skylines, vistas, landscape form, vegetation, rock outcrops and other topographic features), whilst negative impacts (e.g., scarring and a lack of respect for natural terrain and aesthetics) should be avoided, or where complete avoidance is not practically feasible, minimised . Scenic natural features should be incorporated into the subdivision design as natural open space or through the use of larger allotments that can contain the features.

(b) The layout of a development should be sympathetic to the area's natural terrain and hazardous conditions. It should aim to maintain sensitive natural areas and protect and preserve the scenic characteristics of hillsides. Where possible development should be clustered to restrict its impact on the natural state, improve the financial efficiency of the development and assist in creating a variety of the housing forms.

(c) The effect of slope on built form should be identified in the initial stages of the development's

design and appropriate building designs should be encouraged through suitable lot sizes, site, and access works, building envelopes and covenants. This will help ensure the development can be built as proposed and reduce the likelihood of conflict or compromise at a later date.

(d) The extent of earthworks (filling and excavation)is a major consideration in the design of developments on steepslopes, not just for reasons of site stability but also in terms of cost, the efficient use of land and visual impact. Constructed slopes should be stable and capable of re-vegetation and effective maintenance. They should also not be so high as to be visually obtrusive to the streetscape or the scenic quality of the development. Heights between the streets and site levels should not be so great as to provide a disconnect between housing and the street or prove impractical for regular movement. Long stretches of high cuts or fill adjacent to road edges will not be supported . Site grading and retaining walls should be designed to respect the existing terrain; that is, steep land is not to be extensively excavated or filled to create “build-able lots” or flat yards. Final lot grades should, wherever practical, mimic the natural slope.

(e) Where disturbance from future site development is likely to be problematic earthworks to individual sites should occur at the subdivision stage. For subdivision, this may include providing level building pads to accommodate future dwellings, associated filling, and the construction of private retaining walls.This may occur where there are unavoidable large cuts and fills, repeated or close accesses, or where future blasting may be required.

(f) Retaining wall heights should be minimised where possible and should not be of such height that they detract from the amenity and human scale of the development. Generally, walls adjacent to roadways on property boundaries should not exceed a height of one metre . Unavoidably high walls should be articulated, be constructed with visually appealing materials or finishes (i.e,. complementing natural materials where possible), be embellished with sufficient appropriate soft landscaping to screen the wall and be set back from the road boundary to permit landscape treatment. Where possible, a series of smaller stepped walls should be utilised and designed to permit landscaping of the terraces. Retaining walls can be used to reduce slope disturbance, rather than modify natural terrain. Lot sizes should increase as the natural slope increases. Constructed slopes can be placed behind buildings if needed, however, consideration should be given to the principle of minimising the need for any earthworks in the first instance.

(5) Economic

(a) The volume of cut and fill over the development should be minimised and a cut and fill balance over the site as a whole should be achieved where possible.

(b) It is expected that with any new public infrastructure the cost of ongoing maintenance should generally be no more for steep sites than for flat sites on a per lot basis. Where there may be a special requirement for non-standard or higher maintenance infrastructure, it is expected that a full life cycle cost comparison would be provided (e.g., high level pumps or reservoirs, drainage structures, access to landscaped areas, etc.).

(6) Development applications advice

Particular steep land issues that must be addressed at various application stages are indicated below.

(a) Council encourages applicants to discuss development proposals with Council at the initial concept design phase.

(b) It is important that the design reflects all the recommendations of the geotechnical report and that sufficient design detail is provided to demonstrate that the proposed road and lot layouts will

work in practice and result in infrastructure and built form outcomes that comply with these guidelines. In particular, sufficient detail should be provided to assure Council that the layout will not require significant changes due to technical design constraints, i.e., it should not be left to the operational works stage to prove the development will work. Sufficient drawings and design data (including multiple site and building cross-sections) should be provided to demonstrate this.

(c) Where an initial geotechnical report (submitted to support a Material Change of Use or Reconfiguring a Lot development application) identified a requirement to undertake further detailed investigation prior to design, then this must be carried out. The operational works design should be certified by a geotechnical engineer as complying with the recommendations of the geotechnical report.

Development manual planning scheme policy (PSP)
SC6.4.16 Geotechnical investigations

Index

SC6.4.16 1 Introduction

(1) Purpose
(2) Background
(3) Application

SC6.4.16.2 Geotechnical investigations – steep land

(1) Requirements for site specific investigations
(2) Preparation of site specific geotechnical investigations report
(3) Investigation information requirements
(4) Guidelines for applicability of geotechnical assessment Techniques
(5) Applicability of site investigation methods to slope class

SC6.4.16.3 Geotechnical evaluation – pavements

(1) General
(2) Subgrade testing
(3) California bearing ratio (CBR)

SC6.4.16.4 Geotechnical investigations – bridges

(1) General
(2) Geotechnical assessment

SC6.4.16.5 Geotechnical investigations – structures other than bridges

(1) General

SC6.4.16.6 Geotechnical investigations – sewage pump stations

(1) General

SC6.4.16.7 Reference and source documents

SC6.4.16 1 Introduction

(1) Purpose

This policy section provides advice and guidance and assists applications:

(a) on the preparation and assessment of geotechnical investigation reports;

(b) on the expected level of geotechnical investigation required for development based on the level of risk or hazard identified; and

(c) information Council may request for a development application.

(2) Background

Development on steep lands presents a unique set of design and engineering challenges, often requiring a greater degree of detail in the design and approval of allotments, earthworks, roads, services and built form.

There is a growing awareness of the risks, environmental values, and ongoing costs associated with development on steep slopes, which has resulted in an expectation of an improved standard of design in these environmentally and geologically sensitive areas. This is supplemented by an increased mindfulness of the risks and financial cost to construct and maintain the servicing in these areas and the need to consider these factors in the assessment of applications involving a landslide hazard.

Editor's Note - certain existing steep land or hillside developments have demonstrated how inappropriate forms of land use and servicing can permanently damage local environmental features and diminish valued natural assets, particularly scenic qualities. In addition, it has been noted how the costs to maintain associated infrastructure can become a burden on the wider community due to the specialist nature of this infrastructure and the generally lower density in these areas. Whilst these areas do contribute to the diversity of housing choice, the pricing of lot and housing prices usually exceed the ability for the local economy to include these as affordable housing options.

(3) Application

This section applies to development affected by SC2.5 Overlay maps Landslide hazard overlay maps OM-07.1 and OM- 07.2, and geotechnical investigations associated with road pavements, bridge foundations, culverts foundations, retaining walls, acoustic fences foundations, fence foundations, sign support structures, and temporary works.

SC6.4.16.2 Geotechnical investigations – steep land

(1) Requirements for site specific investigations

(a) Where development is subject to assessment against the Townsville City Plan - Part 8.2.7 Landslide hazard overlay code, an applicant will be required to undertake a geotechnical investigation of the likely impacts of the proposed development and to determine the measures to avoid or mitigate unacceptable risk and other adverse impacts.

(b) Table SC6.4.16.1 Guidelines for Applicability of Geotechnical Assessment Techniques in landslide hazard categories specifies the level of investigation required for the hazard level affecting the subject land. Where the subject land has more than one hazard level mapped, the assessment technique shall be for the higher hazard level mapped. Table SC6.4.16.2 Applicability of Site Investigation Methods to Slope Classes should be considered in conjunction with Table SC6.4.16.1.

(c) The planning and design of future development should consider the level of professional geotechnical input commensurate to the landslide hazard category which the development is subject to.

In general, it is appropriate that geotechnical input for development be carried out in accordance with the reporting standards proposed by the AGS, 2007c Landslide Risk Management (Reference 8). This requires the practitioner to consider not only the issues surrounding the landslide hazard (if one exists) but also the consequences if a landslide were to occur (I.e., the assessment needs to be couched in a risk assessment context).

(d) The extent and detail of the investigation will vary dependent upon the level of hazard identified on SC2.5 Overlay maps Landslide hazard overlay maps OM-07.1 and OM-07.2 and the nature of the development being proposed. Council will require each report to demonstrate a scope and depth of investigation appropriate to the level of hazard identified, for the specific site characteristics and the proposed development and works.

(e) Geotechnical reporting needs to clearly indicate whether the risk assessment is based on existing slope conditions or with risk treatment measures implemented (or both).

(2) Preparation of site specific geotechnical investigations report

(a) A geotechnical investigation report must document the following:

(i) introduction to the proposal including a description of the subject land, locality, and proposed development;

(ii) description and investigation of existing conditions of the development site, including assessment of land stability and geotechnical constraints to development (see Clause SC6.4.16.2 (3) Investigation Information Requirements);

(iii) assessment of the suitability of the site for the development. This should include an assessment of the likely effects and impacts of the development upon slope stability or landslide hazard (see Clause SC6.4.16.2 (3) Investigation information requirements);

Editor's Note - Assessments should be undertaken and give sufficient consideration of the final intended development outcomes for the subject site, including staging of development and associated works.

(iv) measures recommended to mitigate impacts including siting, design, engineering, and any other necessary mitigation measures; and

Editor's Note - Applicants may also refer to Section SC6.4.15 Steep land development for further information.

(v) conclusion and recommendations (see Clause SC6.4.16.2 (3) Investigation information requirements).

(b) Geotechnical investigation reports are to reference Australian Geomechanics Society (AGS) Volume 42 No 1 March 2007, or any later guideline of the AGS as agreed by Council.

(c) Geotechnical investigations are to be undertaken and certified by an appropriately qualified and experienced engineering geologist, geotechnical engineer or registered professional engineer appropriately experienced in slope stability investigations in accordance with Australian Geomechanics Society (AGS) Volume 42 No 1 March 2007.

(d) The findings, recommendations and specific works of the geotechnical investigation report must be implemented and complied with to ensure that the risk level for the development will be no more than "low". If works required to achieve a risk level of "low', such works must be certified by a suitably qualified person.

(e) Laboratory testing is required to be undertaken by a National Association of Testing Authority (NATA) certificated laboratory. All investigations, testing and design should be undertaken in accordance with industry practice and the provisions of relevant Australian Standards.

(3) Investigation information requirements

(a) Geotechnical investigations should cover the matters set out below, and may include, but need not be limited to:

(i) review of existing data sources including regional geology, topographic maps, and geotechnical reports;

Editor's Note - where a geotechnical investigation has been previously undertaken and the report provided as supporting documentation to Council for a previous application over the subject land, these documents must be clearly referenced in the report prepared for the subsequent application. Such supporting documentation must be made available to Council and be current and specifically relevant to the proposed development.

(ii) preparation of site plan showing results of geomorphic and engineering geological mapping (to scale);

(iii) subsurface investigations including drill holes, auger holes, shafts and test pits with locations shown on a to scale site plan;

(iv) results of laboratory testing of samples recovered from subsurface investigations;

Editor's Note - the results of all laboratory tests must be included in the geotechnical report, including the location and level ((including datum).

(v) groundwater and surface water studies including recording of groundwater conditions in sub surface investigation and mapping of surface seepages;

(vi) preparation of cross section(s) showing interpreted geotechnical and groundwater conditions with cross section location identified on site plan;

(vii) evidence of past slope stability performance;

(viii) evidence of history of slope instability with assessed trigger events, including in relation to adjoining land;

(ix) identification of landslides, shown in plan and on section, and discussed in terms of the site geomorphology and slope forming process;

(x) assessment of consequences to property and life for each landslide and or type of landslide;

(xi) assessment of risk for each landslide and or type of landslide;

(xii) assessment of landslide frequency (probability) and or type of landslide;

(xiii) risk assessment in relation to tolerable risk criteria (e.g., published criteria where appropriate); and

(xiv) risk mitigation measures and options, including revised risk assessment following implementation.

(4) Guidelines for applicability of geotechnical assessment techniques

Guidelines for applicability of geotechnical assessment techniques in landslide hazard categories Table SC6.4.16.1has been prepared for the standard geotechnical techniques identified in AGS, 2007c which are applicable for the assessment of landslide risk. The various investigation techniques have different levels of applicability for the different hazard categories shown on SC2.5 Overlay maps Development constraints overlay map – Landslide hazard OM-07.1 and OM-07.2. Table SC6.4.16.1 should therefore be considered as a guideline as to the applicability of professional geotechnical input for any hazard category.

Table SC6.4.16.1 - Guidelines for Applicability of Geotechnical Assessment Techniques in Landslide Hazard Categories

Investigation Techniques	**Landslide Hazard**				
	Landslide hazard Map OM-07.1				**OM-07.2**
	Very Low	**Low**	**Medium**	**High**	**>23degrees**
1. Review of existing data sources including regional geology, topographic maps, and geotechnical reports.	B	A	A	A	A
2. Stereoscopic viewing of vertical air photo pairs to facilitate terrain mapping.	B	B	A	A	A
3. Preparation of site plan showing results of geomorphic and engineering geological mapping (to scale).	B	B	A	A	A
4. Subsurface investigations including drill holes, auger holes, shafts, and test pits with locations shown on the site plan.	C	B	A	A	A
5. Results of laboratory testing of samples recovered from the subsurface investigation.	D	C	B	A	A
6. Groundwater and surface water studies including recording of groundwater conditions in sub surface investigation and mapping of surface seepages.	C	B	B	A	A
7. Preparation of cross section (s) showing interpreted geotechnical and groundwater conditions with cross section location identified on the site plan.	C	B	B	A	A
8. Evidence of past slope stability performance.	B	B	B	A	A
9. Evidence of history of slope instability with assessed trigger events, including in relation to adjoining land.	B	B	B	A	A

10. Identification of landslides, shown in plan and on section, and discussed in terms of the site geomorphology and slope forming process.	C	B	B	A	A
11. Assessment of landslide frequency (probability) and or type of landslide.	C	B	B	A	A
12. Assessment of consequences to property and life for each landslide and or type of landslide.	C	B	B	A	A
13. Assessment of risk for each landslide and or type of landslide.	C	B	B	A	A
14. Risk assessment in relation to tolerable risk criteria (E.g., published criteria where appropriate).	D	C	C	B	A
15. Risk mitigation measures and options, including revised risk assessment following implementation.	C	B	B	A	A

Editor's Note - A – Strongly Applicable, B – Applicable, C – May be applicable, D – Seldom applicable.

(5) Applicability of site investigation methods to slope class

Table SC6.4.16.2 summarises the applicability of various site investigation techniques for natural and constructed slopes of various scales. The requirements for site investigations shown in Table SC6.4.16.1 should be considered in the context of the hazard categories given in Table SC6.4.16.2.

Editor's Note:

1. A – Strongly applicable, B – Applicable, C – May be applicable, D – Seldom applicable.
2. In similar areas.
3. SPT, CPT, CPTU.
4. Permeability.
5. During construction.

Table SC6.4.16.2 Applicability of Site Investigation Methods to Slope Classes

Site Investigation Method	Natural Slopes				Constructed Slopes			
	Small/ Shallow	Medium	Large	Existing Cut	New Fill	New Cut	New Fill	Soft Clay
Topographicmapping and survey	A	A	A	A	A	A	A	A
Regional geology	A	A	A	A	A	A	A	A
Geological mapping of project Area	B	B	A	A	B	A	B	C
Geomorphological mapping	A	A	A	B	B	B	B	D
Satellite imagery interpretation	D	D	C	D	D	D	D	D

Air photograph interpretation	A	B	A	C	C	C	C	C
Historic record	A	B	B	A	B	B (2)	B (2)	B (2)
Dating past movements	B	C	B	D	D	D	D	D
Geological methods	C	C	B	C	C	C	D	C
Trenches and pits	B	A	B	B	B	B	B	C
Drilling/boring	C	A	A	C	B	B	B	A
Downhole inspection	C	B	B	C	D	C	D	D
Shafts and tunnels	D	C	B	D	D	D	D	D
In situ testing of strength Permeability	C (3)	C (3)	C (4)	D	B (3)	C	C	A (3)
Strength and permeability monitoring pore pressures, rainfall, etc.	C	A	A	A	A	C	C	A (5)
Monitoring of displacements	C	B	A	B	B	B (5)	C (5)	A (5)
Laboratory testing	C	A	B	B	B	B	C	A
Back analysis of stability	C	B	A	C	B	B (2)	C (2)	C (2)

Source: (Fell, Hungr, Leroueil and Reimer, 2000)

SC6.4.16.3 Geotechnical evaluation – pavements

(1) General

The designer must arrange a detailed geotechnical investigation of the naturally occurring material along the alignment of the proposed roads prior to the commencement of the design process to permit adequate pavement depths to be determined to ensure sufficient cover is achieved to the stormwater infrastructure. The extent of any areas of filling and cutting must be determined including the strength of the underlying materials and considered in the overall pavement design.

The geotechnical investigation, including both field and laboratory testing must be undertaken in accordance with all relevant Australian Standards (e.g., AS 1289) and *Guide to Road Design* in particular *Road Design Part 2: Design Considerations.*

(2) Subgrade testing

(a) Except where a mechanistic design approach is employed using Austroads *Guide to Pavement Technology Part 2: Pavement Structural Design*, the measure of subgrade support

must be the California Bearing Ratio (CBR).

Where a mechanistic design approach using linear elastic theory is employed for flexible pavements, the measure of subgrade support must be in terms of the elastic parameters (modulus, Poisson's ratio), e.g., for use in CIRCLY computerised pavement design methods.

In conducting subgrade tests, the following approach must be adopted for new roads:

(i) test pits/holes along the alignment of the road must have a spacing between 60 m and 120 m as appropriate for each urban residential and industrial street or a minimum of three test locations per street in a stage, whichever is greater;

(ii) test pits/holes along the alignment of a rural area road must have a spacing of up to 300 m or a minimum of 3 test locations per road whichever is greater;

(iii) test holes must be excavated to a minimum depth of 1 m and must extend a minimum 500 mm below the proposed subgrade level;

(iv) if the depth of fill material over the natural subgrade is more than 500 mm, then the fill material is considered to be the new subgrade and it must be assessed; and

(v) if the depth of fill is less than 500 mm, investigation must assess the natural ground conditions, and the properties of the proposed fill material.

(b) The following factors must be considered in determining the design strength/stiffness of the subgrade:

(i) sequence of earthworks construction;

(ii) the compaction moisture content and field density specified for construction;

(iii) moisture changes during service life;

(iv) subgrade variability; and

(v) the presence or otherwise of weak layers below the design subgrade level.

(3) California Bearing Ratio (CBR)

(a) Notwithstanding the requirements of AS1289.6.1.1, this document specifies additional or differing requirements, including:

(i) CBR tests must be carried out with a maximum of 4.5 kg surcharge; and

(ii) maximum correction allowable to the applied force is 0.5 mm along the horizontal axis of the penetration curve.

(b) The calculation of the Design CBR must be based on either soaked or unsoaked conditions as appropriate.

(i) For boxed in pavements, soaked conditions must be adopted for the calculation of Design CBR and must be based on a minimum of three 4-day soaked CBR laboratory samples for each subgrade area compacted to 97% of maximum dry density, standard compaction at optimum moisture content (OMC).

(ii) If it can be demonstrated that the subgrade is well drained and not less than 300 mm above natural surface or table drain, e.g., Rural formation, in free draining material and not influenced by spring/seepage conditions, then the unsoaked condition will be considered for design by Council. When unsoaked conditions are to be adopted the calculation of Design CBR must be based on a minimum of three laboratory samples for each subgrade area compacted to 97% maximum dry density standard compaction at OMC and corrected to allow for the effects of subsurface drainage (or lack of), climatic

zone and soil type if appropriate (as per the guidelines in Austroads *Guide to Pavement Technology Part 2: Pavement Structural Design*) to give an estimate of equilibrium in-situ CBR.

(iii) The Design soaked CBR for each subgrade area is computed by using the appropriate formula as follows:

Design CBR = Least of estimated CBRs, for less than five results or

Design CBR = 10th percentile of all estimated CBRs, for five or more results.

Where practicable, the Design CBR obtained from laboratory testing should be confirmed by testing performed on existing road pavements near to the job site under equivalent conditions and displaying similar subgrades.

The pavement design must include a summary of all laboratory and field test results and assumptions and/or calculations made in the assessment of Design CBR.

SC6.4.16.4 Geotechnical investigations – bridges

(1) General

Such structures may be primarily constructed of concrete, steel, or other materials appropriate to the application. The design should always have a primary emphasis on safety, maintenance, and whole of life cycle costs. The structure/s should comply with current Safety in Design principles and guidelines, the *Bridge Design* Code (AS 5100), and Austroads *Guide to Bridge Technology Part 4.*

(2) Geotechnical assessment

An applicant will be required to undertake a geotechnical investigation of the subsurface conditions at the proposed site of the structure to determine the measures required to avoid or mitigate unacceptable risk and other adverse impacts of constructing the structure.

The extent of geotechnical investigations required to be undertaken prior to the commencement of design of the structure are dependent on the size and value of the structure, site location, and associated risk.

Details of proposed geotechnical investigations to be undertaken by the applicant are to be discussed with Council prior to commencing design of the structure.

Geotechnical investigations are to be undertaken and certified by an appropriately qualified and experienced engineering geologist, geotechnical engineer or registered professional engineer appropriately experienced in bridge foundation investigations.

Laboratory testing is required to be undertaken by a National Association of Testing Authority (NATA) certificated laboratory. All investigations, testing and design should be undertaken in accordance with industry practice and the provisions of relevant Australian Standards.

SC6.4.16.5 Geotechnical investigations – structures other than bridges

(1) General

Public utility structures, major culverts, major sign support structures, retaining walls, and the like will be designed by a competent, practicing engineer (RPEQ certified) who is accredited in the design of such structures. The design must be in accordance with the SC6.4 Development manual planning scheme policy, relevant Austroads codes, all relevant Australian Standards, and the requirements of any utility owners that may be applicable.

The extent of geotechnical investigations required to be undertaken prior to the commencement of design of the structure are dependent on the size and value of the structure, site location, and associated risk.

Details of proposed geotechnical investigations to be undertaken by the applicant are to be discussed with Council prior to commencing design of the structure.

Geotechnical investigations are to be undertaken and certified by an appropriately qualified and experienced engineering geologist, geotechnical engineer or registered professional engineer appropriately experienced in foundation investigations.

Laboratory testing is required to be undertaken by a National Association of Testing Authority (NATA) certificated laboratory. All investigations, testing and design should be undertaken in accordance with industry practice and the provisions of relevant Australian Standards.

SC6.4.16.6 Geotechnical investigations – sewage pump stations

(1) General

Pump stations shall be planned and designed to optimise construction, operation, and maintenance costs for the total life cycle of the infrastructure and equipment.

The applicant will be required to undertake a geotechnical investigation of the subsurface conditions at the proposed site of the pump station to determine the measures required to avoid or mitigate unacceptable risk and other adverse impacts of constructing the pump station.

Geotechnical investigations are to be undertaken and certified by an appropriately qualified and experienced engineering geologist, geotechnical engineer, or registered professional engineer appropriately experienced.

The minimum investigations and geotechnical report shall include:

(a) a bore hole drilled to 1.5 m below the base of the pump station;

(b) a descriptive log of materials encountered and depths of each material;

(c) depth of water below surface if encountered; and

(d) suitability of materials encountered for use as backfilling around pump station where open excavation is used to install the pump station, to minimise backfill settlement that may damage connections between the pump station and other fixtures.

SC6.4.16.7 Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

Australian Geomechanics Society (AGS)	*Australian Geomechanics*, Volume 42 No 1 March 2007
AGS (2007c)	*Practice note guidelines for landslide risk management, Australian Geomechanics Society, Australian Geomechanics,* Vol 42 No 1, March 2007
Austroads	*Road Design Part 2: Design Considerations*
Austroads	*Guide to Pavement Technology Part 2: Pavement Structural Design*
Austroads	*Guide to Bridge Technology Part 4: Design Procurement and Concept Design*
Fell, R., Hungr, O., Leroueil, S. Riemer, W., 2000	*Keynote Lecture – Geotechnical engineering of the stability of natural slopes, and cuts and fills in soil*, GeoEng2000, 1, 21-120. Invited Papers, Technomic Publishing, Lancaster, ISBN:

	1-58716-067-7, November 2000
AS 1289	*Methods of testing soils for engineering purposes*
AS 1289.4.2.1	*Methods of testing soils for engineering purposes - Soil chemical tests - Determination of the sulphate content of a natural soil and the sulphate content of the groundwater - Normal method*
AS 1289.6..	*Methods of testing soils for engineering purposes - Soil strength and consolidation tests - Determination of the California Bearing Ratio of a soil – Standard laboratory method for a remoulded specimen*
AS 5100	*Bridge Design Code (set)*

Development manual planning scheme policy (PSP)

SC6.4.17 Structures

Index

SC6.4.17.1 Introduction

(1) Objective
(2) Design considerations
(3) Safety and service performance
(4) Reference and source documents

SC6.4.17.2 Bridges, culverts, and other structures basis of design

SC6.4.17.3 Provisions for pedestrian and cyclists on road bridges and culverts

SC6.4.17.4 Road traffic bridges, pedestrian bridges, and culverts - design

SC6.4.17.5 Bridge construction

SC6.4.17.6 Culvert construction

(1) General
(2) Material
(3) Siting of culverts
(4) Alignment
(5) Excavation
(6) Bedding – cast in site slabs
(7) Bedding – precast base slabs
(8) Cast in-site base slabs
(9) Installation of precast units
(10) Headwalls and wingwalls
(11) Backfill
(12) Excavation of inlet and outlet channels
(13) Construction loading on culverts
(14) Limits and tolerances

SC6.4.17.7 Culverts, retaining walls, sign support structures, fences, and bollards

SC6.4.17.8 Retaining walls

SC6.4.17.9 Acoustic fences

SC6.4.17.10 Fences

SC6.4.17.11 Signs and sign support structures

(1) General
(2) Protective treatment
(3) Attachment of new signs
(4) Erection of new signs
(5) Special requirements
(6) Limits and tolerances

SC6.4.17.12 Structures used for public safety

(1) General
(2) Non-rigid road safety barrier system

SC6.4.17.13 Temporary works

SC6.4.17.1 Introduction

(1) Objective

This section sets out design considerations to be adopted in the design of structural engineering elements associated with:

(a) road traffic bridges;

(b) pedestrian/cyclist bridges;

(c) any structure designed to carry a road or a path over a waterway, depression, or obstacle;

(d) culverts;

(e) retaining walls;

(f) acoustic fences;

(g) fences;

(h) sign support structures;

(i) structures used for public safety; and

(j) temporary works.

(2) Design considerations

Such structures may be primarily constructed of concrete, timber, steel, or other materials appropriate to the application. The design should always have a primary emphasis on safety and whole of life cycle costs. The structure/s should comply with current Safety in Design principles and guidelines, relevant Department of Transport and Main Roads Specifications where applicable, relevant AS Codes, and statutory authority requirements.

Each design is to be RPEQ certified that the proposed structure will not become unfit for use during its intended design life. This assessment will have measured regard to all associated issues with the proposed structure including:

(a) consideration of any future infrastructure planning;

(b) economic constraints;

(c) physical or structural constraints;

(d) aesthetic considerations;

(e) flooding or hydraulic capacities (if applicable);

(f) safety in design;

(g) maintenance and repair constraints;

(h) constructability; and

(i) be fit for purpose.

(3) Safety and service performance

The safety and service performance of a structure will depend on the quality control exercised in fabrication, supervision of the site, control of unavoidable imperfections, and the experience and skill of the personnel involved. Specific attention must therefore be given to these factors.

(4) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(a) SC6.4 Development manual planning scheme sections:

Section SC6.4.6 Road works and traffic control

Section SC6.4.7 Clearing, grubbing, and earthworks

Section SC6.4.9 Stormwater quantity

Section SC6.4.18 Concrete works

(b) Australian Standards:

AS 1158	*Lighting for roads and public spaces*
AS/NZS 3845	*Road safety barrier systems*
AS 5100	*Bridge Design*
AS 1428	*Design for access and mobility*
AS 1170	*Minimum design loads on structure* (SAA Loading Code)
AS 1684	*National timber framing code*
AS 1720	*Timber Structures*
AS 3600	*Concrete structures*
AS 3700	*Masonry in buildings* (SAA Masonry Code)
AS 4100	*Steel structures*
AS1597.1	*Precast reinforced concrete box culverts - Small culverts*
AS 1597.2	*Precast reinforced concrete box culverts - Large culverts*

AS/NZS ISO 9001:2008 - *Quality management systems - Requirements*

Other codes and guidelines referred to in the Australian Standards, as relevant.

(c) Department of Transport and Main Roads:

MRTS70	*Concrete (10/11)*
MRTS71	*Reinforcing Steel (06/09)*
MRTS72	*Manufacture of Pre-cast Concrete Elements (08/13)*
MRTS05	*Unbound Pavements*
MRTS24	*Manufacture of precast concrete culverts*
MRTS62	*Bridge Substructure*
MRTS63	*Cast-In-Place Piles*
MRTS64	*Driven Tubular Stel Piles*
MRTS65	*Precast Prestressed Concrete Piles*
MRTS66	*Driven Steel Piles*
MRTS68	*Dynamic Testing of Piles*
MRTS72	*Manufacture of Precast Concrete Elements*
MRTS73	*Manufacture of Prestressed Concrete Members and Stressing Units*

MRTS74	*Supply and Erection of Prestressed Concrete Deck and Kerb Units*
MRTS75	*Supply and Erection of Prestressed Concrete Girders*
MRTS76	*Supply and Erection of Steel Girders*
MRTS77	*Bridge Deck*
MRTS78	*Manufacture of Structural Steelwork*
MRTS80	*Bridge Bearings*

(d) Other:

Austroads	*Guide to Bridge Technology Part 4 - Design Procurement and Concept Design, 2009*
Austroads	*Guide to Geotextiles*
Department of Transport and Main Roads	*Road Planning and Design Manual, 2006*
Department of Transport and Main Roads	*Road Traffic Noise Management: Code of Practice, 2000*
Department of Energy and Water Supply	*Queensland Urban Drainage Manual*

SC6.4.17.2 Bridges, culverts, and other structures - basis of design

(1) The basis of the proposed bridge design is to principally conform to Austroads' road design standards, Department of Transport and Main Roads specifications, and AS 5100 as appropriate. The design must be based on sound engineering principles and certified by a suitably qualified engineer (RPEQ).

(2) All design criteria for bridges in the Townsville City Council local government area must be approved by Council prior to the design being carried out. The designer must make reference and address all issues outlined in Appendix A of AS 5100.1. and the relevant Department of Transport and Main Roads Specifications.

(3) Adequate management control and supervision by experienced engineers (RPEQ) is required at all stages of the design and construction to prevent the occurrence of any unapproved non-conformances with the design plans, and specifications.

(4) Specifications must be notated on the drawings with sufficient details to ensure that the above-described strategies are able to be effectively implemented throughout the construction stage.

SC6.4.17.3 Provisions for pedestrian and cyclists on road bridges and culverts

(1) Provision for pedestrians, and cyclists on bridges and culverts is required in rural residential as well as urban areas. The minimum provision is a 1.5 m wide footpath with a 150 mm high kerb at the traffic lane edge. The design is to consider pedestrian safety on a bridge. A safety railing is to be provided between pedestrians and the trafficable lane together with 2.0 m (min) wide shoulder to accommodate on road cyclists on bridges.

(2) Council may require the provision of a combined cycleway and pedestrian footway should the risk to on road cyclists be too high.

(3) Disability access across the proposed bridge is to be DDA compliant and generally in accordance with AS1428.

(4) Urban bridge approaches should be lit in accordance with AS 1158.

SC6.4.17.4 Road traffic bridges, pedestrian bridges, and culverts – design

(1) The design of all bridges, and culverts with a combined span of 1.5 m or greater, must be based on geotechnical investigation undertaken by a Geotechnical Engineer as set out in Section SC6.4.16 Geotechnical investigations.

(2) Bridge and culvert design must only be carried out by properly qualified persons who are Registered Professional Engineers of Queensland (RPEQ) and experienced in structures design. If requested, such designers must submit evidence of these qualifications and experience to Council prior to approval of any bridge design.

(3) The *Bridge Design Code* (AS 5100) must be used for all bridge design, together with relevant Austroads and Department of Transport and Main Roads requirements.

(4) Bridges and culverts must have low maintenance finishes. Adequate precautions must be taken for protection of the materials used in the bridge design; for example, timber and steel require special consideration. Heavy debris and bed loads may be characteristic of some streams so that large spans with slender piers are encouraged. If floodwater overtopping is to occur, pedestrian safety rails and road safety barriers could be omitted to reduce debris collection on the roadway, subject to pedestrian safety considerations. Flood depth indicators and appropriate signposting are required in such cases.

(5) Preventative maintenance is a key issue affecting the design life of the structure. The drawings must specify the design life of the structure together with the relevant maintenance programs to be adopted upon which the design life is based. Parameters used in the design must also be shown on the drawings.

(6) Timber shall only be used in exceptional circumstances where all other avenues have been exhausted.

(7) All steelwork shall be hot dipped galvanised.

(8) All major structures in urban areas, including bridges and culverts, must be designed for the 1% AEP storm event with minimal afflux. Some afflux and upstream inundation may be permitted in certain rural and urban areas provided the increased upstream flooding does not adversely impact private property or critical infrastructure.

(9) Where structures are designed to be inundated, the effect of the backwater gradient on upstream property must be identified on the drawings. Detailed consideration of alternate evacuation routes are to be considered where the bridge structure is to be inundated.

(10) Where no inundation is permitted, 500 mm freeboard to the underside of the bridge deck structure or top of culvert deck structure is required. All road structures with a 1% annual exceedance probability (AEP) designed waterway greater than 5 sqm must be modelled using current hydrological modelling practices (software) to determine the upstream impacts over the full range of storm events.

(11) Safety limitations – Overtopping of Roadways. All floodwaters overtopping a major structure such as a culvert or bridge structures within a road are to be checked for safety and stability limitations for both pedestrians and vehicles. Assessment of the waterway crossing safety and stability is to be undertaken based on criteria outlined in QUDM and AR&R latest edition.

(12) The designer is to enquire with the appropriate authority on any current or likely provisions for public utilities or services on bridges. These should be concealed for aesthetic reasons. Consultation with the appropriate utility authority is to be undertaken during the structural design, particularly in regard to the location and placement of existing and future public utilities.

SC6.4.17.5 Bridge construction

(1) Adequate management control and supervision by experienced engineers (RPEQ) is required at all stages of construction to prevent the occurrence of any unapproved non-conformances with the design plans, and specifications.

(2) All bridge construction is to be undertaken in conformance with the relevant Department of Transport and Main Roads Specification provisions.

(3) Only suitably qualified and experienced contractors will be approved to undertake the construction of bridges.

(4) Details of minimum site geotechnical investigations required for bridge sites are set out in Section SC6.4.16 Geotechnical investigations.

(5) Bridge crossings in urban and rural residential areas must be provided with street lighting in accordance with AS 1158. Such requirements will be noted accordingly on the design drawings.

SC6.4.17.6 Culvert construction

(1) General

(a) Cast in-situ base slabs and culvert structures shall be constructed in concrete and in accordance with Section SC6.4.18 Concrete works.

(b) Details of minimum site geotechnical investigations required for bridge and culvert sites are set out in Section SC6.4.16 Geotechnical investigations.

(2) Materials

(a) Culvert units, link and base slabs

(i) The supply and testing of precast reinforced concrete box culvert units, link and base slabs shall be in accordance with MRTS24 with the following alterations or additional requirements;

(ii) proof load testing must be arranged by the Contractor in batches as specified in Clause15.2 of MRTS24;

(iii) proprietary lifting anchors must be provided in the culvert units, link, and base slabs;

(iv) delivery and unloading is the Contractor's responsibility using appropriate equipment;

(v) the supplier of precast units must implement and maintain a quality system in accordance with ISO 9001 to ensure materials, manufacture and proof load testing conform to the appropriate Standards;

(vi) a conformance certificate, to Clause 15.3 of MRTS24 must be submitted to the Superintendent at least 3 working days prior to dispatch;

(vii) Each unit must be marked at time of manufacture with:

1. the date of manufacture and unique identification number;
2. the manufacturer’s name and registered mark;
3. the size of the culvert component;
4. the maximum mass of the culvert component; and
5. the Technical Specification number and version to which the culvert component has been manufactured.

(b) Handling and delivery

(i) Ensure adequate equipment and load shifting machineries are available for safe handling and unloading.

(ii) Upon delivery of precast units, ensure that the following criteria have been achieved:

1. 70% of the minimum concrete strength; and

2. cured to MRTS24 clause 13.8.

(iii) Prior inspection of the stored precast box culvert units is to be undertaken for dimensional accuracy and defects following delivery. Results of the inspections must show that the units conform to the following:

1. small culvert unit: To AS 1597.1; and

2. large culvert unit: To AS 1597.2.

as set out in MRTS24 Clause 13.10.

(c) Selected backfill

The quality of selected backfill shall comply with the requirements in AS 1597.2, or alternatively comply with the requirements of side/overlay zone materials in Section SC6.4.9 Stormwater quantity, Table SC6.4.9.7 Bedding Material Grading Limits.

(d) Ordinary backfill

Ordinary backfill is material obtained from culvert excavations, cuttings and/or borrow areas which are in accordance with the requirements for the upper 0.3 m of embankment construction as detailed in Section SC6.4.7 Clearing grubbing and earthworks.

(3) Siting of culverts

(a) Before commencing construction of any culvert, the Contractor shall set out on site the culvert inlet and outlet positions to the location and levels shown on the drawings and shall present this set out for inspection by the Superintendent.

(b) The Superintendent may amend the inlet or outlet locations or designed levels or the culvert length to suit actual site conditions. Any such amendments must ensure no negative impacts on neighbouring land parcels and existing properties. Prior approval must be sought from Council for any changes.

(c) Should the Contractor propose changes to the culvert location, length, designed levels, culvert strength, conditions of installation or cover to suit the construction procedures, the Contractor shall present the proposed culvert set out in addition to the designed set out for consideration by the Superintendent and Council. No changes shall be made unless prior written approval from Council is obtained.

(4) Alignment

(a) Unless otherwise shown on the drawings, headwalls shall be constructed parallel to the road centreline and wingwalls at 120º to the headwall or as shown on the drawings.

(b) Where the culvert is laid skew to the road, the wingwalls and headwalls shall be splayed so that the front edge of the wing bisects the angle between the centreline of the culvert and the headwall.

(c) Energy dissipaters shall be constructed in accordance with the drawings and with centreline on the axis of the culvert.

(5) Excavation

Excavation shall be carried out in accordance with the provisions in Section SC6.4.9 Stormwater quantity.

(6) Bedding – cast in-situ slabs

No bedding material shall be placed until the foundations have been inspected and approved by the Superintendent.

Bedding shall be either mass concrete or lightly bound paving material which complies with the requirements of at least a Type 3, Subtype 3.3 material as defined in the Specification MRTS05, whichever is shown on the drawings.

Mass concrete bedding blinding layer shall be 20 mPa compressive strength and shall not be less than 50 mm thick over any point in the foundation. It shall be laid to the line and level of the underside of the base slab to a tolerance of ±10 mm in level and ±50 mm in line. The bedding shall be finished to a smooth surface. Where longitudinal gradients are less than 0.5 per cent, concrete blinding layers shall be installed with +/- 6 mm of the grade line.

(7) Bedding – precast base slabs

Precast base slabs, U-shaped culvert units and one-piece culvert units shall be supported on a bed zone of selected backfill of minimum compacted depth 150 mm in accordance with AS 1597.2.

If suitable compaction of the trench subgrade cannot be achieved, it will be the responsibility of the developer to recommend an alternate solution to Council to achieve the desired bearing capacity for the structure prior to construction.

(8) Cast in-situ base slabs

(a) Cast in-situ base slabs shall be constructed to the dimensions shown on the drawings and in accordance with the requirements of Section SC6.4.18 Concrete works. The invert levels shall be within -10 mm to +10 mm of the design level, grade 5mm in 2.5m (1 in 500) and plan position ±50 mm. Where longitudinal gradients are less than 0.5 per cent cast in-situ base slabs shall be installed within +/- 6 mm of the grade line.

(b) Recesses or nib walls to accommodate the walls of the precast crown units shall be formed in the base slab to the dimensions shown on the drawings.

(9) Installation of precast units

(a) Precast units shall not be installed until the base slab has attained a minimum compressive strength of 20 MPa.

(b) Precast crown units shall be placed on a bed of mortar either on the slab or in the recesses in the base slab. Any gaps between the side walls and the sides of the recesses shall be packed with cement mortar. Lifting holes and butt joints between units shall be packed or sealed with cement mortar or grout or flexible joint filler.

(c) Before placement of top slabs on U-shaped units or link slabs on adjacent crown units, the bearing area of the supports shall be thoroughly cleaned and covered with a bed of mortar of minimum thickness 5 mm after placement of precast unit.

(d) Lifting anchor recesses shall be filled to the surface with cement mortar.

(e) In the case of multi-cell culverts, a nominal 40 mm gap shall be provided between adjacent cells. This gap shall be filled with cement mortar or grout.

(f) All mortar joints shall be protected from the sun and cured in an approved manner for not less than 48 hours.

(g) All external surfaces of vertical joints between precast crown units, shall be covered full length, and minimum 100 mm width, with strips of Denso tape or similar as an alternative to joint filling.

(10) Headwalls and wingwalls

The wingwalls shall be designed and constructed to retain the batters effectively. Where the dimensioned drawings do not satisfy this requirement, the Superintendent shall be notified before the headwalls and wingwalls are constructed. The Superintendent shall direct the Contractor as to the action to be taken. Where rock is encountered at the bottom of excavations for wingwalls and headwalls, and after approval is given by the Superintendent, the depth of cut off walls in uniform rock over the full width of the foundations may be reduced to less than that shown in the drawings but must be not less than 150 mm into sound rock.

(11) Backfill

(a) All bracing and formwork shall be removed prior to backfilling. Prior to backfill placing, present to the Superintendent for inspection all seals, joints, and levels.

(b) Selected backfill shall be placed in the side zones of the box culverts and wingwalls, and to a depth of 300 mm in the overlay zone of the culverts, in layers with a maximum compacted thickness of 150 mm in accordance with the backfilling and compaction requirements of AS 1597.2. Alternatively, cohesionless materials can be compacted in one operation by saturation and vibration to achieve a minimum Density Index of 70. The remainder of the excavation shall be backfilled with ordinary embankment fill in accordance with Section SC6.4.7 Clearing, grubbing, and earthworks.

(c) Backfill shall be placed against wingwalls, headwalls and retaining walls in accordance with Section SC6.4.18 Concrete works.

(d) Backfill layers shall be placed simultaneously on both sides of the culvert with a maximum 600 mm level difference to avoid differential loading. Backfilling and compaction shall commence at the wall and proceed away from it.

(e) Where the slopes bounding the excavation are steeper than 4:1, they shall be cut in the form of successive horizontal terraces of at least 1 m width before the backfill is placed.

(12) Excavation of inlet and outlet channels

Excavation of inlet and outlet channels shall be carried out as shown on the drawings and shall extend to join the existing stream bed in a regular manner as detailed in Section SC6.4.9 Stormwater quantity, Clause SC6.4.9.16.

(13) Construction loading on culverts

(a) Construction vehicles and plant shall not pass over the culvert until 28 days after the casting of the base slab or until the cylinder compressive strength of the base slab concrete has reached 32 MPa.

(b) Construction vehicle loads on culverts for various design fill heights shall be in accordance with AS 1597.2.

(14) Limits and tolerances

The limits and tolerances applicable to the various clauses in this section are summarised in Table SC6.4.17.1 Summary of Limits and Tolerances below:

Table SC6.4.17.1 - Summary of Limits and Tolerances

Item	Activity	Limits/Tolerances	Spec Clauses
(1)	**Mass Concrete Correction**		
	(a) Over highest points of rock	50 mm	Clause SC6.4.17(6)(f).
(2)	**Mass Concrete Bedding**		
	(a) Level	± 10 mm	Clause SC6.4.17(6)(h)
	(b) Level where grade line <0.5%	+/- 6 mm	
	(c) Line	± 50 mm	Clause SC6.4.17(6)(h)
(3)	**Culvert Location**		
	(a) Invert Level	±10 mm	
	(b) Invert where grade line is <0.5%	+/- 6mm	Clause SC6.4.17(6)(h)
	(c) Grade	5 mm in 2.5 m (1 in 500)	Clause SC6.4.17(6)(h)
	(d) Plan Position	± 50 mm	Clause SC6.4.17(6)(h)

SC6.4.17.7 Culverts, retaining walls, sign support structures, and fences

Public utility structures, large culverts, retaining walls, major sign support structures, and fences, and the like, will be designed by a competent, practicing engineer (RPEQ certified) who is accredited in the design of such structures. The design must be in accordance with the SC6.4 Development manual planning scheme policy, relevant Austroads codes, all relevant Australian Standards, and the requirements of any utility owners that may be applicable.

SC6.4.17.8 Retaining walls

(1) Retaining walls to a maximum height of 1.0 m of wall and fill or cut retained, are prescribed building works under Schedule 1 of the *Building Regulations 2006*, and do not require approval, providing there is no surcharge loading over the zone of influence, and the wall is no closer than 1.5 m to a building or another retaining wall.

(2) Retaining walls that do not qualify as prescribed building works under Schedule 1 of the *Building Regulations 2006,* require Building Certification issued by a Building Certifier and should be designed and certified by a suitably qualified RPEQ engineer who will determine the extent of geotechnical investigations required to verify soil type and soil bearing pressure for the design of the retaining wall.

(3) Retaining wall located within the Landslip Overlay of the City Plan will require Council development approval.

SC6.4.17.9 Acoustic fences

Notwithstanding the provisions for fenced under clause (10) below, acoustic fences adjacent to Queensland Rail or roads under the control of the Department of Transport and Main Roads will require approval from the relevant authority.

SC6.4.17.10 Fences

(1) Fences to a maximum height of 2.0 m above natural ground level, and are not a swimming pool fence, are prescribed building works under Schedule 1 of the *Building Regulations 2006*, and do not require approval.

(2) Fences greater than 2.0 m in height require a Building Certification issued by a building certifier and should be designed and certified by a suitably qualified RPEQ engineer who will determine the extent of geotechnical investigations required to verify soil type and soil bearing pressure for the design of the fence. Concrete masonry solid panel and screen fences shall be designed for cyclonic wind loads for Region C as set out in AS 4055 Wind Classification.

(3) Fences greater than 2.0 m in height will require a referral agency response from Council to the building certifier as part of the building certification approval process.

SC6.4.17.11 Signs and sign support structures

(1) General

Sign support structures shall be fabricated from steel sections which shall comply with the requirements of AS 1163, AS 3678 and AS 3679.1.

Signs support structures shall be standard round galvanised posts of 50, 65, or 80 mm, nominal bore, or purpose designed steel structures as shown on the drawings and manufactured in accordance with the requirements of AS 1250.

Splices in members shall be restricted to a maximum of one splice per member. Splices shall be full penetration butt welds.

All welding shall be as shown on the drawings and in accordance with the requirements of AS 1554.1, Category GP.

(2) Protective treatment

Except for standard galvanised posts, all steel components including brackets shall be protected by hotdip galvanising after all fabrication processes are completed.

The steel components shall be finished by the hot dip galvanising process in accordance with AS/NZS 4680 to provide an average minimum coating thickness of 85 microns and a bright finished surface free from white rust and stains.

Bolts, nuts and washers and brackets shall be galvanised in accordance with AS 1214.

Splices in standard galvanised posts shall be painted by using an organic zinc rich primer, or inorganic zinc silicate paint, in accordance with the repair requirements in Appendix E of AS/NZS 4680.

Scratched and slightly damaged surfaces of galvanised coatings shall be renovated by using an organic zinc rich primer, or inorganic zinc silicate paint, in accordance with the repair requirements in Appendix E of AS/NZS 4680.

This method of renovation shall be restricted to areas not exceeding 2500 square millimetres on any one structure. Any structure with totally damaged coating areas exceeding 2500 square millimetres shall be regalvanised by the Contractor.

(3) Attachment of new signs

Posts and other components shall be provided with the required sign attachment holes or fittings to suit the typical attachment systems as shown on the drawings. Sign panels shall be attached to each supporting member at each extrusion section or bolt hole in the sign panel.

The Contractor shall submit details of the proposed attachment systems for the Superintendent's approval.

(4) Erection of new signs

(a) Setting out

The location of signs shall be as shown on the drawings or as directed by the Superintendent. The Contractor shall set out the work to ensure that all signs and support structures are placed in accordance with the drawings or as directed by the Superintendent.

Signs shall be aligned approximately at right angles to the direction of the traffic they are intended to serve. On curved alignments, the angle of placement should be determined by the course of approaching traffic rather than the orientation of the road at the point where the sign is located. Parking signs will generally be aligned at 45 degrees to the kerb line if not otherwise specified on drawings.

The Contractor shall submit details of and set out, for the Superintendent's inspection and approval, the proposed location and alignment of each sign support structure.

Work on the foundations of the sign support structure shall not commence until the Superintendent has approved the location and alignment of the sign support structure.

The Contractor is responsible for locating existing underground services in proximity of the signs prior to placement of footings and erection of signs to protect services from damage.

(b) Clearing

The Contractor shall advise the superintendent of any trees and undergrowth within 3 m of the sign support structure and along a driver's line of sight to the front of the sign that are required to be cleared and removed. On receipt of this advice from the Superintendent, Council will inspect and advise what action is to be taken by the Contractor.

(c) Sign structure footing

The footings for a simple pipe support or the footings for each post of a purpose designed sign support structure shall be constructed in accordance with the drawings or as directed by the Superintendent.

The footings shall be neatly excavated to the depth and width shown on the drawings. The material from the excavation shall be disposed of in a responsible and legal manner.

When anchor bolt assemblies are specified, they shall be accurately placed and firmly supported. Anchor bolt assemblies shall be provided with levelling nuts under the sign structure base plates to allow adjustment of the structure after installation.

Steel reinforcement shall be placed as shown on the drawings.

Concrete in the footings of sign support structures shall comply with Section SC6.4.18 Concrete Works and have a minimum compressive strength at 28 days of 20 MPa for pipe support footings and 32 MPa for purpose-designed support footings.

If ready mixed concrete is used, the concrete shall be mixed and delivered in accordance with AS 1379.

(d) Erection

All components shall be accurately positioned and supported during erection.

The top of each pipe support post shall extend sufficiently beyond the upper extrusion section or bolt holes on the sign panels to enable attachment of the signs. The top of each post shall be below the top edge of the sign panel.

For pipe support multi post installations, the tops of the posts shall be at the same level except where sign shape or the arrangement of sign panels dictates otherwise.

During erection, sign panels shall be suitably supported and braced, and the sign face protected from damage. Signs damaged during erection shall be repaired to a standard equivalent to the original sign or replaced by the Contractor.

Galvanised coatings on purpose designed support structures which are scratched or slightly damaged during erection shall be renovated by using an organic zinc rich primer, or inorganic zinc silicate paint, in accordance with the repair requirements in Appendix E of AS/NZS 4680. This method of renovation shall be restricted to areas not exceeding 2500 square millimetres on any one structure. Any structure with totally damaged coating areas exceeding 2500 square millimetres shall be regalvanised.

(e) Adjustment of existing signs and support structures

Where shown on the drawings, and, where directed by the Superintendent, the Contractor shall adjust existing sign panels and sign support structures. The work shall include minor adjustments of existing sign panels and/or sign support structures or the work may extend to the dismantling of signs and sign support structures, relocation or replacement of sign support structures including footings and re erection of signs including all fittings.

(5) Special requirements

All street name, service and tourist signs shall comply with Council's adopted signage system and with the details as shown on the drawings.

Proprietary signs shall be manufactured and installed in accordance with the requirements of Parts 1 and 6 of MUTCD to the following details:

(Sample only - to be completed by compiler)

(a) Colour:

(i) Legend - Blue, Non-reflective

(ii) Background - Yellow, Class 1 Retroreflective

(b) Lettering and numerals:

(i) Font Type - Series D

(ii) Height – 100 mm

Details of Council's logo shall be supplied to the Contractor by the Council.

Details of the signs and legends are to be shown on the drawings.

The Contractor shall submit details of the manufacturer of all sign materials and sign attachment system to the Superintendent for approval by the Council prior to commencement of sign manufacture.

(6) Limits and tolerances

The limits and tolerances applicable to the various clauses in this section are summarised in Table SC6.4.17.2 Summary of Limits and Tolerances below:

Table SC6.4.17.2 - Summary of Limits and Tolerances – Signs

Item	Activity	Limits/Tolerances	Clause
(1)	**Sign Support Structures**		
	(a) Protective Treatment thickness	> 100 microns	Clause SC6.4.17 (11)
	(b) Paint coating over Splices in standard galvanised posts	> 100 microns	Clause SC6.4.17 (11)(b)
	(c) Damaged Surface of galvanised surfaces:		
	(i) Coating with zinc rich paint	Area < 2500 sq. mm	Clause SC6.4.17 (11)(b)
	(ii) Regalvanise	Area > 2500 sq. mm	Clause SC6.4.17 (11)(b)
(2)	**Clearing**		
	(a) Trees and Undergrowth to be cleared	< 3 metres from sign support structure	
(3)	**Concrete in Foundations of Sign Support Structures**		
	(a) Strength	> 25 MPa at 28 days	

SC6.4.17.12 Structures used for public safety

(1) General

Since the requirement of road safety barriers and pedestrian safety rails on bridges are different, the design engineer must consider whether separate traffic and pedestrian barriers can be detailed to satisfy the major functional requirements.

The *Bridge Design Code* (AS 5100.1 Sections 10 - 12) and AS/NZS 3845 are recommended references in this regard.

It is essential that all safety barriers and rails have been fully tested and accredited for the intended use under quality assurance provisions.

Bridge crossings in urban and rural residential areas must be provided with street lighting in accordance with AS 1158. Such requirements will be noted accordingly on the drawings.

(2) Non-rigid road safety barrier system

(a) Scope

The work to be executed under this section consists of the setting out, supply of all materials, and erection of road safety barriers and terminals, in accordance with the requirements for non-rigid road safety barrier systems in DTMR *Road Planning and Design Manual (Chapter 8),* at the locations shown on the drawings or as directed by the Superintendent.

This section details the requirements for public domain non-rigid road safety barrier systems. Where a patented non-rigid road safety barrier system is specified and shown on the drawings, all materials shall be inaccordance with the manufacturer's specifications and, it shall be constructed strictly in accordance with the manufacturer's instructions.

(b) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(i) SC6.4 Development manual planning scheme policy sections:

Section SC6.4.6 Road works and traffic control

Section SC6.4.18. Concrete works

(ii) Department of Transport and Main Roads:

Road Planning and Design Manual (RPDM) 1st edition – (Chapter 8), Safety Barriers and RoadsideFurniture – as amended.

(iii) Australian Standards:

AS/NZS 1906.2 *Retroreflective devices (non-pavement application)*

AS/NZS 3845 *Road safety barrier systems*

AS/NZS 4680 *Hot-dip galvanised (zinc) coatings on fabricated ferrous articles*

(c) Materials

(i) Components

All steel components for public domain non-rigid road safety barrier systems, W beam and Thriebeam, shall be designed and constructed strictly in accordance with the RPDM (Chapter 8 – as amended) using crushable energy absorbing materials and shall be of the type as shown on the drawings.

(ii) Certification

Road safety barrier components shall not be erected until the Contractor has produced documentary evidence to the Superintendent that such safety barrier components conform to the requirements of this section.

For galvanized steel components provide a manufacturers certificate of compliance certifying that the zinc coating mass conforms to AS/NZS 4680 or, for components of proprietary safety barrier systems or devices, to the manufacturer's recommendations.

(d) Construction

(i) General

The Contractor shall at all times conform to the requirements of Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.17.

Construction of non-rigid road safety barrier shall comply with TMR RPDM, except where explicit departures are approved on the drawings.

Road safety barriers shall be erected after the construction of the base on concrete pavements and after the placing of the initial layer of asphaltic concrete or sprayed seal on a flexible pavement, unless otherwise approved by the Superintendent.

The Contractor shall set out the work to ensure that all road safety barriers and terminal sections are located, in accordance with the drawings or as directed by the Superintendent.

Underground cables and ducts laid in the road safety barrier area shall be located prior to the erection of posts and all care must be taken not to damage such cables and ducts.

The posts should be set to the full depth as shown on the drawings. If this is not possible due to the presence of an underground obstruction, an alternative method of setting the posts, as approved by the Superintendent, shall be used.

Posts shall stand vertical and the spacing shall be such that when the safety barrier is erected no post movement is necessary to align holes or for any other reason.

(ii) Erection of steel posts

The safety barrier posts are to be located as shown on the drawings. The top of the post shall be 750 mm, 845 mm, or 905 mm as appropriate for W beam, Thrie-beam or modified block out -Thriebeam respectively, above the ground level, unless otherwise shown on the drawings. On terminal ends, the level of the posts shall be such as to conform to the extended crossfall of the main pavement unless otherwise shown on the drawings.

When erected in position the posts shall be on a smooth line both horizontally and vertically with the tops of posts within ±10 mm of the heights specified in Clause (iv) 2 of this clause.

Steel posts shall be erected by driving, or by other means, as directed by the Superintendent, in accordance with the requirements for foundation posts in the TMR RPDM. The open section of the post shall point in the same direction as adjacent traffic. The posts are to be firm in the ground and any movement at ground level shall not exceed 3 mm in any direction when force tested in accordance with TMR guidelines

The posts shall not have any obvious deformation as a result of driving. Any damage which does occur to the posts is to be repaired within 24 hours using an organic zinc rich primer in accordance with the repair requirements of Appendix E in AS/NZS 4680.

Any post which has been excessively damaged will be rejected by the Superintendent and shall be replaced bythe Contractor at the Contractor's expense.

(iii) Erection of road safety barriers

Steel block out pieces shall be erected with the open section pointing in the same direction as adjacent traffic.

All rail laps shall be in the same direction as adjacent traffic such that approach rail ends are not exposed to traffic.

Stiffening pieces, 300 mm long, shall be used on intermediate posts.

Road safety barrier rails and block out pieces shall be handled and erected in such a manner that no damage occurs to the galvanising. Any minor damage occasioned to the galvanising shall be repaired within 24 hours using an organic zinc rich primer in accordance with the repair requirements of Appendix E in AS/NZS 4680.

Any road safety barrier rails or block out pieces that have been excessively damaged will be rejected by the Superintendent and shall be replaced by the Contractor at the Contractor's expense.

Road safety barrier rail attachment bolts and splice bolts are to be tightened initially such that the barrier can be erected. Adjustments are then to be made to the rails using the slotted holes provided to produce a smooth regular line, free of any kinks or bumps. The overall line of the top of the safety barrier rails is to visually conform with the vertical alignment of the road pavement.

When the alignment both vertically and horizontally is obtained the splice bolts are to be fully tightened. The bolt head (not the shoulder) should be in full bearing with the rail.

(iv) End treatment of road safety barriers

Both the approach and the departure end of the road safety barrier shall be constructed with leading and trailing terminal sections at locations shown and as detailed on the drawings.

An appropriate terminal end treatment shall be constructed, as detailed on the drawings, at the approach and end locations of road safety barriers as shown on the drawings. Consideration of alternate terminal end treatments will include sufficient clearance behind the safety fence to accommodate pedestrians and cyclists, where applicable.

The approach and the departure end of double-sided road safety barriers shall have terminal sections as detailed on the drawings.

Non-rigid road safety barrier connections to rigid road safety barriers or bridge parapets shall be as detailed on the drawings.

(v) Delineators

Delineators complying with AS 1906.2 shall be fixed with brackets to the road safety barrier, to the details and at the locations shown on the drawings beginning at the first post and then in accordance with Table SC6.4.17 3 below.

Table SC6.4.17.3 - Spacing of Reflectors on Barriers

Radius of Curve	Spacing of Reflectors on Barrier
m	every
30 - 90	3rd post
90 - 180	5th post
180 - 275	8th post
275 - 365	11th post
over 365 (including straight road)	16th post

The delineators shall be so arranged that drivers approaching from either direction will see only red reflectors on their left side, and white reflectors on their right.

(vi) Connection to existing safety fence

The Contractor is to inspect and document the condition of all existing barrier fencing and its suitability to meet current specifications and standards, prior to connection or incorporation into the subject works. All documentation of existing fencing is to be made available to the Superintendent for future inspection, if requested.

If any existing safety fencing is deemed not to comply with current design and safety standards, it is to be replaced by the Contractor.

(e) Limits and tolerance

The limits and tolerances applicable to the various clauses in this section are summarised in Table SC6.4.17.4 Summary of Limits and Tolerances below:

Table SC6.4.17.4 - Summary of Limits and Tolerance

Item	Activity	Limits/Tolerances	Clause
1	**Vertical Alignment** Tops of steel posts	± 10 mm	Clause SC6.4.17(12)(b)(iv)
2	**Post Movement**	± 3 mm	Clause SC6.4.17(12)(b)(iv)
3	**Concrete Footings** Diameter	-0 mm or +50 mm	Clause SC6.4.17(12)(b)(iv)

SC6.4.17.13 Temporary works

Structures which are proposed for the temporary support of roads, services and the like must be designed by a qualified engineer (RPEQ certified) experienced and accredited in the design of such structures and designed in accordance with the *Bridge Design Code* (AS 5100). A construction programme, indicating the sequence of events leading to the implementation and removal of the temporary structures must be specified on the drawings. The design of such temporary structures is to mandate the safe constructability and use of these structures throughout the term of the construction works.

Development manual planning scheme policy (PSP)

SC6.4.18 Concrete works

Index

SC6.4.18.1 Introduction

(1) Scope
(2) Reference and source documents

SC6.4.18.2 Excavation and foundations

(1) General
(2) Kerb and channel
(3) New jersey type barriers, driveways, and footpaths
(4) Drainage pits, and other supplementary structures
(5) Retaining walls, headwalls, and wingwalls

SC6.4.18.3 Formwork

(1) General
(2) Approval of formwork design
(3) Provision for drainage
(4) Construction
(5) Erection

SC6.4.18.4 Materials for concrete

(1) Cement
(2) Water
(3) Fire aggregate
(4) Coarse aggregate
(5) Admixtures
(6) Testing of materials

SC6.4.18.5 Handling and treatment of concrete

(1) Measuring
(2) Measuring by weight, on-site mixing
(3) Measuring by volume, on-site mixing
(4) Consistency
(5) Mixing and delivery
(6) Placing and compacting concrete
(7) Finishing of unformed surfaces
(8) Curing and protection
(9) Removal of forms
(10) Treatment of formed surfaces
(11) Joints
(12) Strength of concrete
(13) Sampling concrete

SC6.4.18.6 Reinforcement for concrete

(1) Fibre reinforced concrete
(2) Steel reinforcement
(3) Bending
(4) Splicing
(5) Marking

(6) Storage
(7) Delivery and receipt of reinforcement
(8) Placing
(9) Cores, fixings, and embedded items generally

SC6.4.18.7 Backfilling

(1) General
(2) Treatment at weepholes

SC6.4.18.8 Sprayed concrete

(1) References and source documents
(2) General
(3) Test panels
(4) Surface preparation
(5) Application of sprayed concrete
(6) Curing

SC6.4.18.9 Summary of limits and tolerances

SC6.4.18.1 Introduction

(1) Scope

(a) This section provides details for the supply and placement of concrete, including sprayed concrete,and ancillary requirements including excavation, preparation of foundations, forming up, placement of reinforcement and backfilling for work shown on the drawings. These works include kerb and channel, New Jersey type safety barriers, drainage pits and other supplementary structures, headwalls and wingwalls, box culverts, box culvert base slabs, driveways, footpaths, median toppings, retaining walls, footings, paving edge strips and works of a similar nature.

(b) The work also includes supply and placement of miscellaneous minor concrete work for water and sewerage construction such as valve chambers, thrust and anchor blocks, bulkheads, pumping stations, bedding, encasement and cast-in-situ access chambers.

(c) Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in Section SC6.4.23 Construction management, quality management, inspection and testing.

(2) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

Editor's note - Documents referenced in this section are listed in full below whilst being cited in the text in the abbreviated form or code indicated.

(a) SC6.4 Development manual planning scheme policy sections:

Section SC6.4.6 Road works, and traffic control
Section SC6.4.7 Clearing, grubbing, and earthworks
Section SC6.4.9 Stormwater quantity
Section SC6.4.17 Structures
Section SC6.4.23 Construction management, quality management, inspection and testing

(b) Australian Standards:

AS1012	Methods of testing concrete - Method 1*: Sampling of fresh concrete*
AS1012.3.1	Methods of testing concrete - Method 3.1: Determination of properties related to the consistency of concrete - Slump test,
AS1012.8.1	Methods of testing concrete - Method 8.1: Method of making and curing concrete - Compression and indirect tensile test specimens,
AS1012.8.2	Methods of testing concrete - Method 8.2: Flexure test specimens,
AS1012.9	Methods of testing concrete - Method 9: Compressive strength tests—Concrete, mortar and grout specimens and
AS1012.14	Methods of testing concrete - Method 14: Method for securing and testing cores from hardened concrete for compressive strength and mass per unit volume
AS1141.14	*Methods for sampling and testing aggregates - Method 14: Particle shape, by proportional caliper*
AS1141.21	*Methods for sampling and testing aggregates - Method 21: Aggregate crushing value*
AS1141.23	*Methods for sampling and testing aggregates - Method 23: Los Angeles*

	value
AS1141.24	*Methods for sampling and testing aggregates - Method 24: Aggregate soundness—Evaluation by exposure to sodium sulfate solution*AS1289.3.3.1 *Methods of testing soils for engineering purposes - Method 3.3.1: Soil classification tests - Calculation of the plasticity index of a soil*
AS1289.5.1.1	*Methods of testing soils for engineering purposes - Method 5.1.1: Soil compaction and density Tests - Determination of the dry density/moisture content relation of a soil using standard compactive effort*
AS1289.5.4.1	*Methods of testing soils for engineering purposes - Method 5.4.1: Soil compaction and density Tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio)*
AS1379	*Specification and supply of concrete*
AS1478.1	*Chemical admixtures for concrete, mortar and grout – Part 1: Admixtures forconcrete*
AS/NZS1554.3	*Structural steel welding - Part 3: Welding of reinforcing steel*
AS/NZS1859	*Reconstituted wood-based panels (set)*
AS2082	*Timber—Hardwood—Visually stress graded for structural purposes*AS/NZS2271 *Plywood and blockboard for exterior use*
AS2758.1	Aggregates and rock for engineering purposes - Part 1: *Concrete aggregates*
AS3600	*Concrete structures*
AS3610	*Formwork for concrete*
AS3799	*Liquid membrane-forming curing compounds for concrete*
AS3972	*General Purpose and blended cements*
AS/NZS4671	*Steel reinforcing materials*
AS/NZS4680	*Hot-dip galvanized (zinc) coatings on fabricated ferrous articles*

(c) Other:

Transport for NSW	*Shotcrete design guidelines*

SC6.4.18.2 Excavation and foundations

(1) General

The foundation where specified, shall be formed at the required depth below the finished surface levels shown on the drawings. Rock foundations shall be neatly excavated to form a bed for the concrete and shall be thoroughly scraped and cleaned. Soil foundation shall, as far as possible, be excavated neatly from the solid material to coincide with the under surface of the concrete. Compaction requirements must meet the appropriate compliance standards as specified in Section SC6.4.7 Clearing, grubbing, and earthworks.

All soft, yielding, or other unsuitable material shall be replaced with sound material approved by the Superintendent, and the subgrade shall be compacted to provide a minimum relative compaction as specified in Section SC6.4.7. Clearing, grubbing, and earthworks. If the subgrade is dry, it shall be sprinkled with as much water as it will readily absorb before the concrete is placed.

Preparation of the foundation is required in accordance with foundation type, as follows:

(a) concrete working base - remove projections above the plane surface, and loose material; and

(b) graded prepared subgrade - blind with sufficient sand to create a smooth surface free from hard projections. Wet the sand just before laying the underlay.

Editor's Note - Provision of a vapour barrier for external slabs on ground prevents water loss to the subgrade and has the potential to reduce slab curling at edges and corners.

AS2870 Section 5.5 provides additional requirements and detailing of damp-proof membranes for concrete slabs and footings exposed to either saline or acid sulphate soils. AS2870 Section C5.5 and CCAA T56 provide information on concrete exposed to saline soils.

Polymeric film underlay must be installed over the prepared foundation. Lap joints at least 200 mm and seal the laps and penetrations with waterproof adhesive tape. Face the laps away from the direction of concrete pour. Take the underlay up vertical faces past the damp proof course where applicable, and tape fix at the top. Patch or seal punctures or tears before pouring concrete. Cut back as required after concrete has gained strength and forms have been removed.

The Contractor shall supply all necessary sheeting and bracing to safely support the excavation in accordance with statutory requirements. The excavation shall be kept free of water.

Prior to the construction of footings for cast-in-situ concrete walls on earth foundations, cover the latter with a mass concrete blinding slab. Unless otherwise specified, place precast concrete wall sections on a fresh mass concrete bedding layer while it is still in a plastic state. Ensure the following is adhered to:

(a) for earth foundation, place concrete not less than 50 mm thick; and

(b) for rock foundation, place the concrete at least 50 mm above the highest points of rock.

Place neither forms nor other materials on the bedding layer within 48 hours of the concrete being placed.

(2) Kerb and channel

Kerb and channel may be constructed in fixed forms, by extrusion or by slip forming, in accordance with AS2876.

The foundation, concrete quality, curing and testing details shall be in accordance with AS2876 except where placed on pavement courses, where the requirements of the respective pavement course must prevail. Kerb and channel will be constructed to the profile nominated on the drawings.

The top and face of the finished kerb and channel shall be true to line and the top surface shall be of uniform width, free from humps, sags, or other irregularities. Kerb and channel shall have a steel float finish.

The level at any point on the surface of the kerb invert shall be within ±6 mm of the design level. When a straight edge 3 m long is laid on top of or along the face or invert of the kerb, the surface shall not vary more than 5 mm from the edge of the straight edge, except at kerb laybacks, grade changes or curves or at gully pits requiring gutter depression. The drainage invert shall be free draining and shall not pond water.

Unless shown otherwise on the drawings, contraction joints, shall be formed every 5 m of kerb invert length for a minimum of 50% of cross-sectional area. The joint shall be tooled 20 mm in depth to form a neat groove of 5 mm minimum width.

Unless shown otherwise on the drawings, expansion joints, 15 mm in width for the full depth of the kerb and channel, shall be constructed where the kerb invert abuts against kerb gully pits, both sides of kerb laybacks/ramps for vehicular or pedestrian access, retaining walls and overbridges.

Expansion joints shall consist of a preformed jointing material of bituminous fibreboard.

Where kerb and channel is cast adjacent with a concrete pavement the same type of contraction, construction and expansion joints specified in the concrete base shall be continued across the kerb and channel.

All house stormwater outlets shall be provided and/or extended, to match the existing type and size of pipe, through the kerb as shown on the drawings providing correctly graded drainage outlet into channel. Pipework shall be in accordance with the requirements for UPVC pipes in Section SC6.4.9 Stormwater quantity or as directed by the Superintendent for other types of pipe.

At all driveway crossings, where shown on the drawings, or where directed by the Superintendent, barrier kerb shall be discontinued to provide for vehicular or pedestrian access. At such locations, kerb laybacks/ramps must be constructed in accordance with the drawings and standards. Footpath crossovers shall be constructed to meet the laybacks as shown on the drawings or reinstated to match existing materials where not otherwise shown.

After the new kerb and channel has been constructed and not earlier than 3 days after placing, the spaces on both sides of the kerb and/or gutters shall be backfilled and reinstated in accordance with the drawings, or as instructed by the Superintendent.

Backfill material behind the kerb shall consist of granular material, free of organic material, clay, and rock more than 50 mm diameter, or material as approved by the Superintendent.

Backfill material behind the kerb shall be compacted in layers not greater than 150 mm thick, to a relative compaction of 95% when tested in accordance with AS1289.5.4.1, for standard compactive effort. The whole of the work shall be finished in a neat and workmanlike manner, free draining and free from surface undulations and trip hazards.

Pavement material adjacent to new gutter shall be backfilled in accordance with the drawings or as directed by the Superintendent.

Where specified in drawings, kerb only work shall be pinned as detailed in standard drawings.

(3) New jersey type barriers, driveways, and footpaths

For New Jersey type barriers, driveways, and footpaths a subbase of approved quality and of minimum 150 mm compacted thickness, unless otherwise shown on the drawings, shall be placed over the subgrade. The surface shall then be checked for uniformity, line and level, and all irregularities shall be made good.

The subbase material shall be compacted to provide a minimum relative compaction as determined by AS1289.5.4.1 of 100% for standard compactive effort as specified in Section SC6.4.7 Clearing, grubbing, and earthworks.

The finished subbase shall not deviate more than 15 mm under a straight edge 3 m long, subject to any necessary allowance on vertical curves.

(4) Drainage pits, and other supplementary structures

Where the excavation is in sound rock, and the Superintendent so directs, part of the concrete lining of gullypits and other structures may be omitted, provided that a neatly formed pit of the required dimensions is constructed, and provided that the wall of the pit adjacent to and parallel with the road is constructed of formed concrete in all cases.

(5) Retaining walls, headwalls, and wingwalls

In the case of rock foundations for retaining walls, headwalls and wingwalls, the excavation shall be carried into the rock for a minimum depth of 150 mm. Where cut-off walls are to be provided, the depth of cut-off in rock foundations may be reduced to 100 mm.

Prior to the construction of cast-in-situ concrete walls on earth foundations, the latter shall be covered by a mass concrete bedding layer at least 50 mm thick and finished to a uniform surface. No forms or other materials shall be placed upon the bedding layer within a period of 48 hours after the concrete has been placed.

Unless otherwise specified, precast concrete wall sections shall be placed on a fresh mass concrete bedding layer while it is still in plastic state. In the case of soil foundations, the concrete shall be not less than 50 mm thick, and where the foundation is in rock, the concrete shall be of such thickness as is required to provide a uniform surface at least 50 mm above the highest points of rock.

SC6.4.18.3 Formwork

(1) General

Formwork shall be provided in accordance with AS3610 to produce hardened concrete to the lines, levels and shapes shown on the drawings or specified elsewhere. It shall have adequate strength to carry all applied loads, including the pressure of fresh concrete, vibration loads, weight of workers and equipment, without loss of shape. Forms shall be mortar tight and designed to allow removal without risk of damage to the completed structure. Joints in the formwork shall be perpendicular to the main axis of the shape of the concrete.

Where concrete is placed in earth excavations, side forms shall be provided to prevent contact between concrete and the in-situ earth.

Design of formwork for high sections shall be such that it shall not be necessary to drop concrete freely from a greater height than 1.2 m or to move concrete along the formwork after deposition.

Formwork material used shall be sound and suitable for the purpose intended and surface finish specified.

Provision shall be made for the accurate location and firm support of fittings, bolts, anchorages, and formers of holes as shown on the drawings. Temporary fittings used for the support of the formwork shall be arranged to permit removal without damage to the concrete. The use of wires and or bolts extending to the surface of the concrete shall not be permitted except where shown on the drawings.

Forms for edges of concrete shall be filleted and for re-entrant angles chamfered as shown on the drawings.

Temporary openings shall be provided where necessary for cleaning out of formwork and inspection before concreting.

(2) Approval of formwork design

For box culverts and reinforced concrete retaining walls, detailed drawings, design calculations, description and/or samples of materials proposed for use shall be submitted for the Superintendent's concurrence before manufacture of the formwork is commenced.

Formwork greater than 1.5 m high should be certified by the RPEQ responsible for the formwork design.

(3) Provision for drainage

Where shown on the drawings, or where directed by the Superintendent, weepholes of 50 mm diameter shall be provided in retaining walls and wingwalls.

(4) Construction

The type and quality of material selected for formwork and the workmanship used in construction shall be such that the surface finish specified shall be obtained. Construction shall be such that the erection tolerances shall be obtainable.

Timber for formwork shall be well seasoned, free from defects and, where in contact with fresh concrete, free from loose knots.

Timber forms for exposed surfaces shall be constructed from plywood or particle board with hardwood or approved softwood studs and wales. The plywood used for forms shall comply with AS2271, the hardwood shall comply with AS2082 and the particle board with AS/NZS1859.

Formwork for exposed surfaces shall be made from panels having uniform widths of not less than 1 m and uniform lengths of not less than 2 m, except where the dimensions of the member formed are less than the specified panel dimensions. Plywood panels shall be placed with the grain of the outer plies perpendicular to the studding or joists. Where form panels are attached directly to the studding or joists the panel shall be not less than 15 mm thick. Form panels less than 15 mm thick, otherwise conforming to these requirements may beused with a continuous backing of dressed material of 20 mm minimum thickness. All form panels shall be placed in a neat, symmetrical pattern.

Forms for all surfaces which will be completely enclosed or permanently hidden below the ground may be constructed from dressed or undressed timber, steel, plywood, or particle board.

Mild steel form surfaces in contact with concrete shall have all bolt and rivet heads counter-sunk and all welds ground back to even and smooth surfaces.

(5) Erection

(a) General

(i) Dimensions and position of forms shall be carefully checked after the forms are erected. Forms shall be aligned accurately and the location of all fittings, hold formers, etc. checked prior to placing concrete. Departure of the forms from the surfaces shown on the drawings shall not exceed 1/300 of the space between supports for any surface visible in the completed work and 1/150 for hidden work. For tolerances in plan position and levels, finishing of unformed surfaces and treatment of formed surfaces refer to Clause SC6.4.18.5.

(ii) Joints as erected shall be mortar tight.

(iii) The interior surface of the forms shall be treated to ensure non-adhesion of the mortar. Commercial quality form oil or grease will be acceptable, but the oil or grease used on forms against surfaces to be exposed shall not stain or discolour the concrete surface. The coating shall be uniformly spread in a thin film and any surplus shall be removed prior to placing concrete. In the case of unlined timber forms, the timber shall be thoroughly wetted before oiling. Forms shall be treated before placing reinforcement to ensure that the form release agent will not contaminate the surface of the reinforcing steel or construction joints.

(iv) Formwork hardware shall be treated with a form release agent and so arranged that it may be removed from the concrete without excessive jarring or hammering.

(b) Approval by the Superintendent

(i) The formwork shall be inspected by the Superintendent, and the placing of reinforcement in the spaces formed, where specified, shall not commence until the formwork is approved by the Superintendent.

(ii) Placing of concrete shall not commence until the reinforcement, where specified, has been

accepted by the Superintendent, and all dirt, chips, hardened concrete, mortar, and all foreign matter removed from the forms.

(iii) When an inspection is requested by the Contractor, a notice of not less than 24 hours, excluding Saturdays, Sundays, and public holidays, shall be given to the Superintendent.

SC6.4.18.4 Materials for concrete

(1) Cement

Cement shall be Type GP Portland Cement complying with AS3972.

When submitting details of the nominated mix in accordance with Clause SC6.4.18 (4), the Contractor shall nominate the brand and source of the cement. On approval of the nominated mix by the Superintendent, the Contractor shall only use the nominated cement for the work.

Documentary or other acceptable evidence of the quality of the cement shall be furnished by the Contractor if required by the Superintendent.

If the Contractor proposes to use cement which has been stored for a period more than 3 months from the date of testing, a re-test shall be required at the Contractor's expense before the cement is used.

All cement shall be transported in watertight containers and shall be protected from moisture until used. Caked or lumpy cement shall not be used.

(2) Water

Water shall be free from injurious amounts of materials harmful to concrete and to its reinforcement and neither salty nor brackish.

Water which is not potable for human beings shall not be used in reinforced concrete.

(3) Fine aggregate

Fine aggregates shall consist of clean, hard, tough, durable uncoated grains, uniform in quality, and shall conform to the requirements of AS2758.1 in respect of bulk density, water absorption (maximum 5%) material finer than 2 micrometres, impurities, and reactive materials.

Fine aggregates shall be evenly graded within the absolute limits shown in Table SC6.4.18.1 Fine aggregate grading and shall not deviate from the proposed grading by more than the amounts in Table. SC6.4.18.1.

Table SC6.4.18.1 - Fine Aggregate Grading

Australian StandardSieve	Proportion Passing(% of Mass)	Deviation from Proposed Grading (% of Mass of Sample)
9.50 mm	100	
4.75 mm	90 - 100	±5
1.18 mm	40 - 85	±10
300 µm	8 - 30	±10
150 µm	2 - 10	±5
75 µm	0 - 4	±3

(4) Coarse aggregate

Coarse aggregate shall consist of clean, hard, durable, crushed stone, crushed river gravel, screened river gravel or metallurgical furnace slag and shall conform to the requirements of AS2758.1 in respect of particle density, bulk density, water absorption (maximum 2.5%), material finer than 75 micrometres, weak particles, light particles, impurities and reactive materials, iron unsoundness and falling or dusting unsoundness. In all other respects, the coarse aggregate shall comply with this section. If required, coarse aggregate shall be washed to satisfy these requirements.

The percentage of wear shall be determined by AS1141.23, and the loss of weight shall not exceed 30%.

When required by the Superintendent, coarse aggregate shall be tested for conformance for any or all of the properties set out below:

(a) Crushing Value - AS1141.21

The aggregate crushing value shall not exceed 25%;

(b) Soundness - AS1141.24

The loss of mass when tested with sodium sulphate shall not exceed 12%; and

(c) Particle Shape - AS1141.14

The proportion of misshapen particles (2:1 ratio) shall not exceed 35%.

Coarse aggregate shall be evenly graded within the absolute limits shown in Table SC6.4.18.2 Coarse aggregate grading and shall not deviate from the grading of the samples submitted under Clause SC6.4.18 (4) Testing of materials by more than shown.

Table SC6.4.18.2 - Coarse Aggregate Grading

Australian Standard Sieve (mm)	Proportion Passing (% of Mass)			Deviation Proposed Grading (% of Mass of Sample)
	40 mm Nominal	20 mm Nominal	Extrusion Concrete	
	For Wallsexceeding 150 mm thickness	For all other structures		
53.0	100			±10
37.5	95 - 100			±10
26.5		100		±5
19.0	30 - 70	95 - 100		±5
13.2			100	
9.50	10 - 35	25 - 35		
4.75	0 - 10	0 - 10		
2.36	0 - 2	0 - 2		

(5) Admixtures

Chemical admixtures and their use shall comply with AS1478.1. Admixtures shall not contain calcium chloride,calcium formate, or triethanolamine or any other accelerator. Admixtures or combinations of admixtures other than specified below, shall not be used.

During the warm season, (October to March inclusive), a set retarding admixture approved by the Superintendent shall be used to control slump within the limits stated in Clause SC6.4.18.5 (4) Consistency. The dosage shall be varied to account for air temperature and haul time in accordance with the manufacturer's recommendations. A copy of the NATA endorsed Certificate of Compliance with AS1478.1 shall be submitted to the Superintendent, together with the proposed “dosage chart” in accordance with Clause SC6.4.18.4 (6) Testing of materials. If the Contractor proposes to vary the admixture between the warm and cool seasons such variation shall require approval by the Superintendent by providing the necessary, certificate of compliance.

(6) Testing of materials

The Contractor shall submit to the Superintendent a copy of a NATA Certified Laboratory Test Report on the quality and gradings of the aggregates proposed to be used in the work.

The materials shall only be used after receipt of the Superintendent's notification of acceptance, and then only as long as the materials accord with the specification.

SC6.4.18.5 Handling and treatment of concrete

(1) Measuring

All materials shall be measured by weight, except that:

(a) water may be measured by volume with an approved adjustable water measuring and discharging device;

(b) cement may be measured by bags as packed by the manufacturer in which case batches shall be proportioned on the basis of one or more unbroken bags of cement, and for this purpose one bag of cement shall be assumed to weigh 40 kg. Bulk cement shall be weighed in an individual hopper and shall be kept separate from the aggregates until the components of the batch are discharged from the batching hopper; and

(c) measurement by volume for smaller works may be undertaken with the prior approval of the Superintendent.

The proportions set out in Table SC6.4.18.3 make allowance for moisture contents of aggregates of 6% for fine aggregates and 1% for coarse aggregates. Where the moisture content of aggregates exceeds 8% or 3% respectively, the proportions of the mix shall be changed to compensate for the excess water in the aggregate.

(2) Measuring by weight, on-site mixing

Where concrete is to be mixed on site, and where mix control is likely to be less efficient than at a central batching plant, the weights of cement, fine and coarse aggregate shown in Table SC6.4.18.3 Materials in batch containing 1 bag (40 kg) cement may be used as a guide to produce the classes of concrete specified. Small changes in the proportions of fine and coarse aggregate may be required to improve density or workability of the concrete. The use of proportions shown in Table SC6.4.18.3 shall not relieve the Contractor of his obligation to provide concrete of the specified compressive strength.

Table SC6.4.18.3 - Materials in Batch Containing 1 bag (40kg) Cement

MPa	Cement (Kg)	Fine Aggregates (kg)	Coarse Aggregates (kg)	Total Aggregates (kg)
10	40	130	250	380
15	40	100	190	290
20	40	88	126	214

The proportions set out in Table SC6.4.18.3 make allowance for moisture contents of aggregates of 6% for fine aggregates and 1% for coarse aggregates. Where the moisture content of aggregates exceeds 8% or 3% respectively, the proportions of the mix shall be changed to compensate for the excess water in the aggregate.

(3) Measuring by volume, on-site mixing

Where measurement by volume is approved, the proportions of the materials shall be such as are required to produce a mix free of voids and having the specified strength at 28 days.

The nominal proportions given in Table SC6.4.18.4 Volume batching may be used as a guide for volume batching.

Table SC6.4.18.4 - Volume Batching

MPa	Parts by Volume		
	Cement	Fine Aggregate	Coarse Aggregate
10	1	3	6
15	1	2.25	4.5
20	1	2	3

The volumes of fine and coarse aggregates for each batch shall be measured in boxes or bins. The aggregates shall be measured loose (I.e., without compaction) in the boxes and shall be struck off level. Measurements byshovels or like methods will not be permitted. Batch proportions shall be so arranged that each batch contains1 bag of cement. One 40 kg bag of cement shall be assumed to have a volume of 27.5 litres.

(4) Consistency

A sufficient quantity of water shall be added to the mix so that the consistency of the concrete is such that it can be placed in the forms, compacted and worked into all corners without permitting the ingredients to segregate, or excess free water to collect on the surface. If required by the Superintendent, the Contractor shall determine the consistence of the concrete in accordance with AS1012.3.1. Except for extruded concrete, the nominated slump shall not exceed 80 mm, plus the field tolerance of ±15 mm.

In the case of concrete placed by an extrusion machine, the water in the mix shall be only sufficient to produce a slump of 10 mm to 15 mm.

(5) Mixing and delivery

(a) General

(i) Concrete may be mixed either at the site or at a central mixing plant. All concrete shall be mixed with mechanically operated mixers. In an emergency, hand mixing may be permitted. Submit proposal for concrete mixing other than premixed concrete for approval

by Superintendent.

(ii) Any concrete which exhibits signs of segregation shall not be used.

(b) Machine mixing at site

(i) The mixing of concrete shall be done in a batch mixer which will ensure a uniform distribution of the materials throughout the batch.

(ii) The mixer shall be of such capacity that one or more whole bags of cement may be used per batch of concrete. The volume of the mixed material shall not exceed the manufacturer's rated capacity of the mixer.

(iii) The mixing time for each batch shall not be less than 1.5 minutes after all ingredients are assembled in the mixer, and prior to any portion of the batch being removed.

(iv) The entire contents of a batch shall be discharged from the mixer before any materials are placed therein for the succeeding batch.

(c) Mixing in an emergency

(i) In the case of breakdown of the mechanical mixing equipment, hand mixing in small quantities to complete a section of the work or reach a suitable construction joint is permitted.

(ii) Hand mixing shall be done on a water-tight platform of sufficient size to allow the mixing of at least two batches simultaneously. The amount of cement used shall be 10% more than the amount specified for machine mixed concrete.

(iii) The fine aggregate and cement shall first be mixed until a uniform colour is obtained, and then spread on the mixing platform in a thin layer. The coarse aggregate, which shall have been previously drenched with water, shall then be spread over the fine aggregate and cement in a uniform layer, and the whole mass turned over as further water is added with a rose sprinkler. After the water is added, the mass shall be turned at least three times, not including shovelling into barrows or forms, until the mixture is uniform in colour and appearance. hand mixed batches shall not exceed 0.25 m^3 each.

(d) Ready mixed concrete

(i) The concrete shall be mixed and delivered in accordance with the requirements of AS1379 relating to:

1. mixing and delivery; and

2. use of non-agitating equipment,

(ii) The water used for flushing the chutes and for cleaning shall be discharged in an area acceptable to the Superintendent. The chutes shall be long enough to permit delivery to the whole of the area enclosed by the forms.

(6) Placing and compacting concrete

No concrete shall be mixed or placed, without the approval of the Superintendent, while the air temperature is, or is likely to be within 24 hours, below 5°C or while the shade temperature exceeds 38°C. All concrete shall be placed in the dry. Prior to placing concrete, the area shall be clean and moist but free from any ponding of water.

The concrete shall be mixed in the quantities required for immediate use and shall be placed in position as rapidly as possible. Any concrete which has developed initial set, or which does not reach the forms within 30 minutes after the water has been added (except when transported in agitator trucks) shall not be used.

The concrete shall be deposited in the forms, without separation of the aggregates. Concrete shall not be dropped freely from a height greater than 1.2 m or be deposited in large quantities at any point and moved or worked along the forms. Conveying equipment, including open troughs and chutes, where used, shall be made of metal, or have metal linings. Where used on steep slopes, troughs and chutes shall be equipped with baffles,or be placed in short lengths in such a way that the direction of flow of the concrete is changed. The concrete shall be placed in horizontal layers in one continuous operation between the ends of the work and/or construction joints. Care shall be taken to fill every part of the forms and to work the coarser aggregate back from the face. The freshly placed concrete shall be compacted by continuous spading, slicing or by vibrator units. Vibrators shall not be left in one position for more than 30 seconds and shall not be permitted to rest on reinforcement.

Exposed surfaces of the concrete shall be struck off and finished with a wooden float. Where shown on the drawings corners and edges shall be left neatly rounded or chamfered. Re-entrant angles shall be neatly filleted.

Concrete shall not be moved after it has been in the forms for more than 10 minutes.

In the case of concrete placed by an extrusion machine, small quantities of cement/sand/slurry, comprised of two parts of plasterer's sand and one part of cement (by volume), together with sufficient water to bring it to a semi-fluid condition, shall be placed in the special receptacle in the machine, if the machine is so equipped and shall be fed onto the surface of the concrete at a rate sufficient to produce a smooth and uniform finish.

(7) Finishing of unformed surfaces

(a) Surfaces other than wearing surfaces

Unformed surfaces shall be compacted and tamped so as to flush mortar to the surface, screeded off and finally dressed with a wooden float to an even surface. Care shall be taken to drain or otherwise remove promptly any water which comes to the surface. A capping of mortar will not be permitted.

All future contact surfaces shall be left rough, with the coarse aggregate at the surface firmly embedded but not forced below the surface.

(b) Wearing surfaces

Where a concrete wearing surface is shown on the drawings the concrete shall be thoroughly compacted and the surface screeded off by a vibrating screed, or hand screeded where the distance between forms perpendicular to the direction of screed is no greater than 2 m. Immediately following compaction and screeding the concrete shall be tested for high or low spots and any necessary corrections made. The surface shall be finished true and uniform and free from any glazed or trowelled finish and shall be finally dressed with a wooden template or float, or by the use of belting in an approved manner. The departure from grade shall not exceed 5 mm in any 3 m length.

Where an asphaltic concrete wearing surface is specified, the surface of the concrete, after being compacted, screeded, and corrected, shall be dressed with a wooden float and finally broomed to produce a rough surface.

(c) Finished levels and location

The unformed surface of concrete structures not adjacent to road pavements shall not vary more than 25 mm in plan position and not more than 25 mm from the specified levels. In the case of barriers, drainage pits, culvert slabs and other structures adjacent to road pavements, the finished concrete shall not vary more than 10 mm from the specified levels and alignment.

Barriers, footpaths and similar shall not deviate from level or alignment by more than 5 mm from a straight-edge 3 m long, subject to any necessary allowances on vertical and horizontal curves.

(8) Curing and protection

All exposed surfaces of the freshly placed concrete shall be kept moist either using plastic sheeting, damp sand, or commercial curing compounds, in accordance with AS3799, for a minimum period of 3 days. During this time the work must be adequately protected from the effects of excessive surface evaporation, rain, running water, vandalism, and other causes likely to damage the concrete. All costs involved in making good orreplacing any work that has been damaged due to the above factors shall be borne by the Contractor.

Curing for concrete shall generally be in accordance with the appropriate surface exposure classification in AS3600.

If it is proposed to use a liquid membrane-forming curing compound, the following information to be submitted:

(a) certified test results for water retention to AS3799 Appendix B; and

Editor's Note - It is likely that polyvinyl alcohol (PVA-based) products will not comply with water retention requirements.

(b) evidence of compatibility with concrete, and with applied finishes including toppings and render, if any, including methods of obtaining the required adhesion.

For visually important surfaces, evidence that an acceptable final surface colour will be obtained.

(9) Removal of forms

All forms shall remain in place, after placement of concrete, for minimum periods specified hereinafter. These periods may be extended by the Superintendent if the air shade temperature falls below 10 °C during the periods specified.

Mass retaining walls. headwalls, wing walls, gully pits, sumps, and similar drainage structures.	48 hours
Footpaths, driveways, and similar	17 hours
Sides of reinforced concrete walls when height of each day pour is:	
Under 0.6 m	1 day
0.6 m – 3 m	2 days
3 m – 6 m	3 days
6 m – 9 m	5 days
Supporting forms under deck slabs of culverts	10 days

To permit the satisfactory finishing of barriers, forms shall be removed in not less than 12 hours nor more than 48 hours after placing concrete, depending upon weather conditions.

Care shall be taken in removing forms so that the concrete will not be cracked, chipped, or otherwise damaged.The use of crowbars or other levering devices exerting pressure on the fresh concrete to loosen the forms will not be permitted.

No superimposed load shall be allowed on any part of a structure until the concrete has reached at least 70% of the design strength.

Hole formers such as pipes and bars shall be removed as soon as the concrete has hardened sufficiently for this to be done without damage to the concrete.

(10) Treatment of formed surfaces

All concrete surfaces shall be true and even, free from stone pockets, depressions, or projections beyond the surface. All arises, shall be sharp and true, and mouldings shall be evenly mitred or rounded. Care shall be exercised in removing forms to ensure this result. Formed concrete surfaces shall be presented for inspection by the Superintendent within 1 day of stripping of formwork and finishes in accordance with the classes of surface finish in AS3610 as follows:

(a) Non-visible surfaces - Class 4.

(b) Visible surfaces - Class 2.

As soon as the forms are removed from mass or reinforced concrete work, all rough places, holes, and porous spots shall be repaired by removing defective work and filling with stiff cement mortar having the same proportions of cement and fine aggregate as used in the concrete and shall be brought to an even surface witha wooden float.

Any tie wires or other fitments extending to outside surfaces, shall be cut back after removal of forms, to a depth of at least 40 mm with sharp chisels or cutters. All cavities caused by removal of fitments or tie wires shall be wetted and carefully packed with cement mortar, as above.

The surfaces of bolt cavities, tie wire holes, and all defects in concrete shall be coated prior to the placing of mortar, grout, or fresh concrete, with an approved bonding agent, in lieu of wetting with water. The method of application of such agent and the conditions in which it is to be used shall generally be as laid down by the manufacturer.

The formed surfaces of concrete structures not adjacent to road pavements shall not vary more than 25 mm in plan position and not more than 25 mm from the specified levels. In the case of drainage pits and other structures adjacent to road pavements, the finished concrete shall not vary more than 10 mm from the specified levels and alignment.

(11) Joints

Submit proposed methods, timing, and sequence of sawing joints for approval by Superintendent a minimum of 7 days prior to works commencing.

Where horizontal construction joints are found to be necessary in walls, or cast-in-situ drainage structures the joints may be made at the base of walls and at other locations in the walls where approved by the Superintendent. In order to provide for bond between the new concrete and the concrete which has already set, the surface on which the new concrete is to be placed shall be thoroughly cleaned of loose material, foreign matter and laitance. The surface shall be roughened or keyed and saturated with water. After any excess water has been removed, the surface shall be thinly coated with a neat cement grout.

Retaining walls shall be provided with vertical expansion joints as shown on the drawings. The expansion joints shall consist of jointing material of approved quality, and of thickness shown on the drawings, and a depth sufficient to fill the joint. The jointing material shall be neatly cut to fit the surface of the concrete.

Where barriers are extruded or cast in place, narrow transverse vertical grooves, 20 mm deep, shall be formed neatly in the surface of the freshly placed concrete to produce contraction joints for the control of cracking. The contraction joints shall be at intervals of 3 m.

In barriers, unless shown otherwise on the drawings, expansion joints, 15 mm in width for the full depth of the barrier, shall be constructed at intervals not exceeding 15 m and where the barrier abuts against gully pits. Expansion joints shall consist of a preformed jointing material of bituminous fibreboard.

In footpaths, median toppings, and driveways, unless otherwise shown on the drawings, expansion joints, 15 mm in width for the full depth of paving, shall be constructed at intervals not exceeding 15 m and where the pavement abuts against gutters, pits, and structures. Expansion joints shall consist of a preformed jointing material of bituminous fibreboard.

All unreinforced paving shall be provided with narrow vertical grooves, 20 mm deep to induce contraction joints for the control of cracking. The joints shall be formed in the freshly placed concrete in a neat regular pattern to form "slabs" no bigger than 2 m^2. The ratio of the longest side to the shortest side shall not exceed 1.6.

Spacing of joints shall not to exceed 25 times the depth of the concrete to avoid intermediate cracking.

(12) Strength of concrete

When tested in accordance with AS 1012.9, the concrete shall have a characteristic compressive strength not less than that shown on the drawings or if not shown shall have a compressive strength not less than that specified in Table SC6.4.18.5 Concrete Strength Requirements for the class of work. The cement content restrictions shown in Table SC6.4.18.5 refer to Portland cement. Where General Purpose Blended cements are utilised, the acceptable minima are indicated in brackets.

The characteristic strength shall be determined from the average of not less than two specimens, moulded from each class of concrete being used in the work, and selected to represent the whole of the concrete placed at the time of moulding.

In general, two pairs of test specimens shall be moulded for each 15 m^3 of concrete, or part thereof, one pair being intended for the 7-day test if required and the other pair for a 28-day test.

Table SC6.4.18.5 - Concrete Strength Requirements

Use	Characteristic Strength MPa	Minimum Portland Cement per m^3 (Minimum GB Blended Cement)	Coarse Aggregate Nominal Size	Characteristic Cylinder Strength Required	
				7 days	28 days
		kg	mm	MPa	MPa
Foundations, mass retaining walls	20	270 (330)	40	15	20
Mass concrete footings, pitching, linings etc.	20	270 (330)	20	15	20
Miscellaneous minor concrete work	20	270 (330)	20	15	20
Reinforced concrete culverts,	32	320	20	24	32

drainage structures,		(380)			
Driveways footpaths, headwalls, base slabs, sign structures. Large footings, retaining walls	50	350 (455)	20	36	50
Extruded concrete	25	270 (330)	14	15	20
Safety Barriers	40	330 (380)	20	24	40

Editor's Note - The total cement and Portland cement quantities indicated as minima are aimed at providing suitably durable concrete for exterior public works under normal circumstances.

The strengths specified at 28 days shall be increased by multiplying by factors as shown in Table SC6.4.18.6 Concrete age conversion factors for tests at ages more than 28 days.

Table SC6.4.18.6 - Concrete Age Conversion Factors

*Age of test specimen in days of date of testing	Factor
28	1.00
35	1.02
42	1.04
49	1.06
56	1.08
70	1.10
84	1.12
112	1.14
140	1.16
168	1.18
196	1.20
224	1.22
308	1.24
365 and greater	1.25
*For intermediate ages the factor shall be determined on a pro-rata basis	

If the test specimens fail to achieve the specified characteristic strength, the Contractor may, with the approval of the Superintendent, arrange for cores to be taken from the work. If the average strength of such cores complies with the specified requirements nominated in Table SC6.4.18.5 Concrete strength requirements, the concrete will be accepted.

If cores taken fail to satisfy the strength requirements, the concrete shall be removed.

(13) Sampling concrete

Equipment and facilities shall be provided by the Contractor for the taking and storage of samples of any materials or concrete being used or intended to be used in the work.

Concrete test specimens shall be cylinders 300 mm long and 150 mm diameter, moulded concurrently in the presence of the Superintendent or Superintendent's representative, in accordance with AS1012.8, from samples taken in accordance with AS1012.1.

SC6.4.18.6 Reinforcement for concrete

(1) Fibre reinforced concrete

Footpath/bikeways/driveways.

The concrete shall be reinforced with a mixed dose of High-Performance Polymer and Discreet Graded Fibrillated filament fibres. These fibres shall be provided as a coarse filament in an engineered contoured sinusoidal profile of not less than 600 denier and discreet graded fibrillated filament fibres of not greater than 6 denier. These fibres are to be manufactured from virgin polypropylene and added to the concrete by the concrete company, at the rate of 4.6 kg/m^3. The 4.6 kg consists of 3.8 kgs of HPP and 0.8 kgs of discrete Graded Fibrillated filament fibres.

Two bags of "Novomesh" HPP as supplied by Tapex Concrete Fibres Qld or approved equivalent added per m^3, will be deemed suitable for council's use. Where footpaths/bikeways are not subject to wheel loads one bag of fibres per m^3 will suffice. Any alternate product must have prior written approval obtained from Council.

(2) Steel reinforcement

Steel reinforcement shall comply with AS/NZS4671 *Steel reinforcing materials*. The type and size of bars shall be as shown on the drawings.

If changes are proposed to reinforcement shown on the drawings, submit details to Superintendent for approval two days prior to commencing works.

Steel reinforcement shall be free from loose or thick rust, grease, tar, paint, oil, mud, mill scale, mortar, or any other coating, but shall not be brought to a smooth polished condition.

Damaged galvanising must be repaired in accordance with AS/NZS4680 Section 8 and notification of repairs made to the Superintendent for approval.

The Contractor shall supply evidence satisfactory to the Superintendent that steel reinforcement complies with AS/NZS4671. Test certificates shall show the results of mechanical tests and chemical analysis.

Where the material cannot be identified with a test certificate, samples shall be taken, and testing arranged by the Contractor. The samples shall be selected randomly and consist of three specimens each at least 1.2 m in length. The cost of all samples and tests shall be borne by the Contractor.

Plastic bar chairs or plastic tipped wire chairs shall be capable of withstanding a load of 200 kg mass on the chair for one hour at 23 ± 5°C without malfunction. The Contractor shall demonstrate that the proposed chairs conform with these requirements.

(3) Bending

Reinforcement shall be formed to the dimensions and shapes shown on the drawings. It shall not be bent or straightened in a manner that will injure the material, and bars with kinks or bends not shown on the drawings will not be accepted. Heating of reinforcement for purposes of bending will only be permitted if uniform heat is applied. Temperature shall not exceed 450°C and the heating shall extend beyond the portion to be bent. Heated bars shall not be cooled by quenching.

(4) Splicing

(a) General

All reinforcement shall be furnished in the lengths indicated on the drawings. If splicing is required, it shall be in accordance with the provisions of AS/NZS4671.

The cost of any test ordered in connection with splices not shown on the drawing shall be borne by the Contractor.

(b) Lapped splices

Laps in reinforcing bars, wire or fabric shall be as shown on the drawings. Laps not shown on the drawings shall be as follows for unhooked bars:

(i) Plain bars, Grade 250 40 bar diameters.

(ii) Deformed bars, Grade 400 35 bar diameters.

(iii) Hard-drawn wire 50 bar diameters.

Splices in reinforcing fabric shall be so made that the overlap, measured between outermost transverse wires of each sheet of fabric is not less than the spacing of those wires plus 25 mm.

(5) Marking

Bars of identical shape shall be made up in bundles of three and securely tied together by soft iron wire. Each bundle shall have a stout metal label of not less than 40 mm diameter attached to it. Each metal label shall be punched with the appropriate marking in accordance with the steel list shown on the drawings. If called for on the drawings the marking shall incorporate a prefix, and bars with different prefixes shall be stored separately.

(6) Storage

Reinforcement shall be stored above the surface of the ground and shall be protected from damage and from deterioration by exposure.

(7) Delivery and receipt of reinforcement

Unless the Contractor elects to have the reinforcement inspected at the site, no reinforcement shall be delivered to the site until all tests and inspections have been satisfactorily completed and permission to deliver has been granted by the Superintendent.

The Contractor shall give 10 working days' notice to the Superintendent for carrying out inspection and testing. The Superintendent will carry out the inspection and testing with reasonable expediency, but the Contractor shall not be entitled to an extra for any delays in this connection.

(8) Placing

Reinforcement shall be accurately placed as shown on the drawings and shall be securely held by blocking from the forms, by supporting on concrete or plastic chairs, or metal hangers, and by wiring together at all intersections or at 0.5 m centres, whichever is the greater distance, using annealed iron wire of diameter not less than 1.25 mm. Steel shall not be supported on metal supports which extend to the surface of concrete, on wooden supports, or on pieces of coarse aggregate. Reinforcement shall have the minimum cover shown on the drawings or otherwise approved by the Superintendent.

The Superintendent may approve the use of tack welding instead of wire ties on reinforcing wire. All welding of reinforcing steel shall be in accordance with AS1554.3. Tack welding of cold-worked and hard grade bars shall not be permitted.

The reinforcement in each section of the work shall be approved by the Superintendent before any concrete is deposited in the section and adequate time shall be allowed for inspections and any corrective work which may be required. Notice for inspection shall not be less than one normal working day.

Splices shall be staggered where practicable and when not shown on the drawings they shall be arranged as directed by the Superintendent.

Bars forming a lapped splice shall be securely wired together in at least two places, unless welded.

The clear cover of any bar, including stirrups, to the nearest concrete surface shall be as shown on the drawings. Where not so indicated it shall be as stated below:

(a) concrete normally in contact only with air:

(i) slabs: 40 mm;

(ii) other than slabs: 45 mm; and

(b) concrete in contact with earth or fresh water:

(i) slabs of box culverts: 50 mm; and

(ii) other than culverts: 50 mm.

(9) Cores, fixings, and embedded items generally

Cores, fixings, and embedded items identified on shop drawings showing the proposed locations, clearances, and cover, and indicating proposed repositioning of reinforcement must be presented for inspection by the Superintendent.

If cutting or coring of hardened concrete is proposed, provide details to the Superintendent for approval.

For adjoining elements to be fixed to or supported on the concrete, provide for the required fixings. If required, provide for temporary support of adjoining elements during construction of the concrete.

If in external or exposed locations, galvanize anchor bolts and embedded fixings, or propose alternative materials such as stainless steel.

Fix cores and embedded items to prevent movement during concrete placing. In locating cores, fixings, and embedded items, reposition but do not cut reinforcement, and maintain cover to reinforcement.

Isolate embedded items so that water cannot track to concrete providing minimum cover to reinforcement.

SC6.4.18.7 Backfilling

(1) General

Backfilling at barriers, paving, etc., and minor concrete works shall not commence until after the concrete has hardened and not earlier than three days after placing.

No superimposed load on any part of what will become a load bearing structure within 21 days after placing concrete shall occur unless the structure is effectively and independently supported to the satisfaction of theSuperintendent (approval must be sought at a minimum of 3 working days prior to loading upon evidence of early strength) or until the Contractor can demonstrate that 85% of the design strength of the concrete has been achieved.

Selected backfill shall be placed against retaining walls and cast-in-place box culverts for a horizontal distance equal to one-third of the height of the wall. It shall consist of granular material,

free from clay and stone larger than 50 mm gauge. The Plasticity Index of this selected backfill material shall not be less than 2 or more than 12 when tested in accordance with AS1289.3.3.1. The material must be placed in layers not exceeding 150 mm and must be compacted to provide a relative compaction as specified in Section SC6.4.7 Clearing, grubbing, and earthworks, Clause SC6.4.7.11.

(2) Treatment at weepholes

Drainage adjacent to weepholes shall be provided by either a layer of broken stone or river gravel consisting of clean, hard, durable particles graded from 50 mm to 10 mm such that:

(a) the maximum particle dimension shall not exceed 50 mm; and

(b) no more than 5% by mass shall pass the 9.5mm A.S. sieve.

The broken stone or river gravel, enclosed in a filter fabric suitable for drainage without scour, shall be continuous in the line of the weepholes, extend at least 300 mm horizontally into the fill and extend at least 450mm vertically above the level of the weepholes.

Alternatively, the Contractor may provide a synthetic membrane of equivalent drainage characteristics at no extra cost to the Principal. It shall be stored and installed in accordance with Manufacturer's instructions. The use of a synthetic membrane shall be subject to the Superintendent's approval.

SC6.4.18.8 Sprayed concrete

(1) References and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

Transport for NSW – *Shotcrete Design Guidelines*.

(2) General

Sprayed concrete is concrete pneumatically applied at high velocity on to a surface. Application may be either a wet or dry process. A sound homogeneous product shall be provided with surface finish reasonably uniform in texture and free from blemishes.

The minimum depth of sprayed concrete to be applied shall be 75 mm.

Sprayed concrete lining in open drains shall be coloured to match the adjoining rock colour.

Sprayed concrete shall have a minimum cement content of 380 kg/m^3 as discharged from the nozzle and shall have a minimum compressive strength of 25 MPa at 28 days when tested by means of 75 mm diameter cores taken from in-place sprayed concrete.

Cores shall be secured, accepted, cured, capped, and tested in accordance with AS1012.14. Equipment and facilities shall be provided by the Contractor for the taking of cores from the work. The Contractor shall arrange for a laboratory with appropriate NATA registration for the curing and testing of the cores. Copies of test results shall be forwarded to the Superintendent.

The cost of all work and material required in the taking, handling, delivery and testing of cores shall be borne by the Contractor.

At least 14 days prior to applying any sprayed concrete the Contractor shall submit to the Superintendent details of his proposed procedure, plant, materials and mix proportions. Materials shall comply with AS3600.

(3) Test panels

Not less than 7 days before applying concrete, the Contractor shall prepare at least three test panels for each mix proposed, in conditions similar to those in the works and in the presence of the Superintendent. The test panels shall be made by applying a 75 mm thickness of sprayed concrete to a hardboard panel approximately750mm square. The sprayed concrete shall be applied to the panels in the same manner, using materials including steel reinforcing fabric, equipment, pressures and curing that will be used in the Works. The panels shall be submitted to the Superintendent for examination.

The Contractor shall cut four 75 mm diameter cores from one test panel for each proposed mix approximately 48 hours after the panel has been sprayed. The cores shall be tested as for cores from in place sprayed concrete. One core shall be compression tested at 3 days, one core at 7 days and the remaining two cores at 28 days.

Should any of the cores reveal defects such as lack of compaction, dry patches, voids, or sand pockets or should the test panel exhibit an unacceptable surface finish, the Contractor shall modify the mix design and/or method of placement and prepare fresh test panels for testing and inspection.

Sprayed concrete shall not be applied to the Works until the Contractor produces test panels for the approval of the Council.

(4) Surface preparation

Earth surfaces shall be graded, trimmed, and compacted and shall be dampened prior to applying the sprayed concrete. The Contractor shall take any precautions necessary to prevent erosion when the sprayed concrete is applied.

Rock surfaces shall be cleaned of loose material, mud and other foreign matter that might prevent bonding of the sprayed concrete onto the rock surface. The rock surface shall be dampened prior to applying the sprayed concrete.

Corrugated steel pipes shall be cleaned of loose material, mud. and any other foreign matter.

The Contractor shall remove free water and prevent the flow of water which could adversely affect the quality of the sprayed concrete.

(5) Application of sprayed concrete

Application shall begin at the bottom of the area being sprayed and shall be built up making several passes of the nozzle over the working area. The nozzle shall be held so that the stream of material shall impinge as nearly as possible perpendicular to the surface being coated. The velocity of discharge from the nozzle, the distance of the nozzle from the surface and the amount of water in the mix shall be regulated to produce a dense coating with minimum rebound of the material and no sagging. Rebound material shall be removed after the initial set by air jet or other suitable means from the surface as work proceeds and disposed of.

Spraying shall be discontinued if wind causes separation of the nozzle stream. Concrete shall not be sprayed in air temperatures less than 5 °C.

Construction joints shall be kept to a minimum. A joint shall be formed by placing or trimming the sprayed concrete to an angle between 30° and 45° to the sprayed concrete surface. The joint edge shall be cleaned and wetted by air-water jet before recommencing concrete spraying.

When spraying around reinforcement, concrete is to be sprayed behind the reinforcement before concrete is allowed to accumulate on the face of the reinforcement.

Adjoining surfaces not requiring sprayed concrete shall be protected from splash and spray rebound. Splash or rebound material on these adjoining surfaces shall be removed by air-water jet or other suitable means as work proceeds.

(6) Curing

Curing shall commence within one hour of the application of sprayed concrete and may be by water or by colourless wax emulsion curing compound complying with AS3799 and applied in accordance with manufacturer's specifications.

In water curing, the surface of the sprayed concrete shall be kept continuously wet for at least 7 days.

SC6.4.18.9 Summary of limits and tolerances

The limits and tolerances applicable to the various clauses in this section are summarised in Table SC6.4.18.7 – Summary of limits and tolerances below:

Table SC6.4.18.7 - Limits and Tolerances Concrete Works

Item	Activity	Limits/Tolerances
(1)	**Foundation** Relative Compaction	95% RDD (standard compactive effort) within 0.3 m below subgrade
(2)	**Barriers, Footpaths etc.** (a) Finished Subbase (b) Relative Compaction of subbase	To be trimmed and compacted so that the levels do not vary more than 15 mm under a straight-edge 3 m long. 100% (standard compactive effort)
(3)	**Formwork** Position of Forms	Forms shall be aligned accurately so that departure of the forms from the surfaces specified on the drawings shall not exceed 1/300 of the space between supports for any surface visible in the completed work and 1/150 for hidden work.
(4)	**Fine Aggregate** Grading	To be evenly graded within the absolute limitsand shall not deviate from the grading of sample aggregate as per Table.SC6.4.18.1
(5)	**Coarse Aggregate** (a) Percentage of wear (b) Crushing Value (c) Soundness (d) Particle Shape	 Loss of weight shall not exceed 30% Crushing value shall not exceed 25% The loss of mass when tested with sodium sulphate shall not exceed 12% The proportion of misshapen particles (2:1 ratio) shall not exceed 35%

	(e) Grading	To be evenly graded within the absolute limits and shall not deviate from the grading of sample aggregate as per Table SC6.4.18.2
(6)	**Aggregate Moisture Content**	Where moisture content of fine aggregate exceeds 8%, or moisture content of coarse aggregate exceeds 3%, the proportion of mix shall be changed.
(7)	**Consistency**	In accordance with AS1012.3, Method 1 the slump shall not exceed the nominated slump ±15 mm. In the case of concrete placed by extrusion machine, the slump will be between 10 mm and 15 mm.
(8)	**Ready-Mixed Concrete** Mixing & Delivery	The time taken from the introduction of water until the concrete is completely discharged shall be not more than 1.5 hours. Where non-agitating equipment is used the concrete shall be completely discharged not more than 30 minutes after the addition of water.
(9)	**Placing & Compacting of Concrete**	Concrete shall not be placed without the approval of the Superintendent if the air temperature within 24 hours is likely to be below 5°C or the shade temperature is likely to exceed 38°C.
(10)	Finishing of Unformed / Formed Concrete Surfaces (a) Wearing Surface (b) Finished Surfaces (i) Not Adjacent to Roads (ii) Adjacent to Roads (iii) Culvert Inverts	to be finished true and uniform so that departure from designed grade shall not exceed 5 mm in any 3 m length. ≤25mm Plan position ≤25mm Level ≤10mm Alignment ≤10mm Level ≤25mm Alignment ≤10mm Level

Development manual planning scheme policy (PSP)
SC6.4.19 Noise and vibration

Index

SC6.4.19.1 Introduction

(1) Purpose
(2) Terminology
(3) Reference and source documents

SC6.4.19.2 Noise and vibration – definition

SC6.4.19.3 Development assessment

SC6.4.19.4 Noise and vibration impact assessments

(1) Subdivision layouts
(2) Noise impact assessment report

SC6.4.19.5 Assessment of existing acoustic environment

SC6.4.19.6 Noise assessment levels

(1) General
(2) Intrusive noise level
(3) Amenity noise level
(4) Project noise trigger level
(5) Comparison to project noise trigger levels and where these levels are exceeded
(6) Potential for sleep disturbance
(7) Low-frequency noise

SC6.4.19.7 Noise and vibration control plans

SC6.4.19.8 Information to include in control plan

SC6.4.19.9 Construction

SC6.4.19.1 Introduction

(1) Purpose

The purpose of this section is to:

(a) provide information to developers and other related parties for use during the planning, construction, and operational stages of a development;

(b) provide guidance on preparing a noise or vibration impact assessment report; and

(c) ensure that development is managed in a way which prevents nuisance from the effects of noise and vibration on the health, community well-being and quality of life of an individual or the community, and wildlife.

(2) Terminology

Unless noted otherwise all terms have the same meaning as given in the most recent version of the *Environmental Protection Act 1994*, the E*nvironmental Protection Regulation 2019*, the *Environmental Protection (Noise) Policy 2019* and the relevant standards. If a definition given in the relevant standards is inconsistent with the Act or Regulation, the Act or Regulation prevails to the extent of the inconsistency.

Background creep	A progressive increase in background noise levels due to new noise generatingactivities locating in an area.

(3) References and source documents:

Reference and source documents that must be read in conjunction with this section are as follow:

(a) Australian Standards:

AS1055.2	*Acoustics – Description and measurement of environmental noise – Part 2: Application to specific situations.*
AS2107	*Acoustics – Recommended design sound levels and reverberation times for building interiors.*

(b) Austroads:

AP-R277/05	*Modelling, Measuring and Mitigating Road Traffic Noise Guide to Road Design Part 6B: Roadside Environment.*

(c) Queensland Authorities and Legislation:

Department of Transport and Main Roads	*Development on land affected by environmental emissions from transport*
Department of Transport and Main Roads	*Road Traffic Noise Management: Code of Practice*

Department of Transport and Main Roads, *MRTS15 - Noise Fences*

Department of Communities, Housing and Digital Economy	*Queensland Development Code MP Part 4.4 – Buildings in a Transport Noise Corridor*
Department of Environment and Science	*Noise Measurement Manual 2020*
Department of Environment and Science	*Environmental Protection (Noise) Policy 2019* (EPP Noise)

SC6.4.19.2 Noise and vibration – definition

Noise is often described as unwanted sound and, by its very nature, can cause varying degrees of nuisance. Some sounds are considered to be annoying by some people but not by others. However, in general, the louder the sound, the greater the annoyance or nuisance caused.

The nature and character of a sound, even at low levels, may also cause annoyance. Sound can have a number of characteristics and can be described in many ways. It is not possible to fully categorise every form of sound.

However, this policy is intended to provide guidance for the majority of commonly experienced sounds. "Noise" has become synonymous with "sound" in common language. In this policy, noise will generally mean sound.

Furthermore, sound is defined in Queensland legislation to include vibration and therefore levels of acceptable vibration are also included.

SC6.4.19.3 Development assessment

Preventing noise problems is always better than attempting to rectify noise impacts after the development and trying to resolve problems may not be always possible and can be costly. The management hierarchy under the *Environment Protection (Noise) Policy 2019* (EPP Noise) is "to the extent that is reasonable to do so".

(1) Firstly – avoid; or

(2) Secondly – minimise; or

(3) Lastly – manage.

Council encourages development that is sympathetic to the amenity of a location and minimises the occurrence of background creep. Where proposed uses are likely to increase noise levels at a locality, or be affected by existing noise sources, a noise (and vibration) impact assessment may be required or requested by Council during the development application phase.

If the noise impact assessment report reveals that the proposed use or activity has the potential to create nuisance or exceed project noise trigger levels listed in this policy below, the application will need to demonstrate by way of a noise (and vibration) control plan how the environmental values (noise) will be enhanced or protected to meet the standard as part of any submission for an operational works permit, or a compliance permit.

SC6.4.19.4 Noise and vibration impact assessment

(1) Subdivision layouts

Subdivision layouts must be designed to ensure that setbacks for habitable structures are not less than 3m from the of acoustic mounds and acoustic fences over 1.8m.

In support of the assessment provisions specified in the Townsville City Plan, a noise (and/or vibration) impact assessment report is likely to be required in situations where:

(a) a new development is proposed that will create significant noise (e.g., new industry, or commercial premises with refrigeration, air conditioning or exhaust equipment); or

(b) a new noise sensitive development is proposed in an area where existing noise sources are present (e.g., an existing industrial site, or a future or existing major road, is located nearby); or

(c) a new development will generate a significant amount of traffic noise, i.e., traffic volumes increase by around 3000 vehicles per day or more (determined by a Traffic Study Assessment); or

(d) building work including rock breaking, drilling, or piling or other noisy activities are proposed; or

(e) it is reasonably required by Council in order to complete a proper assessment of the proposed development.

The assessments are to be undertaken by a suitably qualified and experienced acoustic practitioner (e.g., a member of the Australian Acoustical Society, the Institution of Engineers, the Association of Australian Acoustical Consultants, or a person with other appropriate professional qualifications).

(2) Noise impact assessment report

Information provided in an assessment report should include at least the following:

(a) Background:

(i) the name and qualifications or experience of the person(s) preparing the assessment;

(ii) the project description, including proposed or approved hours of operation; and

(iii) the relevant guideline or policy that has been applied.

(b) Noise impact assessment process

A noise impact assessment report is to describe the existing acoustic environment, present the future forecasted acoustic environment, assess impacts using direct comparisons to noise criteria and describe the noise impact control measures that will be applied by the development.

A noise impact assessment report is to contain the following information as relevant to the specific assessment, although there may be circumstances that warrant further content:

(i) description and location of sensitive uses, zones that may be affected by noise emissions from the development or description and location of existing noise emission sources if the development is a sensitive use;

(ii) description of, and justification for, the noise model and algorithms used to predict the propagation of noise from the noise sources relevant to the development;

(iii) noise model configuration and justification for the model configuration;

(iv) include a comprehensive and representative an inventory of all the proposed and existing noise emission sources relevant to the development;

(v) the sound power level or sound pressure level, how often it occurs, duration and operating times of each noise source;

(vi) the characteristics of each noise source, including low frequency, vibration, tonal or impulsive characteristics;

(vii) whether each noise source produces steady sound or non-steady sound;

(viii) model input data and the representativeness, accuracy and resolution of the input data, including noise source sound power levels, operating hours of each noise source, ground cover assumptions, topography assumptions, road gradient where relevant, reflections from buildings and acoustic fences and noise source and receiver heights;

(ix) methods and assumptions for calculating the effectiveness of noise impact control measures, including the predicted attenuation from shielding from buildings, acoustic fences, fences, walls, mounds or enclosures;

(x) details of noise model calibration method and results;

(xi) assumptions and uncertainties associated with the noise modelling;

(xii) noise modelling results for the relevant assessment period(s), including day (07:00 - 18:00), evening (18:00 - 22:00) and night (22:00 - 07:00) periods, presented in tabular and graphical form, including contours overlayed on a map or aerial photograph to scale;

(xiii) details of modifying factor adjustments (tonality, impulsiveness, or low-frequency content);

(xiv) where measuring existing noise sources, details of noise monitoring equipment, field calibration, location and results; including:

1. noise sample times and measurement intervals;
2. weather conditions during measurement, including wind speed, wind direction and rainfall;
3. adjustments for reflecting surfaces where relevant;
4. table summary of measured noise levels;
5. graphical presentation of measured noise levels using 15-minute intervals, for each noise descriptor; and
6. site photograph indicating the position of the noise monitoring equipment.

(xv) a site plan to scale showing:

1. the location of the noise sources assessed;
2. the location of the sensitive uses and/or sensitive zones that may be impacted by noise from the development, or where the development is for a sensitive use, the location of existing noise sources that may impact the development;
3. the location of noise monitoring equipment used in the assessment;
4. the location of existing or proposed structures, including but not limited to buildings and acoustic fences; and
5. the location of any earth mounding, cuttings or other significant topographical features.

(xvi) a comparison of the measured and predicted source noise levels, including modifying factor adjustments to the noise criteria;

(xvii) a description of the noise impact control measures necessary to achieve the noise assessment levels, including hours of operation, acoustic fences, enclosures and dwelling insulation and including details of the construction materials and the design;

(xviii) the noise level to be achieved at the specific location at the site that is necessary for achieving the noise criteria at a sensitive use or zone;

(xix) conclusions;

(xx) recommendations; and

(xxi) references.

SC6.4.19.5 Assessment of existing acoustic environment

(1) General

The following information is to be included in the noise impact assessment report for the assessment of the existing acoustic environment:

(a) A qualitative description of the existing acoustic environment.

(b) Description of the noise monitoring equipment and procedures used to assess the existing acoustic environment.

(c) A site plan to scale showing:

(i) the location of any existing noise sources that may contribute to the existing acoustic environment including roads, railways, airports, industry, and commercial premises etc;

(ii) the location of the sensitive uses or zones that may be impacted by noise from the development, or where the development is for a sensitive use, the location of existing noise sources that may impact the development;

(iii) the location of noise monitoring equipment used to assess the existing acoustic environment, including distance to any existing noise source that may contribute to the existing acoustic environment;

(iv) the location of existing or proposed structures, including but not limited to buildings, acoustic fences, walls and fences; and

(v) the location of any earth mounding, cuttings or other significant topographical features.

(d) Site photograph indicating the position of the noise monitoring equipment.

(e) Details of noise monitoring equipment field calibration results.

(f) Noise monitoring results including:

(i) sample times and measurement intervals;

(ii) weather conditions during measurement including wind speed, wind direction and rainfall;

(iii) adjustments for reflecting surfaces where relevant;

(iv) description of noise sources that make up the existing acoustic environment and discussion of extraneous noise and any effect it may have on the results;

(v) table summary of measured sound pressure levels and results;

(vi) graphical presentation of measured sound pressure levels using 15-minute intervals and including the L_{Amax}, L_{Aeq} and L_{A90} noise descriptors;

(vii) methodology used for predicting sound pressure levels at locations other than at those monitored; and

(viii) electronic version of the logged data.

(g) Rating background levels using 10th percentile method relevant to the development for day, evening, and night periods for the most affected use.

(h) Existing ambient sound pressure levels, including L_{Amax} and L_{Aeq} for day, evening, and night periods for the most affected use.

(i) Quantify the contribution of existing transport noise (road, rail, aircraft), industry/commerce in L_{Amax}, L_{Aeq}11hr, L_{Aeq}4hr, L_{Aeq}9hr for day, evening, and night, respectively.

SC6.4.19.6 Noise assessment levels

(1) General

The project noise trigger level provides a benchmark or objective for assessing a proposal or site. It is not intended for use as a mandatory requirement. The project noise trigger level is a level that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response; for example, further investigation of mitigation measures. The project

noise trigger level is the lower (i.e., the more stringent) value of the intrusive noise level and amenity noise level.

(2) Intrusive noise level

Intrusive noise levels require that L_{Aeq},15-minute noise levels from the site during the relevant operational periods (I.e., day, evening, and night) do not exceed the rating background level by more than 5 dB. The intrusive criteria outlined was established primarily to deal with individual development applications. In the case of multiple developments, such as a new industrial area, a strategic approach should be implemented to ensure an equitable share of the remaining available allocation of noise for each industrial development is achieved.

(3) Amenity noise level

Assessment of amenity is based on noise levels specific to the land use as per the table 'Maximum Recommended Amenity of Noise Levels'. The ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels where feasible and reasonable specified in the table below. To ensure that industrial noise levels (existing and new) remain within the recommended amenity noise levels for an area, the amenity noise level applies for each new source of industrial noise as follows:

Amenity noise level for industrial developments = recommended amenity noise level listed in the below table minus 5 dB(A)

Table SC6.4.19.1 - Maximum Recommended Amenity of Noise Levels For All Sources

Receiver	**Noise Amenity Area**	**Time of Day**	**Maximum recommended amenity noise level for all sources $L_{Aeq\ 15\ minutes}$, dB(A)**
Residence	**Rural** - an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels	Day	50
		Evening	45
		Night	40
	Suburban - an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.	Day	55
		Evening	45
		Night	40
	Urban – an area with an acoustical environment that: is dominated by 'urban hum' or industrial source noise has	Day	60
		Evening	50
		Night	40

	through traffic with characteristically heavy and continuous traffic flows during peak periods is near commercial districts or industrial districts has any combination of the above or where 'urban hum' means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources.		
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See column 4	See column 4	5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day.
School classroom – internal	All	Noisiest 1-hour period when in use.	35 (internal)
Hospital ward	All	Noisiest 1-hour	35 (internal) 50 (external)
Place of worship		When in use	40 (internal)
Area specifically reserved for passive recreation (e.g. national park	All	When in use	50
Active recreation area (e.g. school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
Industrial interface (applicable only to residential noise amenity areas)	All	All	Add 5 dB(A) to recommended noise amenity area

Editor's Notes -

(1) The levels represent outdoor levels except where otherwise stated. Where internal amenity noise levels are specified, they refer to the noise level at the centre of the habitable room that is most exposed to the noise and apply with windows opened sufficiently to provide adequate ventilation. In cases where the gaining of internal access for monitoring is difficult, then external noise levels 7dB(A) above the internal levels apply.

(2) For residences, the amenity noise levels apply at the reasonably most-affected point on or within the residential property boundary or, if this is more than 30 metres from the residence, at the reasonably most-affected point within 30 metres of the residence.

(3) In areas where traffic flow is continuous and noise from industrial sources is inaudible or difficult to measure due to a high level of road traffic noise, and where the $L_{Aeq, (period), traffic}$ noise level is more than 10 dB above the amenity noise criteria levels presented in the above table, the amenity noise criteria is replaced by $L_{Aeq, (period), traffic}$ minus 10 dB. This becomes the new amenity noise criteria level for the receiver.

(4) This requirement should not be read to infer that the noise limit only applies at the 'reasonably worst affected location'.

(5) In assessing amenity noise levels at commercial or industrial premises, the noise level is to be assessed at the reasonably most-affected point on or within the property boundary.

(6) The amenity criteria outlined was established primarily to deal with individual development applications. For multiple developments, such as a new industrial area, a strategic approach should be implemented to ensure the amenity objectives are not compromised and an equitable share of the remaining available allocation of amenity-related noise for each industrial development is achieved.

(4) Project noise trigger level

The project noise trigger level is the lower (i.e., the more stringent) value of the intrusiveness noise level and amenity noise level of the above points. The L_{Aeq} is determined over a 15-minute period for both intrusive and amenity noise levels and over an assessment period (day, evening and night). To standardise the time periods for the intrusive and amenity noise levels, this policy assumes that the L_{Aeq},15 minutes will be taken to be equal to the L_{Aeq}, period +3 decibels (dB), unless robust evidence is provided for an alternative approach for the particular project being considered.

(5) Comparison to project noise trigger levels and where these levels are exceeded

(a) Where the project noise trigger levels are forecast to be exceeded after the application of noise impact control measures, the noise impact assessment report is to include the following:

(i) Justification that there are no technically and economically feasible noise impact control measures that can be applied to the development to enable achievement of the criteria.

(ii) A description of the predicted nature and scale of the noise impact on sensitive uses in accordance with the methodologies in this section, to enable an analysis of impact versus benefit of the development.

(b) In certain circumstances it may be demonstrated that the effect of the proposed noise source is minimal where the existing environment has a more significant impact and has similar characteristics (e.g. where the development may produce occasional vehicle noise at a location where the sensitive use is exposed to existing frequent road traffic noise).

(6) Potential for sleep disturbance

The potential for sleep disturbance from maximum noise level events from a premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

L_{Amax} assessment only applies to 'specified noise sources' which are defined as impact noises; hammering; loading/unloading; dropping items; beepers, alarms, bells, phones, sirens; power tools; valve releases; air brakes; door slamming. Note - People noise and vehicle pass-by noise (engine, exhaust, induction, tyres) are specifically excluded. Where the subject development can satisfy the following three maximum noise level event trigger levels no additional assessment or evaluation of sleep disturbance is required:

(a) L_{Aeq},15min 40 dB(A) 1 metre from the façade or the existing rating background level plus 5 dB, whichever is the greater.

(b) The arithmetic average of the maximum levels from up to 15 single events over a given night-time period L_{AFmax} 52 dB(A) 1 metre from the façade or the existing rating background level plus 15 dB, whichever is the greater.

(c) The absolute highest LAFmax 60 dB(A) 1 metre from the façade or the existing rating background level plus 15 dB, whichever is the greater.

(7) Low-frequency noise

Low-frequency noise requires the C-weighting assessment as it offers a more appropriate method to assess low-frequency noise. All energy down to 10Hz should be considered. This assessment may often not be required where the noise being considered does not involve a significant contribution from low frequencies. Some specific source examples where low frequency should be considered are: gas turbines; boilers; forced draft and induced draft fans; shakers on hoppers; vibratory screens; wind farms; solar farm inverters; power stations or generators; night clubs or uses that provide amplified music.

Table SC6.4.19.2 - Criteria Location Low Frequency Noise Criteria ($L_{Ceq,adj}$,T)

Use	Day ($L_{Ceq,adj}$,11h)	Evening ($L_{Ceq,adj}$,4hr)	Night ($L_{Ceq,adj}$,9hr)
Residential (External)	65 dB(C)	65 dB(C)	60 dB(C)
Commercial (External)	75 dB(C)	75 dB(C)	70 B(C)

SC6.4.19.7 Noise and vibration control plans

Where an impact assessment demonstrates that noise is likely to exceed thresholds contained within the *Environmental Protection (Noise) Policy 2019* or other relevant document or Australian Standard, a noise (and vibration) control plan will need to be submitted.

Editor's Note - The noise assessment should have regard to the following:

Queensland Development Code Part 4.4 – Buildings in a Transport Noise Corridor. Australian Standards AS1055.2 and AS2107; *or* Department Environment and Science, *Noise Measurement Manual 2020* or *Environmental Protection Act 1994* and *Environmental Protection (Noise) Policy 2019* (EPP Noise), or Department of Transport and Main Roads Road, *Traffic Noise Management – Code of Practice.*

Editor's Note - Where in the vicinity of an airport, detailed designs showing how construction can ameliorate noise impacts are to be submitted in accordance with AS2107.

SC6.4.19.8 Information to include in a control plan

Information to include in a control plan is outlined in Table SC6.4.19.3.

Table SC6.4.19.3 - Information to Include in Control Plan

	Typical actions
Community Relations **Editor's Note -** noise and vibration control plans should describe the approaches to be applied when consulting with and notifying the community where necessary. Large projects may also be required to develop acommunity relations plan which includes consultation, notification, and complaint management. Where this is the case, the following is to be included in any noise (and vibration) control plan.	(a) Identify all noise and vibration sensitive receivers. Include characteristics of, and risks exposed to, existing buildings, fences, trees, property boundaries and services (within at least 1km for blasting operations). (b) Contingency actions must be developed if the relevant noise/vibration limitswill be exceeded. (c) A complaints management system should be devised which includes corrective and preventative actions. (d) Consultation with and information supplied to nearby residents and other sensitive uses.
Hours of operation/construction schedule	Information regarding opening hours or hours of operation in accordance with therelevant planning scheme provisions. For construction hours, refer to Section SC6.4.23 Construction management, quality management, inspection and testing, Clause SC6.4.23.1 (4) Hours of work and Section 440R of the *Environmental Protection Act 1994*. Scheduling works at periods where people are least affected will also reduceimpacts and should flow on from consultation with the community (as above).
Potential noise and vibration generating activities	The choice of plant and equipment employed on the project can have a direct effect on noise and vibration levels. By selecting equipment of an appropriate size with low vibration generation characteristics, and by ensuring that the equipment is being operated correctly and that noise and vibration reduction devices are operating efficiently, the number of complaints received can be greatly reduced.

Potential noise and vibration mitigation methods	For construction, rock breaking, drilling, and/or piling the following mitigationmethods should be considered: (a) maximising the distance between the noisy activities and noise sensitive land uses; (b) undertaking noisy fabrication work offsite where possible; (c) maintaining any pre-existing barriers, or walls onsite as long as possible; (d) including construction barriers in the project design; (e) using building and stockpile materials as noise barriers during the earthworks phase which may be used in the final landscape design; and (f) installing purpose-built noise barriers, acoustic sheds, and enclosures. Road and rail noise attenuation will be considered in the following order ofpreference; a combination may also be provided: (g) a buffer between noise receptor and receiver; (h) service roads between noise receptor and receiver; (i) larger lots closest to the noise source that allow dwelling units to be setback from the noise source to achieve the applicable reduction level; (j) architectural treatments; For class 1-4 buildings see *MP 4.4 Buildings in a transport noise corridor.* (k) incorporating mounding and landscaping into the design; Noise barriers are to be provided in accordance with the principles of theDepartment of Transport and Main Roads *Code of Practice Chapter 5:* *Integrated Noise Barrier Design;* and (l) providing an acoustic fence: A detailed design is to be submitted as soon as possible in the planningprocess. Design and construction of barriers must meet MRTS15 *Noise Fences*. The acoustic fence must not be located on the road reserve, butwithin the boundary line of the abutting property. Refer to Section SC6.4.3 Standard drawings SD002, SD003 and SD004. Where acoustic reports identify that noise levels will be exceeded, all usesshould be provided with attenuation requirements designed by suitably qualified consultants that will enable the use to meet the prescribed standard.
Noise and vibration monitoring	Where appropriate in relation to the use or activity. Include details such asmonitoring equipment, standard employed, monitoring

	frequency, on-site meteorology, activity logs, and results handling procedure.

SC6.4.19.9 Construction

All construction work is to be undertaken pursuant to the *Environmental Protection (Noise) Policy (EPP (Noise))* and the *Environmental Protection Act 1994*. Construction works shall be carried out in accordance with the requirements and restrictions relating to hours of work specified in Clause SC6.4.23.1 (4).

Ground vibration levels, transmitted from the construction works, rock breaking, drilling, and piling, operating items of plant or other noisy activities shall not exceed levels that are close to the lower level of human perception nor is it to cause any damage to any adjoining buildings or infrastructure. Acceptable practices and vibration thresholds shall be determined in accordance with current Statutory Regulations.

A complaints management system should be devised which includes corrective and preventative actions. Consultation with and information supplied to nearby residents, workers and any other sensitive noise receptors is to be undertaken when vibration is known to be generated and is considered sufficient to warrant notification.

Editor's Note - The results and recommendations of reporting on noise and vibration, as detailed in Clause SC6.4.19.44 Noise and vibration impact assessment above, associated with a particular development will be required to be implemented.

The control of ground vibration as a result of blasting shall be strictly in accordance with Section SC6.4.7 Clearing, grubbing, and earthworks and any other relevant construction specifications found in SC6.4 Development manual planning scheme policy and will be solely at the risk and responsibility of the Developer.

Development manual planning scheme policy (PSP)
SC6.4.20 Footpath treatment and outdoor dining design

Index

SC6.4.20.1 Footpath treatment

(1) Purpose
(2) Footpath treatment
(3) Footpath treatment standards
(4) General guidelines
(5) Banding details
(6) Footpath details
(7) Footpath treatment location maps

SC6.4.20.2 Outdoor dining design for permanent outdoor dining structures

(1) Introduction
(2) Permanent outdoor dining structures
(3) Access guidelines
(4) Furniture guidelines
(5) Umbrellas/shade structure guidelines
(6) Advertising guidelines
(7) Lighting

SC6.4.20.1 Footpath treatment

(1) Purpose

(a) The purpose of the footpath treatment is to achieve an appropriate footpath treatment and installation to achieve consistency of surfacing material located in key areas across Townsville, commensurate with the streetscape intent having regard to:

(i) the projected level of usage in each location, such as shared use or heavy traffic movements;

(ii) activities anticipated to occur within the verge at the given location and safety requirements; and

(iii) the desired streetscape character of the location, giving particular attention to the relevant zone code.

Note - Refer Clause SC6.4.20.1 (7) Footpath treatment location maps for locations of treatments.

(b) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(i) Townsville City Plan:

Part 4 Local government infrastructure plan

Part 9.3.3 Landscape code

Part 9.3.4 Reconfiguring a lot code

Part 9.3.6 Works code

Section SC6.4.2 Development application guidelines

Section SC6.4.4 Active transport Infrastructure

Section SC6.4.6 Road works and traffic control

Section SC6.4.12 Landscaping and open space

Section SC6.4.13 Irrigation

Section SC6.4.14 Public utilities and building over/near services

(ii) Australian Standards:

AS/NZS 1158.3.1	*Lighting for roads and public spaces - Part 3.1: Pedestrian area (Category P) lighting - Performance and design requirements*
AS 1170	*Structural design actions (set)*
AS 1428	*Design for access and mobility (set)*
AS 2890.3	*Parking facilities – Part 3: Bicycle parking facilities*
AS 3996	*Access covers and grates*
AS 3727.1	*Pavements – Part 1: Residential*
AS 4586	*Slip resistance classification of new pedestrian surface materials*

(2) Footpath treatment

(a) The standards and requirements of this policy section will achieve compliance with Townsville City Plan where the planning scheme code notes this policy as providing compliance.

Editor's Note - Part 9.3.3 Landscape code, Part 9.3.4 Reconfiguring a lot code and Part 9.3.6 Works code each have outcomes that can be achieved by this policy section, in addition to the relevant zone code.

(b) The locations where footpath treatment standards of this policy are to be met are shown in Clause SC6.4.20.1 (7) Footpath treatment location maps. In general, the following locations require footpath treatment in accordance with this policy section:

(i) the principal central (CBD) and key development areas supporting the CBD;

(ii) other key activity centres (generally those in the Centre zones category and Specialised centre zone), in particular along the supporting roads and streets where attractive pedestrian streetscapes are intended by the zone and precinct;

(iii) key infill areas, including medium density and higher density residential areas where there is an emphasis on creating attractive and pedestrian oriented streetscapes;

(iv) facilities with high levels of public use warranting improved footpath treatment such as: educational establishments (schools, TAFE colleges), places of worship etc., the finish of the footpath treatments shall be at the discretion of the Townsville City Council;

(v) mixed use areas that have frequent pedestrian use have a highly visible frontage or where attractive pedestrian environments are intended by the zone and precinct;

(vi) special footpath type areas such as Magnetic Island, The Strand, Palmer Street and Sir Leslie Thiess Drive; and

(vii) any new centres, commercial, mixed use and community uses that are not identified in Clause SC6.4.20.1 (7) Footpath treatment location maps. In such instances, the above criteria shall be used to determine the most similar development to inform the treatment to be applied.

Editor's Note - For any other areas not covered by Clause SC6.4.20.1 (7) Footpath treatment location maps see Section SC6.4.6 Road works and traffic.

Editor's Note - Refer to Clause SC6.4.20.1 (7) Footpath treatment location maps for location of proposed treatments.

Editor's Note - For land with the Townsville City Waterfront Priority Development Area (PDA) additional criteria applies, see the Townsville City Waterfront Priority Development Area Development Scheme.

(3) Footpath treatment standards

(a) Footpath treatment standards for each of the nominated locations identified in Clause SC6.4.20.1 (7) Footpath treatment location maps are set out in the following Tables.

Editor's Note - Refer to Clause SC6.4.20.1 (7) Footpath treatment location maps for locations of proposed treatments.

FT1 – Footpath Treatment 1 Core Retail and Entertainment Areas of the Principle Centre CBD
Statement of Intent - FT1
Footpath treatment 1 serves the core retail and entertainment areas of the principle centre (CBD). The treatment provides the highest finish intended to support high levels of pedestrian use and may provide for on street dining, and informal and formal recreational and civic spaces.
Body of Footpath and Driveway Crossings: FT1

Description:	• Footpath treatment FT1 shall be full width from building line to the road kerb alignment. • Two kinds of stone pavers of varying length and width set in mortar on mass concrete base (Refer to Section SC6.4.6 Road works and traffic control). • Facing: split face finish to top (saw cut other edges). • Image: refer to Figure SC6.4.20.2 Image FT1.
Pattern:	• Staggered pattern as shown in Figure SC6.4.20.1 Conceptual diagram: FT1, and Figure SC6.4.20.2 Image FT1. • Pavers shall be laid alternatively 200mm and 100mm wide with the basalt (darker) paver towards the building line and the granite (lighter) paver towards the kerb. • A staggered transition between the pavement types shall occur at approximately 70 per cent basalt 30 per cent granite, see Figure SC6.4.20.1 Conceptual diagram FT1.
Grout:	• Product: CTA Polyblend G15 or approved equal. • Colour: 'Mid Grey'.
Pavers:	• Basalt: 100% grey range (darker stone in Figure SC6.4.20.1 Conceptual diagram FT1). • Granite: 'Sindoor Brown' (lighter stone in Figure SC6.4.20.1 Conceptual diagram FT1). • Width: 200 mm or 100 mm (refer varying widths in Figure SC6.4.20.1 Conceptual diagram FT1). • Length: 300 mm or 500 mm • Depth: 40 mm
Driveway and Pedestrian Crossing Point	
Description:	• Driveway access through footpath shall be monolithic poured coloured concrete slabs, colour to be matched to the basalt paver, with saw cut detailing to match adjacent paver pattern (scoringcuts only 5mm deep). See Figure SC6.4.20.3 Image FT1 driveway option. • Driveway crossover shall be "plain natural" concrete with a surface broom finish. • Pedestrian kerb ramp shall be "plain natural" concrete with surface: broom finish.
Figure SC6.4.20.1 Conceptual Diagram: FT1	

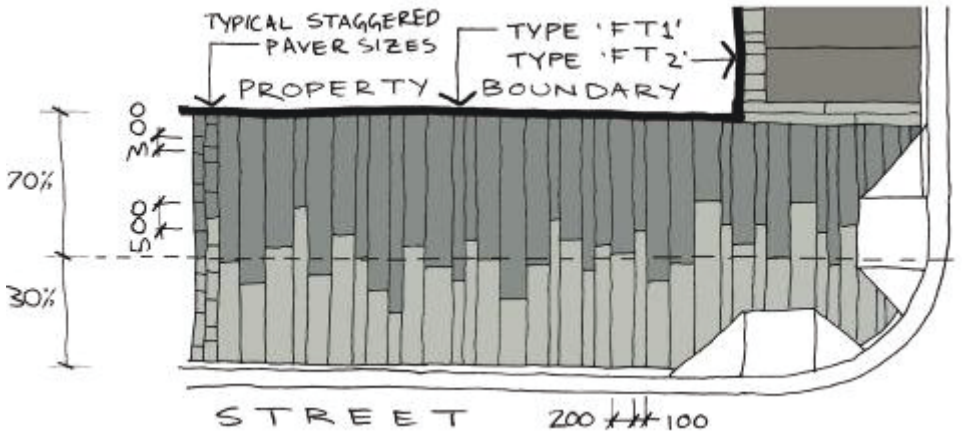


Figure SC6.4.20.2 Image: FT1

Figure SC6.4.20.3 Image FT1 Driveway Option

Editor's Note - Refer to Clause SC6.4.20.1 (7) Footpath treatment location maps for locations of proposed treatments.

FT2 – Footpath Treatment 2 Remainder of the Principle Centre (CBD)	
Statement of Intent	
Footpath treatment 2 serves the remainder of the principle centre (CBD), key areas which support the CBD and areas intended for medium and higher residential densities nearby the CBD. The treatment provides a nexus with FT1 and is of a high quality to support high levels of pedestrian use and may provide for the integration of civic spaces. A reduced width option may be permitted in the medium density residential areas as indicated on Clause SC6.4.20.1(7) Footpath treatment location maps.	
Body of Footpath: FT2	
Description:	• Footpath treatment FT2 shall be full width from building line to the road realignment. • Monolithic poured concrete slabs in approximately 5 m lengths with decorative scoringpattern and perimeter stone paver banding on mass concrete base, see Section SC6.4.6 Road works and traffic control, and Figure SC6.4.20.4 Conceptual diagram: FT2, and Figure SC6.4.20.5 Conceptual diagram FT2, and Figure SC6.4.20.5 Image: FT2. • Finish: 'light wash' 1 mm – 2 mm deep (2 mm max) using a water based chemicalretarder, see Figure SC6.4.20.8, Figure SC6.4.20.9, and Figure SC6.4.20.10. • Standard drawings as noted in Clause SC6.4.20.1(3)(c)(ii). • Decorative scoring, see Figure SC6.4.20.4, Figure SC6.4.20.5, and noted in

	Clause SC6.4.20.1(3)(c)(vii). **Note** - Refer to Figure SC6.4.20.8 for maximum acceptable aggregate exposure and Figure SC6.4.20.9 and Figure SC6.4.20.10 for unacceptable, under and over, aggregate exposure
Description reduced width option areas:	• Reduced width which allows for a planting zone from back of curb and/or property boundary see Figure SC6.4.20.7 Conceptual diagram FT2 – Reduced width option. • Monolithic poured concrete slabs with decorative scoring pattern and stone paver banding at approximately 5m intervals on a mass concrete base, see Figure. SC6.4.20.7. • Finish: 'light wash' 1 mm – 2 mm deep (2 mm max) using a water based chemical retarder, see Figure SC6.4.20.8, Figure SC6.4.20.9, and Figure SC6.4.20.10. • Standard drawings as noted in Clause SC6.4.20.1(3)(c)(ii). • Decorative scoring: see Figure SC6.4.20.7 and noted in Clauses SC6.4.20.1(3) and SC6.4.20.1(3)(c)(vii). **Note** - Refer to Figure SC6.4.20.8 for maximum acceptable aggregate exposure and Figure SC6.4.20.9.and Figure SC6.4.20.10 for unacceptable, under and over, aggregate exposure.
Pattern:	• See Figure SC6.4.20.4 Conceptual diagram FT2 and Figure SC6.4.20.5 Conceptual diagram F2 and Figure SC6.4.20.7 Conceptual diagram F2 reduced width option for saw cut pattern.
Colour:	• Concrete colour: "CCS Onyx" at 4% dose in a grey cement base. • Aggregate: Hanson "salt and pepper" or approved equivalent.
Banding: FT2	
Description:	• Granite stone pavers of varying length and width on mass concrete base, Refer to SC6.4.20.1 (5) Banding details. • Facing: split face to top, saw cut finish to all other sides. • Standard drawings as listed in Clause SC6.4.20.1 (3)(c)(ii).
Pattern:	• Staggered pattern as shown in Figure SC6.4.20.4Conceptual diagram FT2, Figure SC6.4.20.5 Conceptual diagram FT2, Figure SC6.4.20.6 Image FT2 and Figure SC6.4.20.7 Conceptual diagram FT2 reduced width option.
Grout:	• Product: Polyblend G15 sanded grout from Construction Technologies Australia or approved equal. • Colour: "Mid Grey".
Pavers:	• Granite "Sindoor Brown". • Width: 200 mm or 100 mm. • Length: 300 mm or 500 mm. • Depth: 40 mm.
Driveway and Pedestrian Crossing Points: FT2	

Description:	• Driveway access through footpath shall be SC6.4.20.3. • Finish: light wash finish 1 mm – 2 mm deep (2 mm max), using a water based chemicalretarder (“CCS Reveal" 1 mm or approved equal, do not use sugar), see Figure SC6.4.20.5, Figure SC6.4.20.9, and Figure SC6.4.20.10. • Driveway crossover shall be “plain natural” concrete with surface: broom finish. • Pedestrian kerb ramp shall be “plain natural” concrete with surface: broom finish. • Standard drawings: as noted in Clause SC6.4.20.1(3)(c)(ii).
Pattern:	• Refer to Figure SC6.4.20.4 Conceptual diagram: FT2 and Figure SC6.4.20.5 Conceptual diagram: FT2 for sample crossover layout and decorative scoring pattern.
Colour:	• Concrete colour: “CCS Onyx" at 4% dose in a grey cement base. • Aggregate: Hanson "salt and pepper" aggregate or approved equivalent.

Figure SC6.4.20.4 Conceptual Diagram: FT2

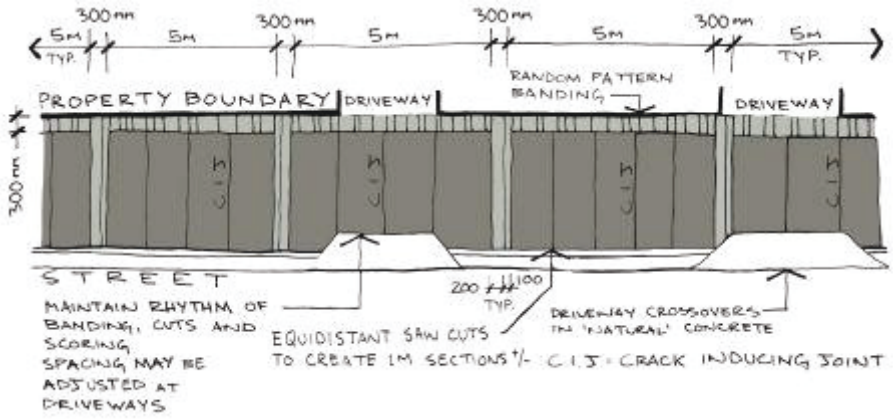


Figure SC6.4.20.5 Conceptual Diagram: FT2

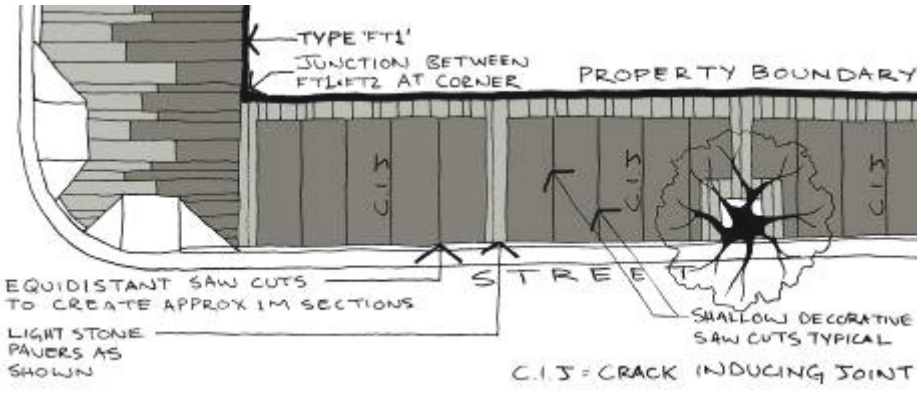


Figure SC6.4.20.6 Image FT2

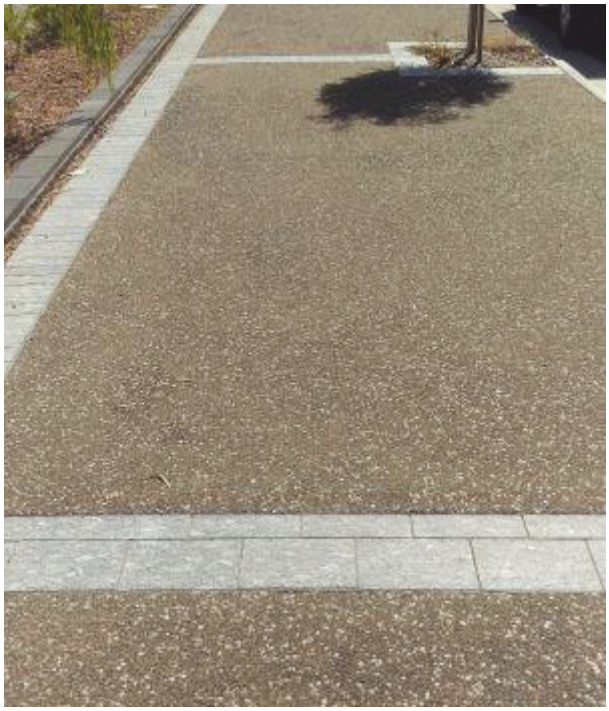


Figure SC6.4.20.7 Conceptual Diagram FT2 Reduced Width Option

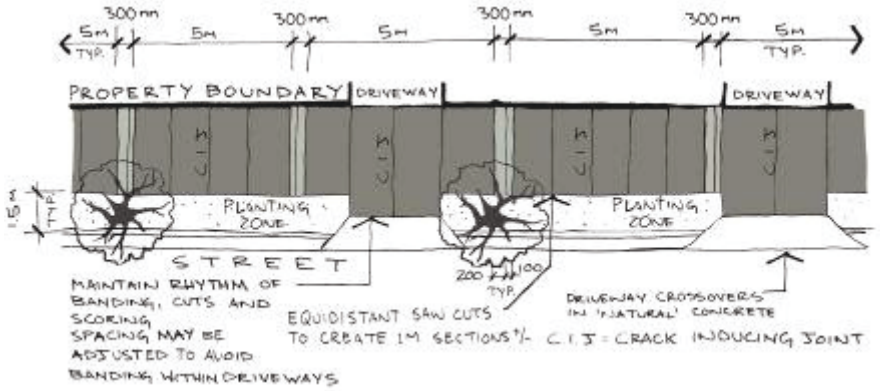


Figure SC6.4.20.8 Image FT2 (2 mm Maximum Exposure Acceptable)

Figure SC6.4.20.9 Image FT2 (1 mm Exposure - Unacceptable - Underexposed)

Figure SC6.4.20.10 Image FT2 (3 mm Exposure – Unacceptable - Overexposed)

Editor's Note - Refer to Clause SC6.4.20.1 (7) - Footpath treatment location maps for locations of proposed treatments.

FT3 – Footpath Treatment 3	
Statement of Intent	
Footpath treatment 3 serves many of the city activity centre areas, including major, district and local centres andsome neighbourhood centres, mixed use areas and specialised centres, where regular pedestrian use is anticipated for commercial and recreational purposes.	
Body of Footpath: FT3	
Description:	• Footpath treatment FT3 shall be full width from building line to the road kerb alignment.monolithic poured coloured concrete slabs in 5 m lengths with decorative scoring and lateral coloured concrete banding. • Conceptual image: see Figure SC6.4.20.11 Conceptual diagram FT3. • Finish: broom finish. • Standard drawings: as noted in Clause SC6.4.20.1 (3)(c)(ii). **Note** - For decorative scoring, see Clauses SC6.4.20.1 (4), SC6.4.20.1 (3)(c)(vii) and SC6.4.20.1 (3)(c)(ix)
Description reduced width option areas:	• Reduced width which allows for a planting zone from back of kerb and/or property boundary see Figure SC6.4.20.13 Conceptual diagram FT3 Reduced width option. • Monolithic poured coloured concrete slabs with decorative scoring and coloured concrete banding at approximately 5m intervals on a mass concrete base. • Conceptual image: see Figure SC6.4.20.13 Conceptual diagram FT3 Reduced width option.

	• Finish: broom finish. • Standard drawings: as noted in Clause SC6.4.20.1 (3)(c)(ii). **Note** - For decorative scoring, see Clauses SC6.4.20.1(4), SC6.4.20.1(3)(c)(vii) and SC6.4.20.1(3)(c)(ix).
Pattern:	• Conceptual scoring pattern: see Figure SC6.4.20.11 and Figure SC6.4.20.13. • For variations such as corners, trees, doorways etc, refer: Figure SC6.4.20.20. • Align scoring pattern with adjacent footpath scoring and/or saw cuts where applicable. **Note** - For decorative scoring, see Clauses SC6.4.20.1(4), SC6.4.20.1(3)(c)(vii) and SC6.4.20.1(3)(c)(ix).
Colour:	• “CCS paperbark" at 4% dose in a grey cement base.
Banding: FT3	
Description:	• Coloured concrete beams constructed 300 mm wide and 150 mm deep between property boundary and back of kerb (see SC6.4.20.1(5) Banding details). • Finish: broom finish.
Pattern:	• Lateral banding across the direction of the path only. • Conceptual image: see Figure SC6.4.20.11 and Figure SC6.4.20.13.
Colour:	• CCS "ghost gum".
Driveway and Pedestrian Crossing Points: FT3	
Description:	• Driveway access through footpath shall be monolithic poured coloured concrete slabs. • Driveway crossover shall be “plain natural” concrete with surface: broom finish. • Pedestrian kerb ramp shall be “plain natural” concrete with surface: broom finish. • Standard drawings: as noted in Clause SC6.4.20.1(3)(c)(ii). **Editor’s Note** - For decorative scoring, see Clauses SC6.4.20.1(4), SC6.4.20.1(3)(c)(vii) and SC6.4.20.1(3)(c)(ix)
Pattern:	• For pattern integration of driveways. • Align driveway scoring pattern with adjacent footpath decorative scoring and/or crack control saw cuts. **Editor’s Note** - For decorative scoring, see, Clauses SC6.4.20.1(4), SC6.4.20.1(3)(c)(vii) and SC6.4.20.1(3)(c)(ix).
Colour:	CCS "paperbark" at 4% dose in a grey cement base, kerb transition: "natural" concrete colour.

Figure SC6.4.20.11 Conceptual Diagram FT3

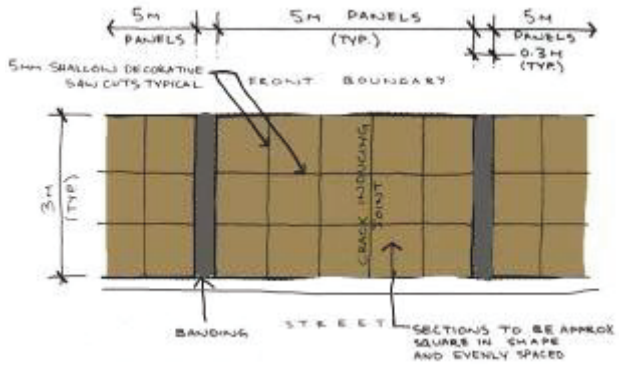


Figure SC6.4.20.12 Image: FT3

Figure SC6.4.20.13 Conceptual diagram FT3 Reduced Width Option

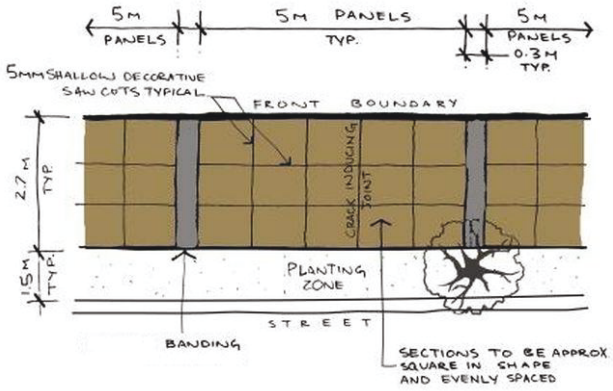


Figure SC6.4.20.14 Image FT3 Reduced Width Option

Editor's Note - Refer to Clause SC6.4.20.1 (7) - Footpath treatment location maps for locations of proposed treatments.

FT4 – Footpath Treatment 4	
Statement on Intent	
Footpath treatment 4 serves many of the city's lower order activity centre areas, mixed use areas, key corridors and key infill areas intended for increased residential densities and attractive streetscape.	
Body of Footpath: FT4	
Description:	• Footpath treatment FT4 shall be full width from building line to the road kerb alignment. • Monolithic, poured, full depth coloured concrete finish: broom finish. • Standard drawings: see standard drawings noted in Clause SC6.4.20.1 (3)(c)(ii).
Description reducedwidth option areas:	• Reduced width which allows for a planting zone from back of kerb and/or property boundary. • Monolithic, poured, full depth coloured concrete finish: broom finish. • Standard drawings: see standard drawings noted in Clause SC6.4.20.1 (3)(c)(ii).
Colour:	• CCS "paperbark" at 4% dose in a grey cement base.
Pattern	• Divided by crack control joints as required and decorative scoring into equal sections of approximately 1 m wide throughout the length of the footpath.
Driveway and Pedestrian Crossing Points: FT4	

Description:	• Driveway access through footpath shall be monolithic, poured, full depth coloured concrete. • Driveway crossover shall be “plain natural” concrete with surface broom finish. • Pedestrian kerb ramp shall be “plain natural” concrete with surface: broom finish. • Standard drawings: see standard drawings noted in Clause SC6.4.20.1(3)(c)(ii).
Colour:	• CCS "paperbark" at 4% dose in a grey cement base.
FT5 – Footpath Treatment 5	
Statement of Intent	
Footpath treatment 5 is a specialised treatment which serves the Palmer Street and Gregory Street dining/entertainment areas.	
Body of Footpath: FT5	
Description:	• Footpath treatment FT5 shall be full width from building line to the road kerb alignment,monolithic poured concrete slabs in approximately 2 m to 5 m lengths. • Finish: ‘light wash’ exposed aggregate 1 mm – 2 mm deep using a water based chemical retarder, see Figure SC6.4.20.16 image FT5. • Standard drawings: as noted in Clause SC6.4.20.1 (3)(c)(ii).
Pattern:	Slabs will be of alternating colours with joins to be from 5 degrees to 30 degrees off perpendicular see Figure SC6.4.20.15 Pattern FT5.
Colours:	• “CCS "Onyx" at 4% dose in a grey cement base. • Aggregate: Hanson “salt and pepper” or approved equivalent. • CCS "Paperbark" at 4% dose in a grey cement base. • Aggregate: Hanson “Sahara” or approved equivalent.
Permeable Paving:	• Minimum 30mm depth of 8-10mm resin bound aggregate, hand trowelled to design level. • Sub-base to be 30mm minimum depth coarse washed sand with geofabric Tensar TriAx (or approved equivalent) covering over planting media. • Colours to be best match to surrounding concrete.
Driveway and Pedestrian Crossing Points: FT5	
Description:	• Driveway access through footpath shall be monolithic poured concrete with a CCS “Stallion” coloured brick pattern stencil. see constructed in accordance with Council standard drawings. • Driveway crossover shall be “plain natural” concrete with surface: broom finish. • Pedestrian kerb ramp shall be “plain natural” concrete with surface: broom finish.
SC6.4.20.15 Pattern FT5	

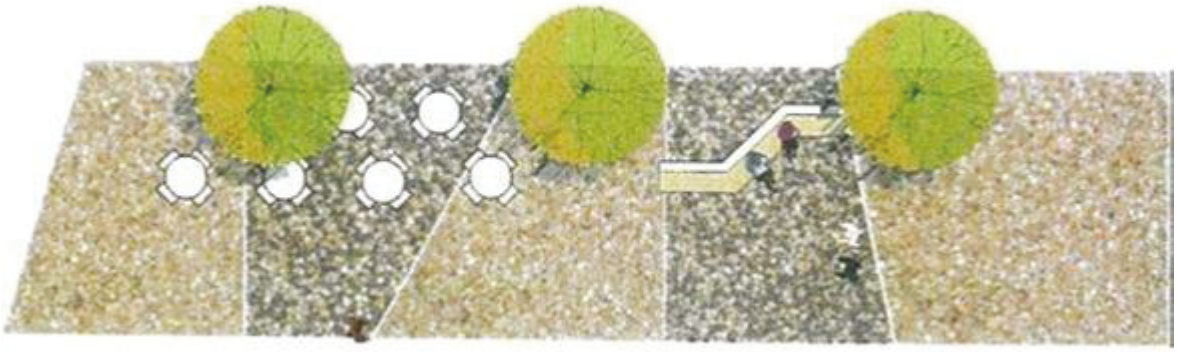


Figure SC6.4.20.16 Image FT5 Body of Footpath

Editor's Note - Refer to Clause SC6.4.20.1 (7) Footpath treatment location maps for locations of proposed treatments.

FT6 – Footpath Treatment 6	
Statement of Intent	
Footpath treatment 6 is a specialised treatment area which serves the southern side of The Strand through to Ross Creek.	
Body of Footpath and Driveway Crossings: FT6	
Description:	• Footpath treatment FT6 shall be full width from building line to the road kerb alignment. • Monolithic, poured, full depth coloured concrete pathway with a decorative scoring pattern, see standard drawings noted in Clause SC6.4.20.1 (3)(c)(ii). • Finish: 'light wash' exposed aggregate 1 mm – 2 mm deep using a water based chemical retarder, see Figure. SC6.4.20.17.
Pattern	Decorative scoring shall be cut from property boundary to the kerb alignment at approximately 1m intervals, see Clauses SC6.4.20.1 (3) and SC6.4.20.1 (3)(c)(ix).
Colour:	• Concrete colour: CCS "Onyx" at 4% dose in a grey cement base. • Aggregate: Hanson "salt and pepper" or approved equivalent.
Driveway and Pedestrian Crossing Points: FT6	

Description:	• Driveway access through footpath shall be monolithic poured concrete slabs with decorative scoring. • Finish: light wash finish 1 mm – 2 mm deep (2 mm max), using a water based chemical retarder. • Driveway crossover shall be “plain natural” concrete with surface: broom finish. • Pedestrian kerb ramp shall be “plain natural” concrete with surface: broom finish. • Standard drawings: as noted in Clause SC6.4.20.1 (3)(c)(ii).
Colour:	• Concrete colour: CCS "Onyx" at 4% dose in a grey cement base. • Aggregate: Hanson “Salt and Pepper” or approved equivalent.
Figure SC6.4.2.17 Image FT6	

Editor’s Note - Refer to Clause SC6.4.20.1 (7) - Footpath treatment location maps for locations of proposed treatments.

FT7 – Footpath Treatment 7	
Statement of Intent	
Footpath treatment 7 is a specialised treatment area which serves the Sir Leslie Thiess Drive area and the east end of the southern side of The Strand.	
Body of Footpath: FT7	
Description:	• Monolithic poured concrete slabs in 5 m lengths. • Finish: lightly exposed aggregate, refer texture only of Figure SC6.4.20.8. • Image: see SC6.4.20.18. • Standard drawings: refer to the standard drawings noted in Clause SC6.4.20.1 (3)(c)(ii).
Colour:	• CCS “Coco” 4% dose in a grey cement base. • Aggregate: Hanson “Burdekin Red” or approved equivalent.
Driveway and Pedestrian Crossing Points: FT7	
Description:	• Driveway access through footpath shall be monolithic poured coloured concrete slabs. • Driveway crossover shall be “plain natural” concrete with surface: broom finish.

	• Pedestrian kerb ramp shall be “plain natural” concrete with surface: broom finish.

Figure SC6.4.20.18 Image FT7

Editor’s Note - Refer to Clause SC6.4.20.1 (7) - Footpath treatment location maps for locations of proposed treatments.

FT8 - Footpath Treatment 8 (Section Superseded)

FT 9 – Footpath Treatment 9	
Statement of Intent	
Footpath treatment 9 is a specialised treatment occurring only on Magnetic Island.	
Body of Footpath: F9	
Description:	• Monolithic poured coloured concrete slabs. • Primarily in eucalypt with the secondary colour black used to highlight special features such as premises entries, dining areas, etc. • Finish: ‘light wash’ 1 mm – 2 mm deep (2 mm max) using a water based chemical retarder. • Standard drawings: as noted in Clause SC6.4.20.1(3)(c)(ii). **Note** - Refer to Figure SC6.4.20.8 for maximum acceptable aggregate exposure and Figure SC6.4.20.9 and Figure SC6.4.20.10 for unacceptable, under and over, aggregate exposure.
Description reduced width area:	• Reduced width which allows for a planting zone from back of kerb and/or property boundary. • Monolithic poured coloured concrete slabs. • Primarily in eucalypt with the secondary colour black used to highlight special features such as premises entries, dining areas etc. • Finish: ‘light wash’ 1 mm – 2 mm deep (2 mm max) using a water based chemical retarder. • Standard drawings: as noted in Clause SC6.4.20.1(3)(c)(ii). **Editor’s Note** - Refer to Figure SC6.4.20.8 for maximum acceptable aggregate exposure and Figure SC6.4.20.9 and Figure SC6.4.20.10 for unacceptable, under and over, aggregate

	exposure.
Colour:	• Primary - CCS "eucalypt" at 4% dose in a grey cement base Figure SC6.4.20.19 Image FT9. • Secondary - CCS "black" at 4% dose in a grey cement base Figure SC6.4.20.19 Image FT9. • Aggregate: Hanson “salt and pepper” or approved equivalent.
Pattern:	• Divided by crack control joints as required.
Driveway and Pedestrian Crossing Points: FT9	
Description:	• Driveway access through footpath shall be monolithic poured coloured concrete slab. • Driveway crossover shall be “plain natural” concrete with surface: broom finish. • Pedestrian kerb ramp shall be “plain natural” concrete with surface: broom finish.
Colour:	• Primary - CCS "eucalypt" at 4% dose in a grey cement base see Figure SC6.4.20.19 Image FT9. • Secondary - CCS "black" at 4% dose in a grey cement base Figure SC6.4.20.19 Image FT9. • Aggregate: Hanson “salt and pepper” or approved equivalent.
Figure SC6.4.20.19 Image FT9	

(b) All constructed coloured concrete beam bands are to have a:

(i) width of 300 mm and depth of 150 mm;

(ii) concrete properties in accordance with TCC Standard drawing SD075;

(iii) joint detail incorporating dowel sleeves at 500 mm centres, staggered on both sides of the coloured concrete band. This detail is also applicable to coloured concrete bands along the edge of driveways;

(iv) two coats of low VOC, water based, 7-15 years recoat penetrating sealer system designed to repel grease and oil stains; and

(v) edge of the coloured concrete banding shall be filled with 10 mm thick compressible filler board for fulldepth of slab and 20 mm polyurethane-based sealant.

(c) All concrete slabs shall be:

(i) integrally coloured for the full depth of the slab where colouring is noted in Clause SC6.4.20.1(3) Footpath treatment standards;

(ii) engineer certified design drawings must be submitted to Council for acceptance prior to approval being given showing site-specific construction details of coloured concrete band designs and integrated construction joints at intervals that are generally in accordance with TCC Standard drawing SD070. Pavements are to be constructed as per Section SC6.4.3 Standard drawings:

SD-015: Verge Service Corridors General Type Sections;

SD-020: Concrete Kerbing;

SD-025: Kerb Ramp;

SD-030: Driveway Access Urban Residential Properties;

SD-031: Driveway Access Commercial and Industrial Properties;

SD-032: Driveway Crossovers Urban Residential Properties;

SD-055: Road Crossing and Footpath Reinstatement for Trench Laid Services;

SD-060: Traffic Sign Installation;

SD-065: Street Name Sign and Installation Details;

SD-070: Concrete Pathway Reinforced Concrete (Mesh) Alternative;

SD-075: Concrete Pathway Reinforced Concrete (Fibre) Alternative; and

SD-500: Standard Bus Shelter and Footing Details,

(iii) sealed with two coats of low VOC, water based, 7-15 years recoat penetrating sealer system designed to repel grease and oil stains;

(iv) proportioned in terms of 'width to length' as '1 to 1.5' between crack control joints as per standard drawings listed in Clause SC6.4.20.1 (3)(c)(ii) above;

(v) laid in accordance with standard drawings listed in Clause SC6.4.20.1 (3)(c)(ii) above;

(vi) constructed so that all runoff, slurry, and excess materials must be captured and disposed of appropriately, and all surrounding surfaces are protected from staining;

(vii) constructed so that all decorative scoring cuts are five mm deep for the full length of the slab continuous through the end of the slab;

(viii) constructed so that all crack inducing saw cuts are continuous through to the end of the slab;

(ix) constructed so that all saw cuts:

1. are made approximately 24 hours after finishing (preferably the morning after the pour);
2. are cut with a "Early Cut Saw" only;
3. are cut with a "Dry Cut" method only (this requirement is to override conflicting specifications on standard drawing SD-070 (for coloured concrete only);
4. are aligned where possible with any service penetrations, on at least one side of the penetration, or services to be located wholly within one saw cut square (see Figure SC6.4.20.23);
5. are constructed in accordance with standard drawings listed in Clause SC6.4.20.1 (3)(c)(ii) except for SC6.4.20.1(3)(c)(ix)3;
6. for footpath treatment type FT3, create a pattern comprised of:
    a) both decorative scoring and crack inducing joints (as required) to create sub-panels approximately 1x1 m square or otherwise closely proportioned rectangular shapes evenly spaced throughout the panel (see Figure SC6.4.20.20);
    b) minimum sub-panel dimensions of 0.8 m either width or length, generally creating rectangular, regularly spaced sub-panels evenly spaced through the primary panel;
    c) maximum sub-panel dimensions of 1.2 m either width or length, generally creating rectangular, regularly spaced sub-panels evenly spaced through the primary panel; and

d) for footpath treatment type FT2, create patterns comprised of both decorative scoring and crack inducing joints (as required) creating sub-panels approximately 1 m wide (4 cuts in 5 m lengths) evenly spaced throughout the panel (see Figure SC6.4.20.20);

7. coloured concrete slabs shall be grade S32 and N32 minimum for fibre reinforced and steel reinforced slabs. Where concrete is located in an aggressive environment (e.g., salt exposure, aggressive soils, etc.), the concrete strength design shall be in accordance with AS3600;

8. concrete slab thickness shall be 100 mm minimum. In areas where maintenance vehicular loading is expected, concrete thickness shall be 125 mm minimum;

9. concrete cover to steel reinforcement shall be 40 mm unless otherwise noted;

10. concrete shall be laid on minimum 50 mm of compacted crusher dust / sand bedding with moisture barrier;

11. all concrete shall be cured in accordance with the following:

    a) AS3600;

    b) aliphatic alcohol must be used. The aliphatic alcohol shall be applied after screeding and bullfloating operations;

    c) no water shall be added to the concrete mix;

    d) an impermeable membrane shall be applied. All joints in membrane are to be taped and the edges secured to prevent the ingress of air;

    e) minimum curing period shall be not less than 7 days for strength grade S32 and N32 and not less than 4 days for high early strength concrete;

12. exposed edges of formed concrete elements shall have a 20 mm chamfer unless otherwise noted;

13. all concrete shall be mechanically vibrated. Hand-held vibrators must be held upright. Concrete must not be spread using a vibrator; and

14. all other requirements shall be in accordance with Section SC6.4.18 Concrete works.

(d) Tactile ground surface indicators (TGSI) where required shall:

(i) be stainless steel studs (CTA “SureSteel” or approved equal) installed as per AS/NZS1428.4.1 providing slip resistance of R13 (wet/oil ramp); and

(ii) be supplied and installed in accordance with AS/NZS1428.4.1 providing correct illuminance contrast, and AS1428.1 and AS4586 Slip Resistance of Pedestrian Surfaces, and as per manufacturers specifications and in accordance with AS1884. Also, to be in accordance with Section 6.4.4 Active transport infrastructure, Clause SC6.4.4.6.

(e) Footpath treatment shall not impede into private property.

(f) For all footpath treatment types the ground surface on the continuous accessible path of travel – construction tolerances for abutment of surface shall be in accordance with AS 1428.1. to eliminate the possibility of tripping hazards and non-compliance levels of abutting surfaces occurring.

(4) General guidelines

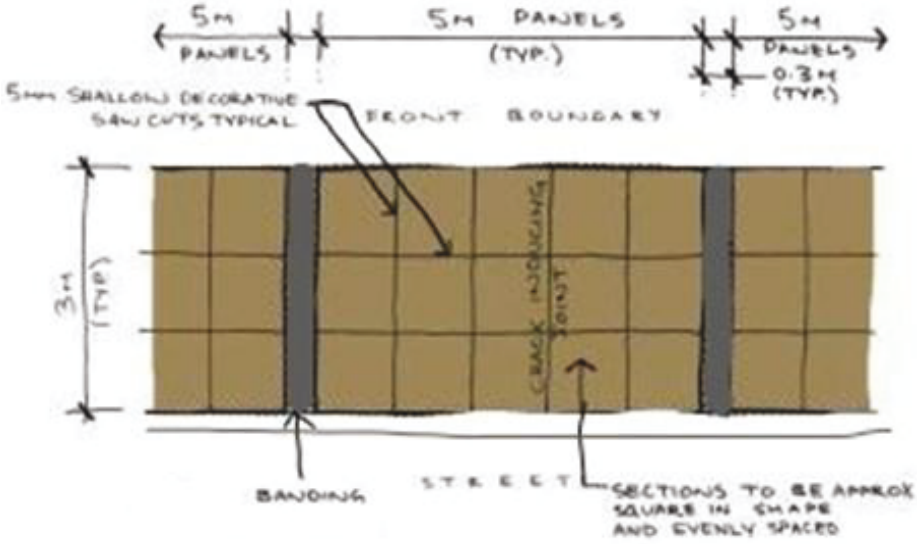


Figure SC6.4.20.20 Typical footpath treatment FT3

(5) Banding details

(a) Banding is to be continuous across tenancy or property boundaries at regular 5 m intervals (Figure SC6.4.20.20).

(6) Footpath details

(a) Joint lines and trim courses are to be straight and as continuous as is practical along the footpath length regardless of individual property boundaries.

(b) Service access lids and inspection pits:

(i) installed within the footpath zone shall be finished and matched to the finished surface levels of the footpath treatment;

(ii) which are manufactured shall be installed in accordance with manufacturer's installation instructions,having regard to the footpath pattern of the selected footpath treatment type;

(iii) in footpath treatment areas FT1:

1. be housed within an angle surround frame, which enables adjacent footpath treatments to be placed to the edge of the service penetration. The lid is to allow for matched pavers to be placed within, matching the adjacent paver material, colours, and patterns flush with the top of the adjacent treatment (see Figure SC6.4.20.22);

(iv) in footpath treatments FT2, FT3, FT6, and FT7, have their perimeter supports resting on concrete slabs that are integral with the adjacent concrete slab without a separate surround (see Figure: SC6.4.20.21):

1. be housed within an angle surround frame, which enables concrete to be laid to the edge of the service penetration;

2. be located in and integrated with adjacent concrete slabs so service access

structures limit or control cracking in surrounding concrete (see Figure SC6.4.20.23); and

3. are located where possible so future replacement or alteration of service access structures minimises disruption to adjacent concrete panels and are aligned with existing or proposed concrete crack control saw cuts where possible or are located wholly fully within the saw-cut panel (see Figure SC6.4.20.23); and

(v) when penetrating a banding area of FT3, be installed such that the cobbles continue to the edge of the new service access lids and inspection pits (see Figure SC6.4.20.22).

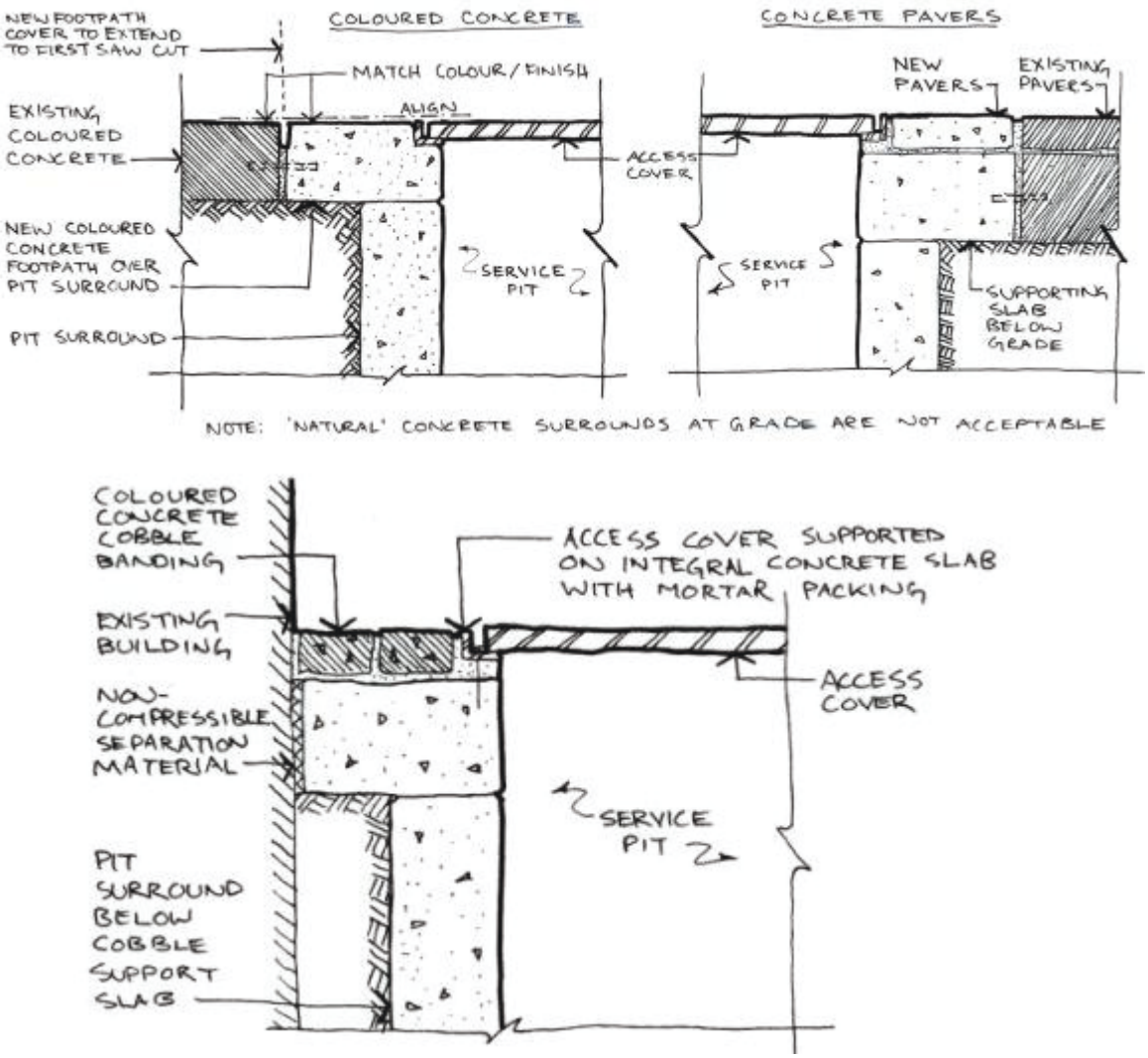


Figure SC6.4.20.21 Edge treatments to Service Access Lids and Inspection Pits for Footpath Treatment areas FT2, FT3, FT4, FT5, FT6, FT7 and FT9

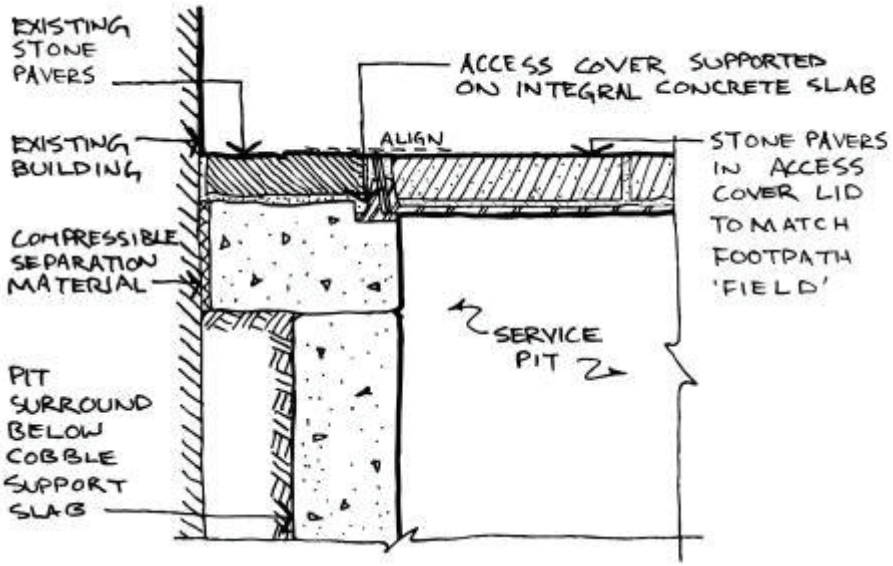


Figure SC6.4.20.22 Edge treatment to service access lid and inspection pits adjacent to pavers for type FT1

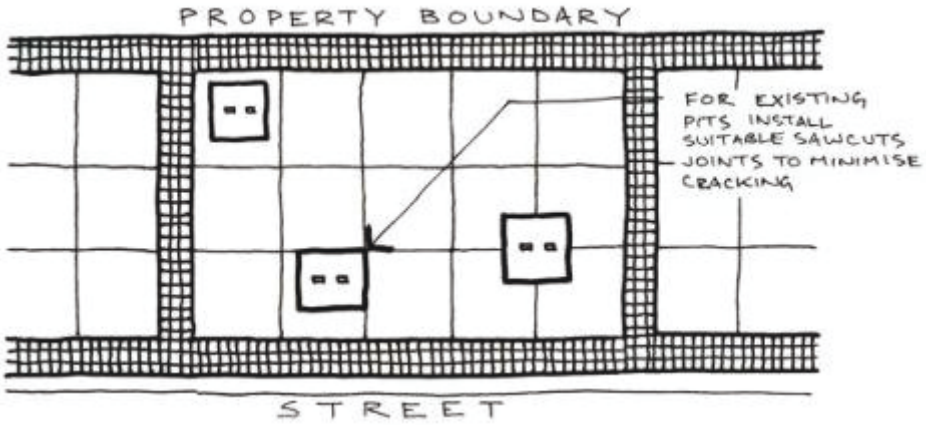


Figure FC6.4.20.23 Incorporate service access lids and inspection pits into decorative saw cut pattern

(c) All footpaths shall have maximum:

(i) cross fall of 1:40 (for cross fall greater than 1:40 liaise with Council) ; and

(ii) slope of 1:20 (for slopes greater than 1:20 liaise with Council).

(d) Kerb ramps are to be:

(i) in accordance with the standard drawings see Clause SC6.4.20.1 (3)(c)(ii) SD-025 – Kerb Ramp;

(ii) in accordance with AS1428.1 *Design for Access and Mobility, Part 1: General requirements for access – New Building Works*;

(iii) installed facing the direction of travel and aligned parallel and perpendicular with opposite kerb ramp;

(iv) located to suit the flow of pedestrian traffic and the position of the signal button;

(v) constructed of surface broom finished plain natural concrete;

(vi) installed with sharp transitions between adjacent surfaces (top and bottom); and

(vii) installed with Tactile Ground Surface Indicators (TGSIK) in accordance with AS/NZS1428.4.1 *Design for Access and Mobility Part 4.1: Means to assist the orientation of people with vision impairment – Tactile ground surfaces indicators*.

(e) Where the existing kerb edge is uneven:

(i) ensure suitable concrete admixture (Fosroc Renderoc or approved equal) is used to create a straight and true edge if irregularity in kerb is less than 50 mm deep, see standard drawing SD-020: Concrete Kerbing; and

(ii) infill is not to be formed so a tripping hazard occurs. In accordance with AS1428.1 Construction tolerances for abutment of surfaces.

(f) When providing reinstatement from trenching:

(i) where trench passes through concrete footpath treatment areas:

1. reinstate new concrete in accordance with standard drawings listed in Clause SC6.4.20.1 (3)(c)(ii) flush with adjacent support surface/slabs to allow level reinstatement;

2. ensure new concrete matches adjacent slab colour: refer to relevant footpath type in Tables SC6.4.20.3 for concrete colour, aggregate, finish, etc. for types as identified in Clause SC6.4.20.1 (7) Footpath treatment location maps; and

3. allow for replacement and installation of any broken, cut or deteriorated or otherwise damaged footpath treatment caused by the removal.

(g) When incorporating existing trees into new works, installing new trees, or other landscape features:

(i) incorporate elements into the paving pattern, as shown in Figure SC6.4.20.24;

(ii) modify installation where practical in accordance with the construction detail indicated in Figure SC6.4.20.25 and

(iii) refer to Section SC6.4.12 Landscaping and open space for street tree spacing, selection, root barrier treatments, root development zone, tree grates or other tree surround treatments and lighting.

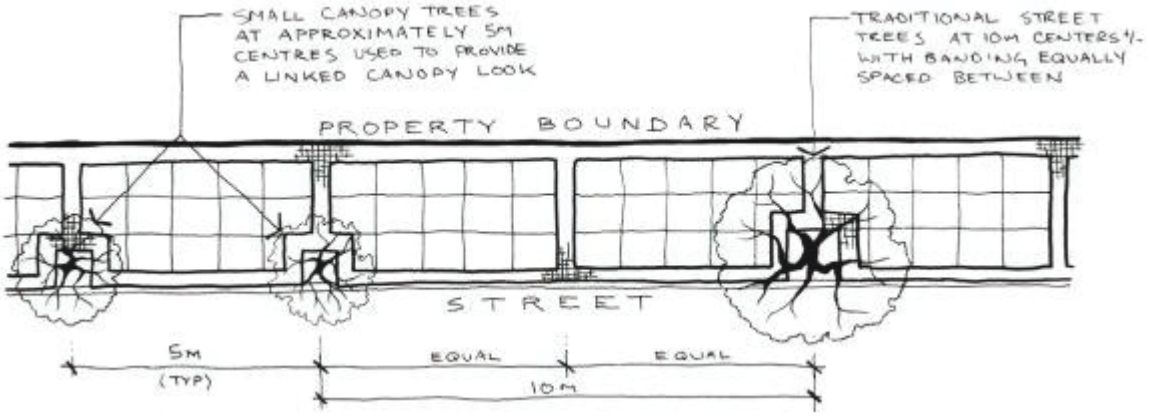


Figure SC6.4.20.24 Banding Around Tree Planting

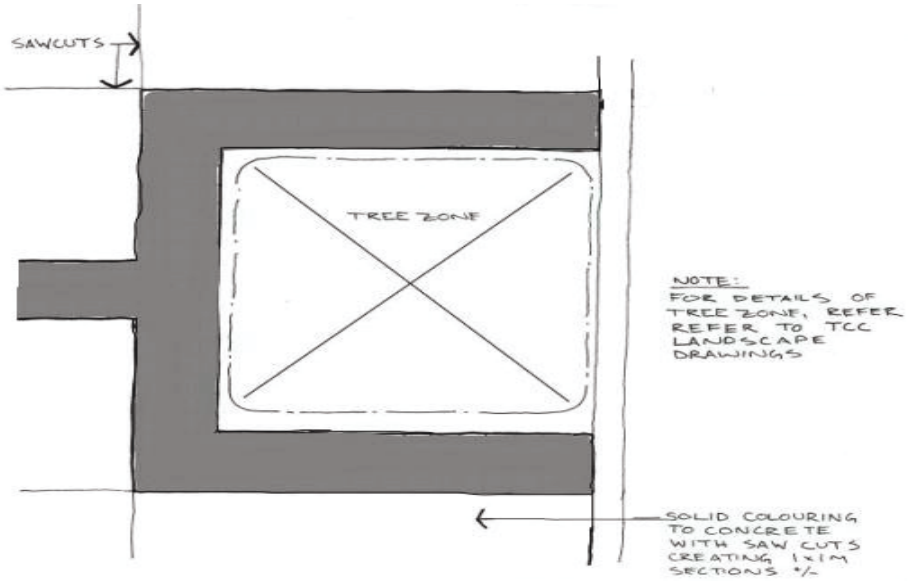


Figure SC6.4.20.25 Paver Banding Plan at Tree Surround

(h) When incorporating existing road transport related infrastructure (such as bus stops, street signs and traffic signals) or providing for the placement of new road related infrastructure into any of the footpath treatment types:

(i) safety and visibility requirements shall be in accordance with the *Manual of Uniform Traffic Control Devices* (MUTCD) for the placement of new such infrastructure;

(ii) footpath treatments and patterns shall be modified around existing elements, in order to reduce disturbance to established infrastructure;

(iii) bus stops shall be in accordance with standard drawings listed in Clause SC6.4.20.1 (3)(c)(ii). Bus stop concrete slab is a reinforced solid object supporting a large size structure, therefore required to be one whole slab undisturbed. Footpath treatment to be made flush with adjacent support slabs to allow level reinstatement;

(iv) street signs and traffic signals shall be in accordance with Australian Standards and guidelines; and

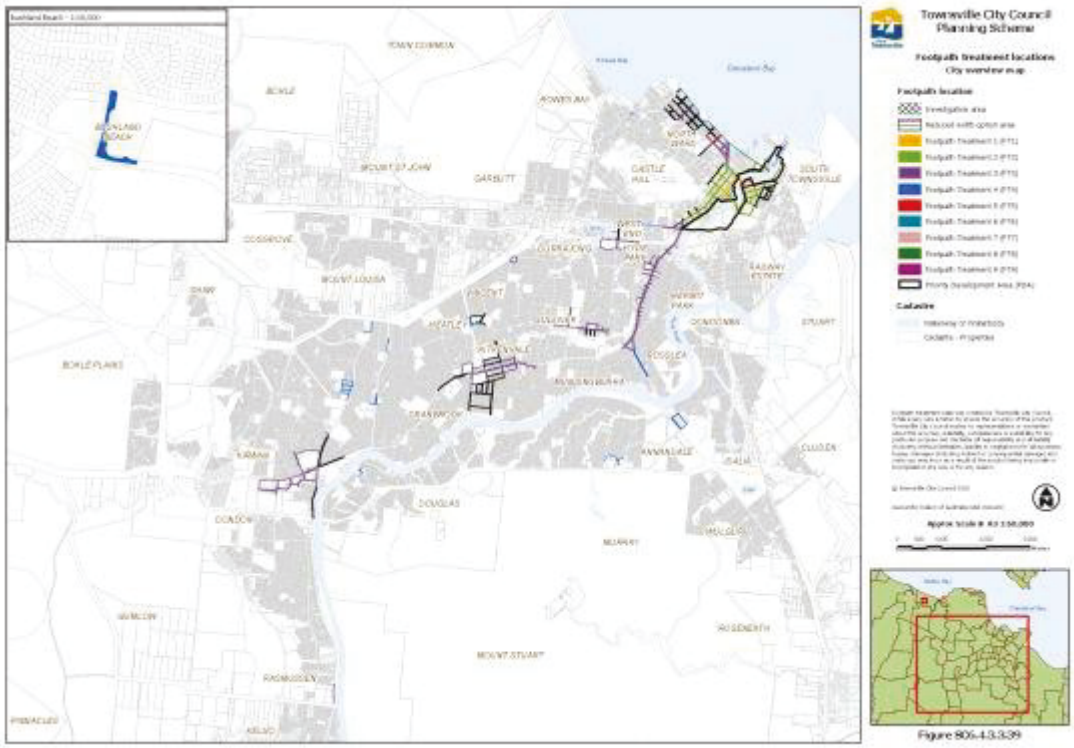
(v) street signs shall be in accordance with standard drawings listed in Clause SC6.4.20.1 (3)(c)(ii).

(i) When incorporating the placement of street furniture (such as, seating, rubbish bins and bollards):

(i) installation should not impede pedestrian movement along the footpath. There shall be an 1800 mm minimum clear width for the continuous accessible path of travel along the building property line, building façade and fence lines for pedestrians, especially people with a vision impairment, .in accordance with AS2890.3; and

(ii) the placement of street furniture shall, give consideration to minimizing the disturbance to the footpath treatment type and paving patterns.

(7) Footpath treatment location maps



Click here to view PDF high resolution map.

Figure SC6.4.20.26 City Overview Map

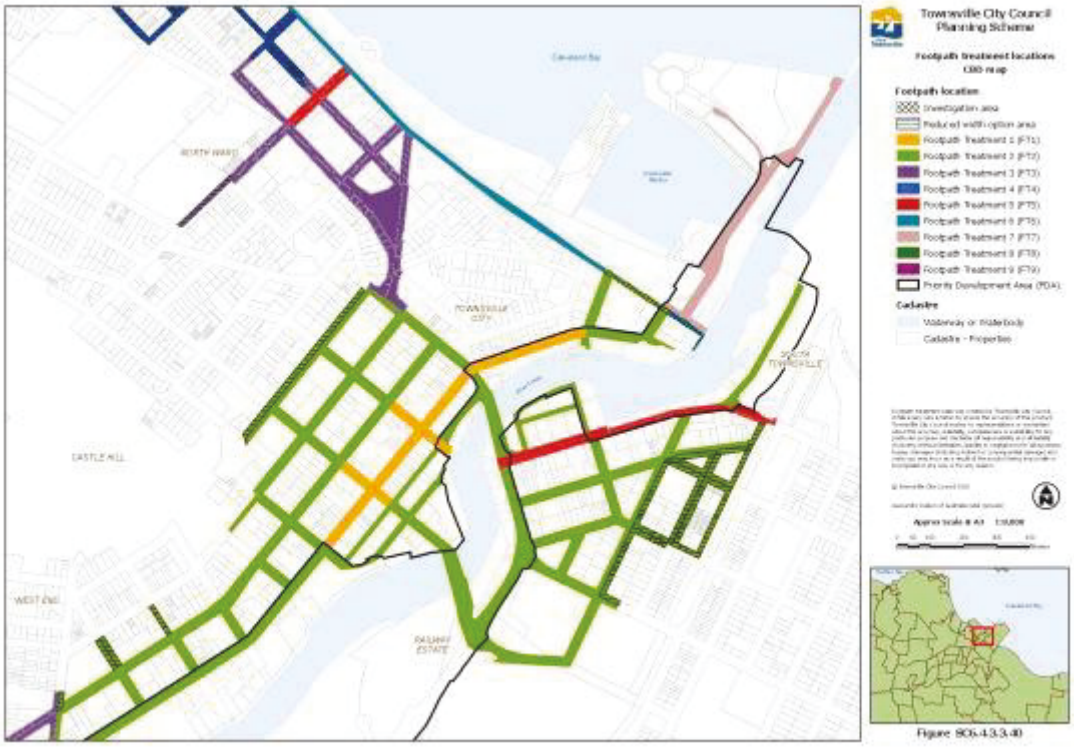


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Figure SC6.4.20.27 CBD Map

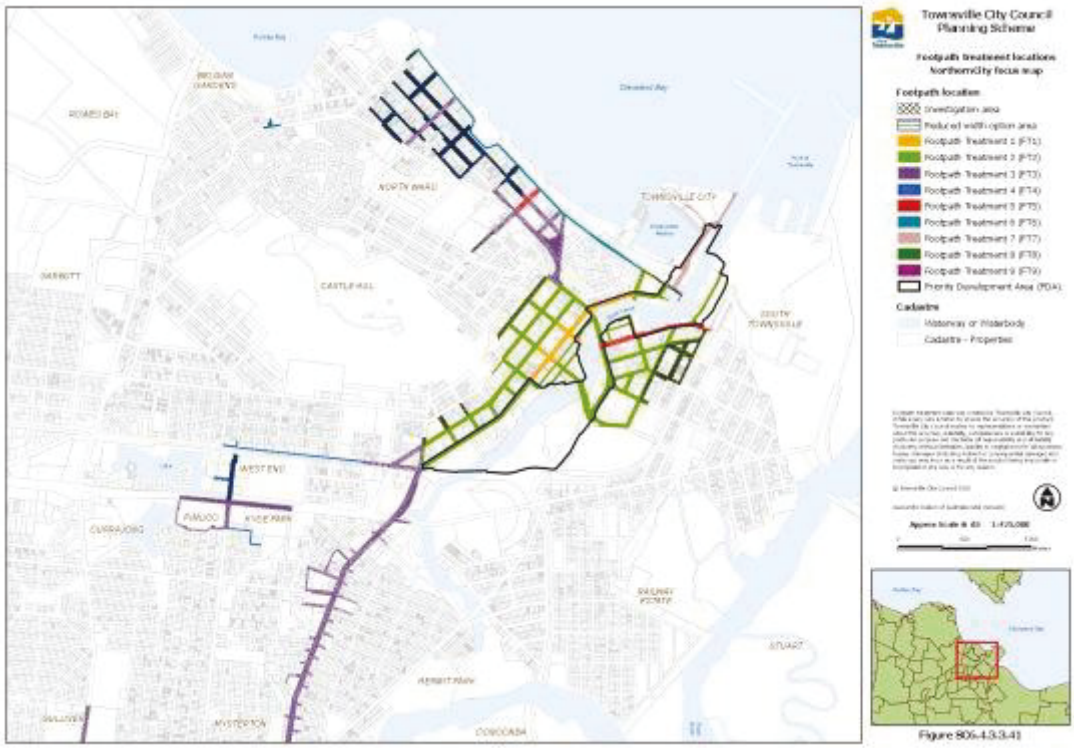

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Figure SC6.4.20.28 Northern City Focus Map

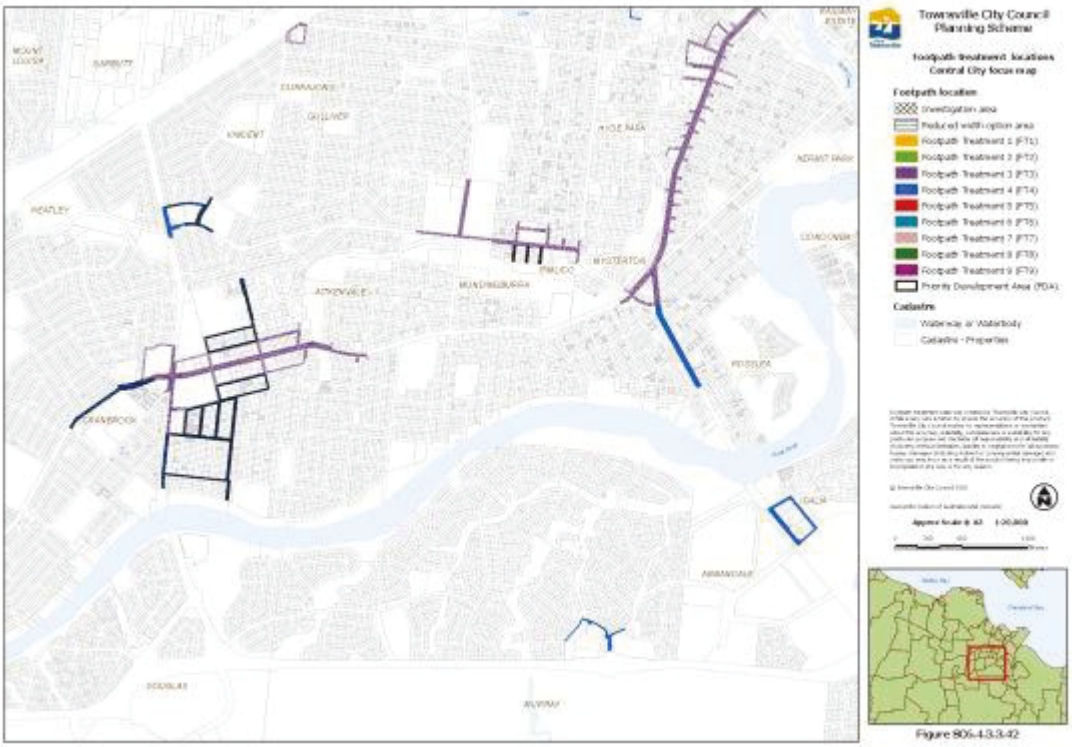

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Figure SC6.4.20.29 Central City Focus Map

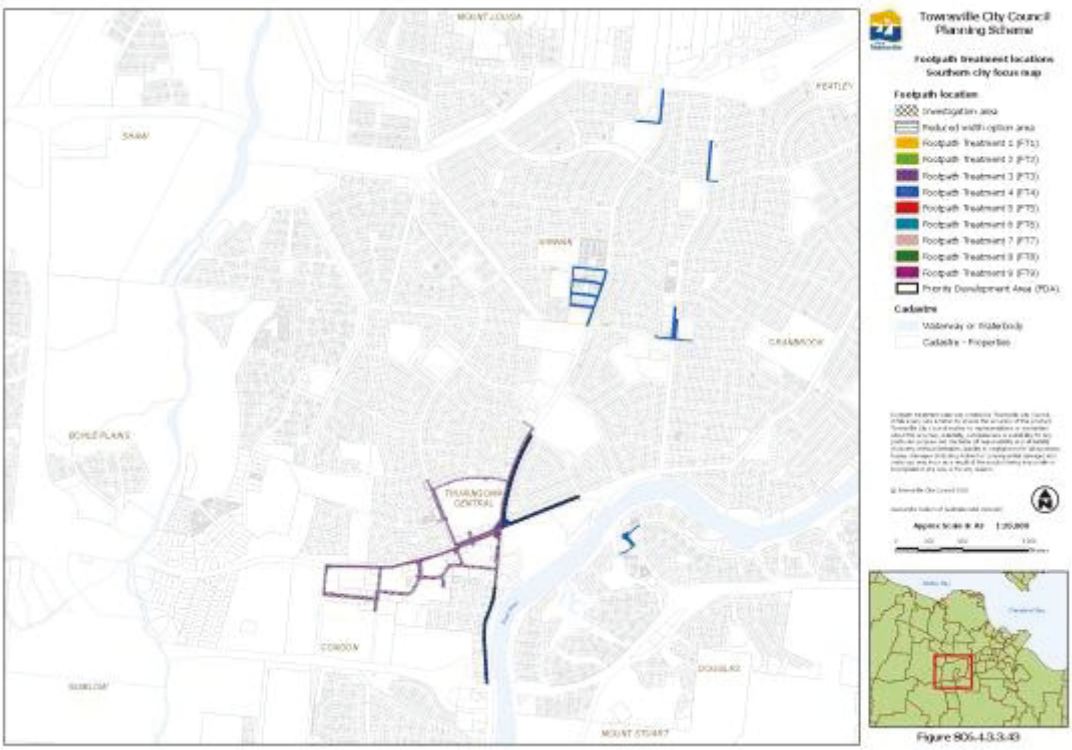

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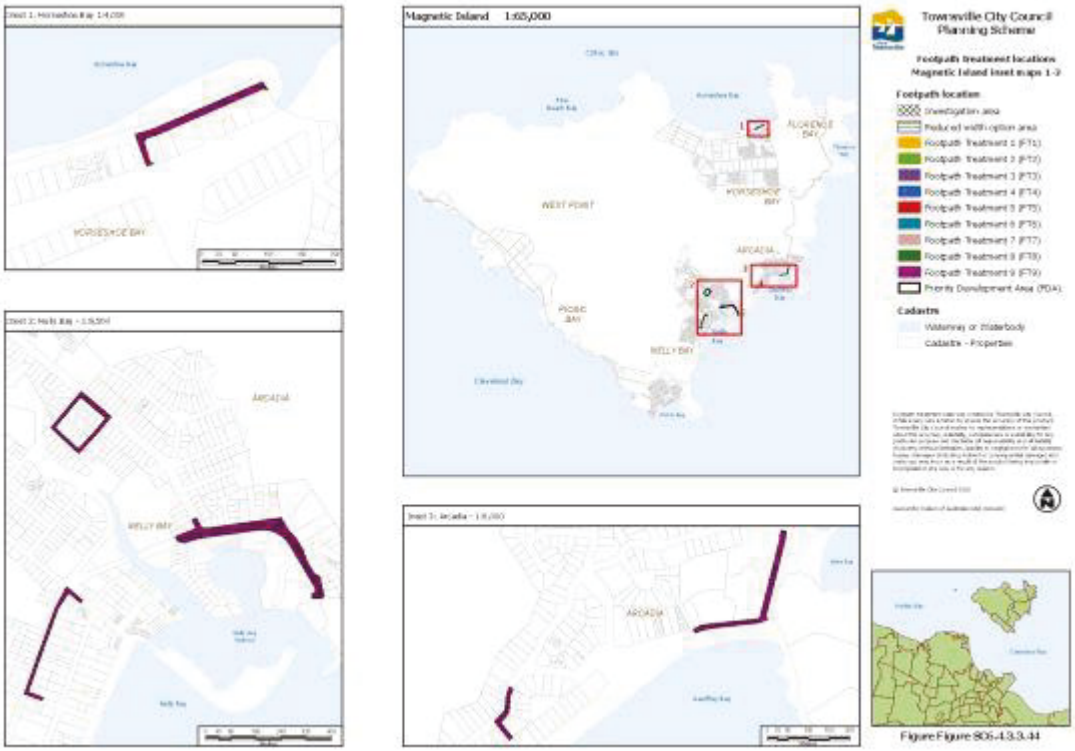
Figure SC6.4.20.30 Southern City Focus Map



Click here to view PDF high resolution map.

Figure SC6.4.20.31 Magnetic Island Inset Maps 1 - 4

SC6.4.20.2 Outdoor dining design for permanent structures

(1) Introduction

(a) Purpose

(i) To protect pedestrian traffic by the introduction of shared footpath management guidelines for the purpose of providing improved use of the footpath area and business opportunity.

(ii) To effectively address risk management issues which relate to the introduction of street furniture in association with permanent outdoor dining areas, as well as the potential interaction with vehicles.

Editor's Note - This section does not apply for business owners seeking a permit for outdoor dining. To apply for an outdoor dining permit, please refer to the Council's outdoor dining webpage.

(2) **Editor's Note -** Any person wishing to use any Council-controlled land for outdoor dining must lodge an application for an outdoor dining licence under Council's Outdoor dining policy, which can be found on Council's website. All proposals for permanent outdoor dining structures should be designed with reference to the outdoor dining design guidelines found on Council's website Permanent outdoor dining structures

In the case where a permanent structure (for example concrete walls, decking, awnings) are proposed, detailed plans are to be submitted for approval.

Structures, and associated services, must be designed and constructed by suitably qualified persons in accordance with the relevant Australian Standards and the requirements of the Townsville City Plan (I.e., relevant zone code) to maintain public safety, good amenity and ease of cleaning and maintenance.

Electrical supply must have an isolating switchboard to enable the operator of the outdoor dining service to isolate the electrical supply.

Editor's Note - Works within Council's road reserve will require separate approvals under the relevant local laws (E.g., Road Work Permit).

(3) Access guidelines

Outdoor dining should enrich the pedestrian experience and public life and support the purpose of the relevant zone. It is therefore important that they present an open, inviting image and are easily accessible from the public way. The layout and access must be ergonomically designed to allow safe operation of outdoor dining.

The streetscape must provide safe, equitable and dignified access for all, enabling all people to move around independently, safely and without restriction within an outdoor space. The edge of the building permits people who are visually impaired to easily locate entrances to buildings without encountering hazards. Hence, where possible and practical, the trading zone should be located on the kerb-side of the footpath, and the pedestrian zone should be located on the building side of the footpath adjacent to the property building line to provide a continuous accessible path of travel for all pedestrians.

In some locations, conditions may make siting of the trading zone on the kerb-side impractical, seriously disadvantageous or an unreasonable impediment to pedestrian traffic. In such situations, Council will consider allowing the location of the trading zone adjacent to the building rather than against the kerb.

In all locations, an outdoor dining area must stay within the area identified as trading zone on the approved layout plan.

Details of required clearances to public infrastructure are provided in the Outdoor dining guidelines.

Outdoor dining areas must be easily accessible from the footpath and must present an open and inviting image to entice participation. Pedestrians should not be forced onto the roadway by outdoor dining activities or other non- permanent items/structures on the footpath.

(4) Furniture guidelines

Permanent outdoor furniture should make a positive contribution to the street environment. A furniture style that is practical and integrates well with the surrounding cityscape is encouraged.

(a) Outdoor furniture should enhance the character of the street.

(b) Outdoor furniture should be robust to withstand the wear and tear of outdoor commercial usage.

(c) Outdoor furniture should be safe in its design, compliant with Australian Standards, and not cause any hazards to the patrons, shopkeepers, or pedestrians.

(d) Barricades, safety rails, bollards etc. may be required for safety reasons. All such barriers must be provided and maintained in accordance with this section.

(e) The use of framed fabric or any other style of low height barriers, including planter boxes, within public domain must be carefully designed and selected to ensure minimal impact on the use, enjoyment and safety of pedestrians and patrons.

(f) Removable furniture is to be removed when business is not open.

(g) No part of the footpath is to be used for storage.

(5) Umbrellas/shade structure guidelines

(a) Fixtures that penetrate or damage the pavement on public footpaths will generally not be permitted. However, assessments will be undertaken on a case-by-case basis.

(b) In some cases, the applicant may wish to undertake streetscape works to accommodate an outdoor café. Such works may include footpath widening, paving, street tree planting, installation of permanent umbrellas/shade structures, pedestrian lighting and where such works are in support of the relevant zone code of the Townsville City Plan.

(c) Umbrellas and other shade structures should not encroach upon, nor interfere with pedestrian movement or services.

(d) Umbrellas and other shade structures must have not less than 2.5 m clearance above the footpath within the obstruction free zone (AS1742.2) from the lowest point of the extended arms (spokes) and not cause a hazard to pedestrians within a pedestrian zone.

(e) Umbrellas and other shade structures must be maintained in sound and aesthetically acceptable condition to the Council's satisfaction.

(f) Umbrellas and other shade structures must be secured against high winds.

(g) Umbrellas and other shade structures must be removed when the outdoor seating area is not in use.

(h) Any advertising on umbrellas and other shade structures must comply with Part 9.4.1 Advertising devices code (any relevant approval obtained for the placement of an advertising device) and the relevant local law (*Local Law No. 1.4 Installation of advertising devices 2011)*.

(6) Advertising guidelines

The Advertising devices code found in Part 9.4.1 of the Townsville City Plan provides applicants with information regarding the placement of advertising devices. In some instances, separate approval for

operational works for the placement of an advertising device may be required. Refer to Table 5.8.2 of the Townsville City Plan to determine levels of assessment for the placement of an advertising device.

(7) Lighting

Any outdoor dining establishment approved to operate outside daylight hours must provide adequate lighting to Australian Standards, to ensure the safety and amenity of patrons and the general public. The use or reliance on Council infrastructure is not permitted and the cost of maintaining, running and installing the lighting shall be the responsibility of the applicant/operator of the outdoor dining space. Any outdoor lighting must also comply with any light spillage requirements so as not to cause nuisance to adjoining properties or traffic movement areas. Lighting shall be safe and not cause obstruction or pose a hazard to pedestrians or traffic.

Development manual planning scheme policy (PSP)

SC6.4.21 Rear lanes

Index

SC6.4.21.1 Introduction

(1) Purpose of rear lanes
(2) Design of rear lanes
(3) Crime prevention

SC6.4.21.2 New rear lanes – development standards

(1) Design outcomes
(2) Rear lane design standards
(3) Consideration of desired built form of adjacent lots

SC6.4.21.3 Historic rear lanes

SC6.4.21.4 Development intent for historic rear lanes
(1) Rear lanes inherent part of historic make up
(2) Ensure character of historic rear lanes
(3) Appropriate development

SC6.4.21.5 Description of historic rear lanes

(1) Description

SC6.4.21.6 Development standards

(1) Retain and enhance historic character
(2) Waste collection vehicles
(3) Subdivision of rear lane lots
(4) Crime Prevention Through Environmental Design Considerations
(5) Landscaping and driveways

SC6.4.21.1 Introduction

The following design principles set out standards, advice, and guidelines for consideration where a proposed development includes the creation of a new rear lane or development of land that has a frontage to an existing or historic rear lane.

(1) Purpose of rear lanes

(a) to provide vehicular access to the rear of the premises;

(b) by nature, and by design, to provide streets where pedestrians, cyclists, and vehicles have shared use, but which do not create a more direct through route than provided by the adjoining street network;

(c) used to alleviate access difficulties along frontage roads, such as where the lots are narrow, or along roads or streets carrying high volumes of traffic; and

(d) in some cases, to improve both the streetscape and to relate the domestic environment more closely to the street frontage;

(2) Design of rear lanes

Design of rear lanes should be undertaken in accordance with other relevant sections of the Development manual planning scheme policy including:

(a) Section SC6.4.6 Road works and traffic control, and

(b) Section SC6.4.12 Landscaping and open space.

(3) Crime prevention

Design of rear lanes should have regard to the *Crime Prevention through Environmental Design Guidelines for Queensland* (CPTED).

Editor's Note - For all setbacks, please refer to the relevant parts of the *Queensland Development Code.*

SC6.4.21.2 New rear lanes – development standards

This section outlines development standards and provides guidance and advice to inform appropriate development outcomes for the creation rear lanes associated with new development.

(1) Design outcomes

(a) Rear lanes should be functional and provide good visibility and manoeuvrability. Development of rear lanes should:

(i) provide enough width to allow safe vehicle passage and turning into and out of garages, movement of pedestrians and cyclists, and with sufficient room for service vehicles;

(ii) enable easy and safe access from driveways;

(iii) utility services must be located with easy access for maintenance (including water, sewerage, stormwater drainage, gas, electricity, telecommunications, etc.) with appropriate clearances in accordance with minimum requirements;

(iv) ensure that subdivision of lots with rear lane frontage addresses the principal street, for example, that the letterbox is on the street and not the rear lane; and

(v) a minimum of one and a half on-street car spaces (unmarked) must be provided within 25 m walking distance to each allotment. The car park may not be located within the rear lane.

(b) Rear lanes are to be designed having regard to *Crime Prevention Through Environmental Design Guidelines for Queensland* (CPTED) principles, in particular:

(i) ensure rear yards of properties can be fenced in accordance with CPTED principles;

(ii) lighting of the rear lane is to meet road safety requirements and CPTED principles, while minimising overspill of light into abutting properties, impacting on amenity; and

(iii) ensure that boundary treatment and landscaping do not conceal recesses or provide opportunities for anti-social behaviour.

(c) Rear lanes should be designed to accommodate the needs of abutting property owners and the streetscape, in particular:

(i) landscaping is to be designed to be low maintenance, without impacting on CPTED requirements;

(ii) landscaping to rear lanes should not impede any pedestrian or vehicle access; and

(iii) landscaping within rear lanes should not create recesses or provide uninvited opportunities for antisocial behaviour. As a guide, grass, ground cover, or visually permeable low-level vegetation, are acceptable. Trees and shrubs that provide visual screening of activity are discouraged;

Editor's Note - Landscaping should otherwise be undertaken in accordance with the Part 9.3.3 Landscape code of Townsville City Plan.

Figure SC6.4.21.1 Inappropriate and Appropriate Screen Fencing Types at Various Heights

(iv) landscaping must not obstruct traffic movements and sightlines, particularly at driveways and intersections;

(v) the use of rear lanes as a short-cut route should be discouraged, as this may introduce through traffic travelling at high and unsafe speeds and reduce the amenity; and

(vi) a minimum of one off-street carpark is to be provided per allotment.

(vii) fencing can be provided to the boundary fronting rear lanes to provide security, discourage uninvited access and enhanced amenity. The following advice is provided in respect of fencing, which should be in accordance with CPTED principles. Figure SC6.4.21.1 provides examples of inappropriate and appropriate fencing for rear lanes, in addition to the following:

1. screen fencing and gates that are opaque should not be more than 1.2 m in height;
2. screen fencing and gates may be more 1.2 m in height if they are non-opaque (e.g., pool fencing) but should not be greater than 1.8 m in height;
3. screen fencing and gates that are opaque and higher than 1.2 m should be set back a minimum of 3 m from the rear lane boundary; and

4. boundary fencing between properties, if opaque and higher than 1.2 m, is to taper down to 1.2 m to the rear lane boundary from a setback distance of 3m.

(2) Rear lane design standards

(a) Traffic flows on rear lanes should not exceed 100 vpd.

(b) Reserve widths for rear lanes must allow for:

(i) a road reserve width appropriate to allow for vehicle turning paths to access allotments and to contain stormwater drainage flows;

(ii) all services located within the rear lane maintaining appropriate clearance as per relevant standards and requirements;

(iii) water mains and connections for allotments provided to correlate to the addressing of the properties;

(iv) sewer mains and connections for allotments provided in accordance with; and

(v) stormwater in accordance with Section SC6.4.9 Stormwater quantity.

(c) Rear laneways should not exceed 75 m in length to maintain a maximum design speed of 30 km/hr based on an intersection speed of 20 km/hr.

(d) Horizontal and vertical alignment should incorporate curves to encourage low vehicle speeds by creating an environment where drivers are actively discouraged from driving above 30 km/hr.

(e) Traffic calming can be achieved through acceptable geometric methods.

(f) Rear lanes must be designed so that they are not used as a short-cut between streets.

(g) Street lighting must comply with. Section SC6.4.14 Public utilities and building over/near services, Clause SC6.4.14.2.

(h) Intersections of rear lanes with other lanes and other streets must comply with Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.1.

(3) Consideration of desired built form of adjacent lots

Consideration of the final desired built form of adjacent lots being serviced will be a consideration to ensure sufficient operating space and clearance is achievable for waste collection vehicles. Access for emergency vehicles must also be a consideration.

Editor's Note – SC6.4 he Development manual planning scheme policy, Section SC6.4.22 Waste management provides additional information regarding waste collection standards.

SC6.4.21.3 Historic rear lanes

The following design standards, advice and guidance are provided for consideration when assessing development applications for reconfiguring a lot and involving a historic rear lane and where a historic rear lane forms a road frontage to the development.

Editor's Note - While the following information is provided to guide development involving the historic rear lanes of Townsville, the principles may be useful for consideration of other existing rear lanes that are not historic.

SC6.4.21.4 Development intent for historic rear lanes

(1) Rear lanes inherent part of historic make up

Rear lanes are an inherent part of the historic make-up and character of some of Townsville's oldest suburbs, particularly South Townsville and Railway Estate. Historic rear lanes have been identified through studies undertaken by council as being worthy of preservation as they contribute towards the unique character and amenity of Townsville's older suburbs. Importantly, historic rear lanes have influenced the character and built form.

(2) Ensure character of historic rear lanes

The purpose of this section is to ensure the character of historic rear lanes does not diminish, and to enhancethe existing character provided by the rear lanes. Further, it is intended to discourage inappropriate development outcomes adjacent to these rear lanes.

(3) Appropriate development

This part seeks to clarify the characteristics of development that are appropriate to historic rear lanes and therefore provide guidance and certainty to all stakeholders, whilst also adhering to best practice CPTED principles.

SC6.4.21.5 Description of historic rear lanes

(1) Description

Principally, rear lanes are found in Railway Estate and South Townsville. The use of the term “historic rear lanes” generally refers to historic rear lanes associated with land zoned as Character residential zone under the Townsville City Plan.

The dominant physical characteristics of Townsville’s historic rear lanes are as follows:

(a) they are typically 6 m wide;

(b) they are between 50 m to 350 m long, with the majority being approximately 110 m long;

(c) they are straight and occasionally intersect with other rear lanes;

(d) where sealed, the bitumen is approximately 2.7 m to 3 m wide and is in the centre of the rear lane. The space on either side of the bitumen is an unsealed landscaped grass verge;

(e) some rear lanes have not been sealed;

(f) they are generally one lane with two-way access;

(g) most properties with access to a historic rear lane have primary access via the street. However, some properties fronting Boundary Street, for example, have primary access via the rear lane only; and

(h) they are sometimes the primary point of access for local infrastructure such as sewerage and water.

SC6.4.21.6 Development standards

(1) Retain and enhance historic character

This section outlines development standards to guide appropriate development to retain and enhance the historic character of rear lanes.

Development affecting rear lanes should:

(a) ensure rear lanes remain functional and provide good visibility and manoeuvrability;

(b) provide appropriate width to enable safe and efficient vehicle movement, including for service vehicles;

(c) enable easy and safe access into and out of sheds, carports, and garages;

(d) not create a more direct through route alternative for vehicles, cyclists, or pedestrians than the adjoining street network;

(e) be designed to ensure rear yards of properties can be fenced in accordance with CPTED principles (Queensland);

(f) ensure that boundary treatment and landscaping do not conceal recesses or provide opportunities for anti-social behaviour; and

(g) ensure that subdivision of lots with rear lanes addresses the principal street, for example, that the letterbox and water connection are on the street and not the rear lane.

(2) Waste collection vehicles

Waste collection vehicles will not service a rear lane unless the design facilitates safe vehicle access and operating conditions for a waste collection vehicle.

Editor's Note – SC6.4 he Development manual planning scheme policy Section SC6.4.22 Waste management provides additional information regarding waste collection.

(3) Subdivision of rear lane lots

Subdivision of lots in areas with rear lanes should be "vertical", down the centre of the block (see "b" in Figure SC6.4.21.2), creating two similar sized rectangular blocks (approximately 10 m wide). This is consistent with lot sizes in parts of Workers Cottage precinct and South Townsville precinct in the Character residential zone, where the existing character of the lot sizes of some sites in Townsville's older suburbs is 10 m wide by either 40 m or 50 m deep.

(a) Where subdivision of lots in areas with rear lanes is proposed to be "vertical", down the centre of the block, primary vehicular access via the rear lane is permitted.

(b) Where lots are configured in a "hatchet" configuration, as shown in "a", "c" and "d" in Figure SC6.4.21.2, primary vehicular access is not permitted via the rear lane. Generally, primary vehicular access to the block is to be from the street, with the exceptions as noted in SC6.4.21.2.

(c) Some properties that border Boundary Street in South Townsville may have exceptional circumstances in relation to the scenarios outlined in Figure SC6.4.21.2. These will be assessed on their individual merits.

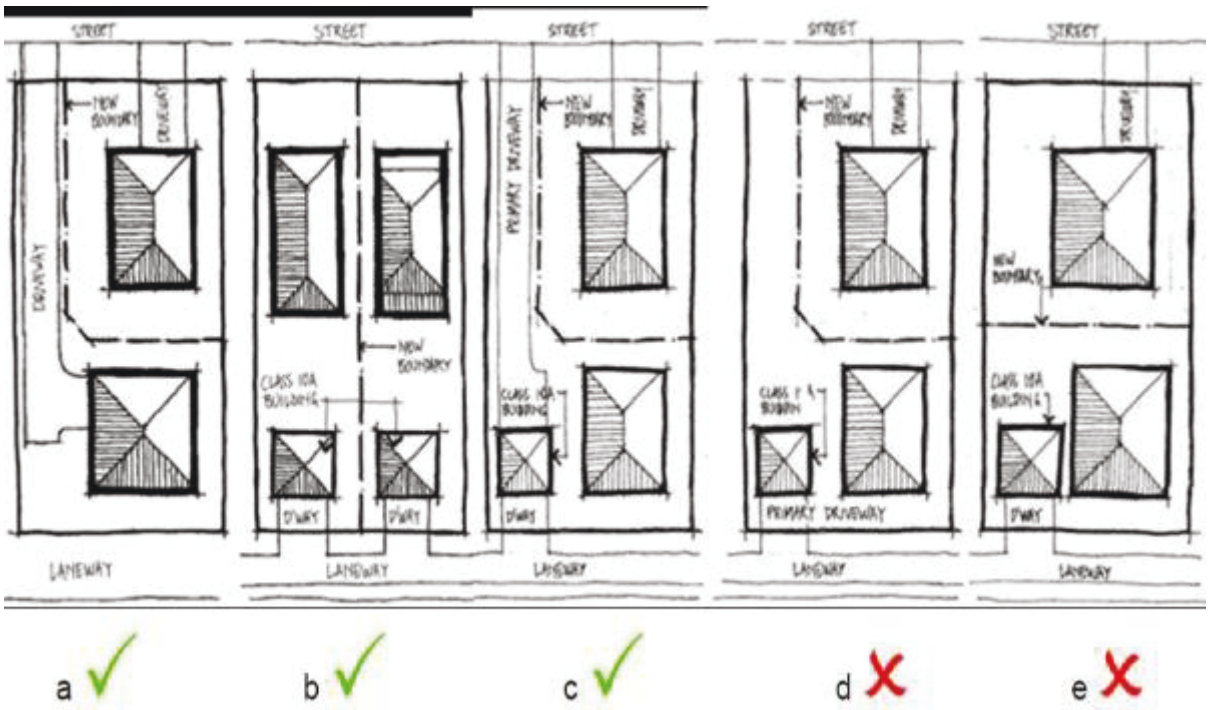


Figure SC6.4.21.2 - Unacceptable and Acceptable Lot Reconfiguration and Access for Properties Adjacent to Rear Lane

(4) Crime prevention through environmental design considerations.

Editor's Note - Applicants should also have regard to *Crime Prevention through Environmental Design Guidelines for Queensland* in addition to the below specific guidelines.

(a) Lighting should be provided for buildings with vehicular or pedestrian access to rear lanes. Appropriate lighting may include sensor lighting, installed overlooking the driveway or pathway respectively.

(b) Tilt panel doors or other doors should not open directly onto the rear lane.

(c) Rear yards of properties may be fenced to support CPTED principles and improve amenity, security (casual surveillance) and vistas.

(d) Rear boundary fence gates to rear lanes are encouraged to increase activation of the space.

(e) Fencing can be provided to the boundary fronting rear lanes to provide security, discourage uninvited access and enhanced amenity. The following advice is provided in respect of fencing and should be provided with regards to the principles of CPTED. Figure SC6.4.21.1 provides an example of inappropriate and appropriate fencing for rear lanes, in addition to the following:

  (i) Fences or walls along a street frontage have a maximum height of 1.2 m where solid, or 1.8m where that portion of the fence above 1.2 m high is at least 50% transparent.

(f) Historic rear lanes are generally not used for on street parking except for short-term parking by service vehicles. Parking should be discouraged through approved treatments, including landscaping, surface finish and limited signage (if necessary).

(5) Landscaping and driveways

(a) Landscaping, where provided to rear lanes should create local amenity and beautification of its environs and must be in keeping with established character of the rear lane.

(b) Landscaping, where provided within rear lanes should not conceal recesses or provide uninvited opportunities for anti-social behaviour. This can be achieved with grass, ground cover, or visually permeable low-level vegetation. Trees and shrubs that provide visual screening of activity are to be discouraged.

(c) Landscaping must not obstruct traffic movements and sightlines, particularly at driveways and intersections.

(d) Driveways are to be constructed in accordance with the Section SC6.4.5 Road network infrastructure, Clause SC6.4.5.4.

Development manual planning scheme policy (PSP)
SC6.4.22 Waste management

Index

SC6.4.22 1 Introduction

(1) Purpose

(2) Reference and source documents

SC6.4.22.2 Waste management plans

(1) Submission of waste management plans

(2) Information required in waste management plans

SC6.4.22.3 Waste management standards for development

(1) General requirements

SC6.4.22.4 Regulated waste guidelines

SC6.4.22.5 Concrete hardstand design for wheelie bins

SC6.4.22.6 Examples of bin storage areas

SC6.4.22.7 Bulk bin specification

SC6.4.22 1 Introduction

(1) Purpose

The purpose of the waste management guidelines is to:

(a) ensure development provides for the functional management of waste in a manner which is environmentally acceptable, safe, and efficient and that does not have adverse amenity impacts on external properties or internal development;

(b) provide general guidelines and advice about achieving waste management outcomes of the Townsville City Plan and satisfying any assessment criteria which identifies this planning scheme policy section as providing that guidance or advice;

(c) state standards for waste management, storage and servicing identified in assessment criteria and whichidentifies this planning scheme policy section as providing the standards; and

(d) provide guidelines about the preparation of a waste management plan.

(2) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(a) SC6.4 Development manual planning scheme policy sections:

Section SC6.4.2 Development application guidelines

Section SC6.4.5 Road network infrastructure, Clause SC6.4.5.3 Public transport facilities,

Section SC6.4.5 Road network infrastructure, SC6.4.5.4 Car parking

Section SC6.4.5 Road network infrastructure, SC6.4.5.5 Driveways

Section SC6.4.12 Landscaping and open space

Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.1 Geometric road design

(b) Townsville City Council:

Trade Waste Policy

Water Supply (Safety & Reliability) Act 2008.

Trade Waste Management Plan 2019

(c) Legislation:

Waste Reduction and Recycling Regulation 2023

Environmental Protection Regulation 2019

Environmental Protection (Water and Wetland Biodiversity) Policy 2019

ESR/2015/1571 Guideline: Clinical and related waste

(d) Australian Standards:

AS/NZS 3816 *Management of clinical and related waste (Set)*

AS/NZS 2890 *Parking facilities (Set)*

AS 4123 *Mobile waste containers (Set)*

SC6.4.22.2 Waste management plans

(1) Submission of waste management plans

Where proposed developments are likely to generate unusual or large amounts of waste, a waste management plan (WMP) may be required in demonstration of providing appropriate waste storage and waste servicing.

(a) Council may require submission of a waste management plan for development involving the following development thresholds:

(i) a residential use with more than 10 dwellings;

(ii) a business/commercial/industrial use with a gross floor area greater than 500 m² or any use likely to generate large or unusual amounts of waste, including educational establishment, rooming accommodation, hotel major sport, recreation, and entertainment facility;

(iii) an environmentally relevant activity (as defined by Schedule 2 of the *Environmental Protection Regulation2019)* and/or development involving the use of a hazardous materials or chemicals;

(iv) operational works involving substantial waste materials resulting from removal and construction of newinfrastructure or demolition and major earthworks; and

(v) another use or activity, where identified as having significant waste management requirements.

(b) Where WMPs are required to support a development application, it should be tailored to the needs of the proposal.

(c) Short term activities or small scale, uncomplicated developments require relatively simple and short WMPs.

(d) Larger proposals will require detailed plans covering the different stages of the development, operations orworks program.

(2) Information required in waste management plan

A WMP should be submitted detailing how the proposal will meet the requirements of the Townsville City Plan and consider the following issues:

(a) Residential applications:

(i) types and amounts of waste that may be generated based on number of dwellings;

(ii) how the waste will be disposed including number of mobile storage bins or nomination of asuitable size bulk bin;

Editor's Note - All residential waste must be removed by council.

(iii) access and egress for council waste collection vehicles;

Editor's Note - Applicants should refer to Sections SC6.4.5 Road network Infrastructure Clauses SC6.4.5.4 Car Parking, SC6.4.5.3 Public Transport Facilities, and SC6.4.5.5 Driveways for additional information on design and access requirements.

(iv) screening of waste facilities by landscaping or other suitable means and where required, nomination of separation distances to property boundary or other residential buildings;

Editor's Note - Applicants should refer to Section SC6.4.12 Landscaping and open space for additional information regarding landscape treatments.

(v) design of facility incorporating requirements from Clause SC6.4.22.3 Waste management

standards for development, and Table SC6.4.22.1 General Requirements;

1. sensitivity of the receiving environment and neighbouring residents (adequate setbacks of waste areas from adjoining property boundaries to prevent odour, dust or noise nuisance);and
2. designated bin wash down facilities to be identified for the contained cleaning of waste bins.

Editor's Note – Bin washing water is not to be disposed of into stormwater facilities.

(b) Commercial and industrial applications:

(i) types and amounts of waste that may be generated by the authorised activities;

(ii) how the waste will be dealt with, including a description of the types and amounts of waste that will be dealt with;

(iii) procedures for identifying and implementing opportunities to minimise the amount of waste generated, promote efficiency in the use of resources, and otherwise improve the waste management practices employed, including recycling;

(iv) details of waste management practices that are congruent with Queensland *Waste Management and Resource Recovery Strategy* and targets;

(v) access and egress for those disposing waste and for waste collection vehicles;

Editor's Note - Applicants should refer to Section SC6.4.5 Road network infrastructure, Clauses relating to SC6.4.5.4 Car parking, SC6.4.5.3 Public transport facilities, and SC6.4.5.5 Driveways for additional information on design and access requirements.

Editor's Note - If the waste is stored in a secured underground shelter, then the waste must be taken out and presented toTownsville Waste Services on collection day.

(vi) noise management considerations;

(vii) screening of waste facilities by landscaping when used in combination with other suitable means and where required, nomination of separation distances to property boundary or other sensitive land uses;

Editor's Note - Applicants should refer to Section SC6.4.12 Landscaping and open space for additional information regarding landscape treatments.

(viii) details of any accredited management system employed, or planned to be employed, to deal with thewaste;

(ix) how often the performance of the waste management practices will be assessed;

(x) the indicators or other criteria on which the performance of the waste management practices will beassessed;

(xi) staff training on matters relevant to waste management;

(xii) details of the responsible person for implementing the WMP;

(xiii) procedures for dealing with accidents, spills, and other incidents;

(xiv) sensitivity of the receiving environment, and neighbouring residents (adequate setbacks of waste areas from adjoining property boundaries to prevent odour, dust, or noise nuisance);

(xv) management of odour;

(xvi) extent and life of the proposed activities;

(xvii) details of bunding arrangements to contain waste where appropriate; and

(xviii) designated bin wash down facilities to be identified for the contained cleaning of waste bins.

Editor's Note - Bin washing water is not to be disposed of into stormwater facilities.

(c) Council may request other reasonable management strategies in relation to individual developments.

(d) The WMP must be implemented during construction and at commencement of the use or the signing of thesurvey plan.

(e) WPMs should take into account any staging of a development.

(f) Consideration of screening treatments will include ensuring structural safety, and durability to minimise whole of life costs, and where practical, integration into the building design and constructed from similar materials used in the building design (integration). Screening must be to a minimum of the height of the bins used and should ensure screening addresses adjoining uses and public spaces.

(g) Any amendments to a WMP must not be implemented until approval from council is received.

SC6.4.22.3 Waste management standards for development

(1) General requirements

(a) The waste management standards for development are identified in the following section and in Table SC6.4.22.1 General Requirements.

(b) In addition to the requirements of Table SC6.4.22.1 General Requirements, the following standards shall be considered for development:

(i) access for a waste collection vehicle to an on-site or kerbside bin or a compactor is maintained at all times; or

(ii) "No Standing Any Time" signs are to be installed in designated waste truck turning areas including residential developments, cul-de-sacs and other locations to enable safe access for waste vehicles; or

(iii) a development application is to indicate the days and times that a waste removal service is to operate. If evidence from a waste collection contractor indicates that collection will occur outside normal service/delivery or business times, it may be permissible to allow a waste collection vehicle to utilise service bays or parking spaces on the site for access; or

(iv) where applicable, development is to provide the vertical and horizontal clearances for the service to operate safely, and efficiently. Unless otherwise stated in Table SC6.4.22.1 General Requirements, the minimum vertical clearance required for movement of a waste collection vehicle is 6.5 m. Larger operational clearance dimensions may be required depending on site specific requirements; or

(v) where applicable, a development that proposes to utilise a waste collection system requiring clearances less than 6.5 m for vehicle movement is to include a written confirmation from the proposed waste collection provider giving full details of the proposed system, bin sizes, number of bins, frequency of collection and the waste collection vehicle size; or

(vi) all waste collection for residential development is to be collected by Council, whilst office waste may be collected by the council or a private operator and retail, shop, or industrial waste collection may be collected by a private operator; or

(vii) whether domestic waste collection is from a bulk storage area or bins located throughout a unit development, all circulation and access roads utilised by a waste vehicle are to be a minimum of 6.5 m wide; or

(viii) where a development has access onto a road, all waste collection is from within the site. For access to a road the waste truck is required to enter and leave the site in a forward direction; or

Editor's Note - Applicants should refer to Section SC6.4.5. Road network infrastructure for additional information.

(ix) industrial development is to indicate the location of the waste collection area in the development application and provide an indication of the proposed method of disposal of waste, including trade waste. Where disposal of industrial or commercial liquid waste by discharge to a road tanker application is necessary, the road tanker is able to stand totally on-site, and comply with all other relevant regulations; or

(x) the owner/occupier must keep bins clean, in good repair and securely covered; or

(xi) the property must be designed to store the bin/s at ground level, and generally located towards the rear of the premises or, if not, out of site of the general public, except when put out for collection (one day maximum); or

(xii) where required, the property must be designed to facilitate the placing of the bin/s out (on the specified collection day) as follows:

1. on, or as close as possible to, the kerb adjacent to the premises, with the bin axle away from theroad;
2. with no structure or obstacle preventing the waste/ recycling crew from picking the bin up; and
3. with at least 500 mm spacing between the bins; or

(xiii) particular serviced premises may be required to keep the bin on an elevated platform or an imperviouslypaved area, enclosed and/or with drainage; or

(xiv) Council may also instruct certain residential premises to dispose of their waste by an approvedenvironmental licensed authority.

(c) Applications must ensure that adequate unhindered access for waste collection vehicles is possible, ensuring that not only the road reserve widths accommodate a waste collection vehicle, but that vehicles can safely and efficiently collect kerb side waste.

(d) Waste collection from properties in cul-de-sac heads or hammer heads may require kerb side concrete hardstand areas to be constructed to ensure that kerb side collection remains possible. Clause SC6.4.22.5 Concrete hardstand design for wheelie bins provides the design specification for kerb site domestic wheelie bins.

Editor's Note - Applicants may be asked to submit a plan demonstrating the location of waste collection points.

(e) Waste collection from a laneway is only permitted when the laneway has through access, sufficient width to accommodate the waste collection vehicle and the identification of wheelie bin collection points. Overhead services also need to be clear of the waste collection area.

(f) Private access handles where multiple lots may be serviced from, are not accessible by a waste collection vehicle. In such instances, a safe designated kerb side collection point is to be nominated. Clause SC6.4.22.5 Concrete hardstand design for wheelie bins provides the design specification for kerb side domestic wheelie bins.

Editor's Note - Applicants may be asked to submit a plan demonstrating the location of waste collection points.

(g) Where waste collection points are nominated away from the property being serviced (cul-de-sacs, laneways, access handles), nominated collection points are not permitted adjacent to a park, and are not to compromise the safe use or access to pedestrian, or other utility service.

Editor's Note - Applicants may be asked to submit a plan demonstrating the location of waste collection points.

(h) Where staged residential estates result in temporary no through connection roads (for example, until subsequent stage construction is complete), a compacted gravel (or equivalent) turnaround is required to be created at the end of a constructed road within a public tenure (I.e., road reserve).

Editor's Note - Waste collection vehicles will not be permitted to use privately owned land to turnaround.

(i) In instances where roads terminate to adjoining land and adjoining land is in separate/different ownership or not subject to the development application, applicants will need to provide a turnaround area within the development site until future through connection can be established. In this instance, the turnaround area will need to be constructed of durable material.

(j) If a rear lot, the frontage is to include an additional truncated area to provide sufficient space for the servicing of mobile waste containers. These truncated collection points are to avoid obstructing any driveway or encroachment onto neighbouring frontages.

(k) If there are two or more rear lots, no more than two adjoining truncated areas are provided for the servicing ofmobile waste containers.

(l) Collection points are not located:

(i) near intersections;

(ii) near roundabouts or traffic calming devices (or other traffic management devices);

(iii) on arterial road frontages;

(iv) in narrow lanes (where waste collection vehicle access is difficult or impossible);

(v) near bus stops; and

(vi) near pedestrian crossings.

(m) Where on street (kerbside) waste collection is proposed for standard domestic waste containers sufficient kerbside space is provided adjacent to the frontage of the premises for the required number of bins and such space is:

(i) clearly separated from car parking bays, loading bays and other similar no standing areas;

(ii) clear of overhanging branches, awnings, and other such hindrances to servicing by a lifter arm;

(iii) clear of footpaths and pedestrian access connections to the road;

(iv) not in front of shop entrances or private residential premises;

(v) not blocking the vision of vehicles using the roadway or entering and exiting the property;

(vi) capable of being serviced safely without the collection vehicle impeding traffic flow during servicing; and

(vii) capable of being serviced while the collection vehicle travels forward (I.e., without the vehicle needing to reverse).

SC6.4.22.4 Regulated waste guidlines

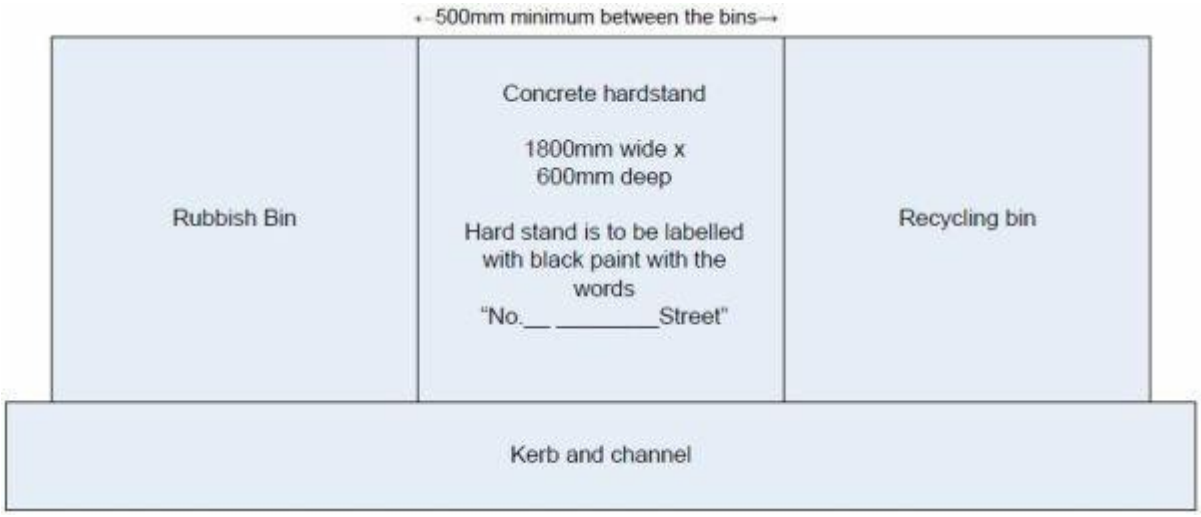
(1) Regulated waste is administered by the Department of Environment, Science and Innovation.

(2) Transport, storage, recycling, or disposal, of regulated wastes are environmentally relevant activities.

(3) Environmentally relevant activities that are prescribed activities are generally industrial activities but can also include some agricultural activities. A full list of all prescribed ERAs can be found in Schedule 2 of the *Environmental Protection Regulation 2019.*

SC6.4.22.5 Concrete hardstand design for wheelie bins

Where waste collection vehicles are unable to collect wheelie bins directly in front of a property due to access restrictions, owner/occupiers must take the bin/s to a designated collection point. The diagram below demonstrates the dimensions required for a hardstand for these bins at the designated collection point.



SC6.4.22.6 Examples of bin storage areas

FOR SALE

APARTMENTS ON YOC LANE

Figure SC6.4.22.1 Example of Concrete Hardstand for Mobile Waste Containers or a Bulk Bin

Figure SC6.4.22.2 Enclosed Concrete Hardstand for Bulk Waste and Recycling Mobile Waste Containers

SC6.4.22.7 Bulk bin specifications

Editor's Note - Refer to AS 4123 for the standard sizing of bulk bins. Bulk bins must be ordered well in advance to ensure availability.

Table SC6.4.22.1 - General Requirements

	General details	Access and collection	Locality of storage areas/design of facility

Residential (dwelling house dual occupancies)	Mobile waste containers (240 L)are used for both waste collection and recycling. Owner/occupiers may also choose to pay a small additionalcharge for a 360 L recycling bin.	Where sloping areas exist (≥15%), an adequate level hardstand area with sufficient space to accommodate all bins for collection is to be made available along the street frontage for the collection of mobile waste and recycling containers collected fortnightly. Refer to SC6.4.22.5 for an auto court concrete hardstanddesign for wheelie bins. Other arrangements may be negotiated.	Mobile waste containers mustbe stored at a location within the property boundary that avoids nuisance to neighbouring properties.

Residential (including multiple dwelling, residential care facility retirement facility and the like)	Developments containing a maximum of 10 dwellings will be issued with new mobile waste containers unless there is insufficient footpath to place the waste and recycling bins for collection. Where on street access for collection of mobile garbage (wheelie) bins is not available, ormultiple dwellings contain more than 10 dwelling (or similar) thedeveloper must provide bulk waste facilities. Refer to SC6.4.22.7 for more information on bulk bin collections. Recycling bins will be allocated at the rate of: 1-4 dwellings 1 bin per dwelling 5-10 dwellings 5 bins More than 10 dwellings 1 bin per 2 dwellings Addition recycle bins may be requested.	Access roads must be designed and constructed to accept vehicle loadings of notless that G.V.M. 33 tonnes. If the road system is incapable of allowing waste vehicle access, tailored solutions will be negotiated with the developer in association with the Waste Services Division. Vehicles must be capable of exiting the site in a forward gear. A turning circle of 25 m is required. Waste collection facilities are to be located within the curtilage of the premises in an accessible location to receive the service. Facilities should be sited in front of any entry gates to thebuilding. Where security gatescross the driveway restricting vehicular access to the site, bin storage areas are to be located within property boundaries on the street side of the gate. A minimum overhead clearance of 6.5m is required (with an additional 2mif located near power lines). This must be unobstructed byanything overhead such as trees, wires, sails, awnings, fascia, or other structures. Where sloping areas (≥15%) such as steep road reserves exist, an adequate level hard stand area with sufficient space to accommodate all bins for collection is to be made available along the street	For multiple dwellings where there is sufficient room for each dwelling to store their mobile waste containers; the resident of each dwelling is responsible for the storage of their bins (including recycling bins). Where there is insufficient space for individuals to accommodate their bins, a common waste storage area must be provided of a sufficient size to accommodate all bins (including recycling bins). Storage areas must provide convenient access for owners, tenants, and collection vehicles. Refer to SC6.4.22.6 for examples of bin storage areas. Facilities must provide a suitable level enclosure with a concrete slab floor, graded, and drained through an approved sediment/silt trap to a legal sewer connection. A hose cock and hose must be fitted in close proximity to the enclosure. Enclosure dimensions for bulk bins must exceed the size of the nominated bin size by at least 300 mm at the rear and both sides and 600 mm at the front; and be oriented to allow convenient access for collection. Where mobile wastecontainers are in use, an adequate storage area must be provided. Facilities must be enclosed/screened such that

		frontage for the collection of mobile waste containers (collected weekly) and recycling mobile waste containers (collected fortnightly).	they are not visible from any street frontage.

Commercial and business industrial	The proprietor is to arrange for the removal of waste from the premises by a suitably licensedwaste transport contractor. Putrescible waste arising from activities undertaken on this development must be collectedand removed at periods not exceeding seven days. (a) The collection of waste isto be undertaken to minimise, as far as reasonably practicable, excessive noise to neighbouring occupants. The collection method must ensure that waste is adequately managed to prevent escape or contamination. (b) Where the development has the potential to generate or handle clinical and regulated waste material; clinical and medical related waste is to be handled in accordance with AS/NZS3816; and the *Environmental Protection Regulation2019*. (c) Where practicable, all loading and unloading shall take place within	Access roads and driveways must be designed and constructed to accept vehicleloadings of not less that G.V.M. 33 tonnes. Vehicles must be capable of exiting thesite in a forward direction. A turning circle of 25 m is required. A minimum overhead clearance of 6.5 m is required (with an additional 2 m if located near power lines). Thismust be unobstructed by anything overhead such as trees, wires, sails, awnings, fascia, or other structures.	Facilities are to be located within the curtilage of the premises in an accessible location to receive the service. Facilities should be sited in front of any entry gates to the building. Where security gates cross the driveway restricting vehicular access to the site, bin storage areas are to be locatedwithin property boundaries on the street side of the gate. Adequate provision must be made for the collection of the waste storage containers withinthe premises. Storage of waste must notcause odour, dust, or noise related nuisance to neighbouring properties. Facilities must provide a suitable level enclosure with a concrete slab floor, graded, and drained through an approved sediment/silt trap to a legal sewer connection. A hose cock and

	the containment area (storage area). This area is to be constructed in such a way that any spills from loading or unloading are not permitted to escape to areas exposed to storm water.		hose must be fitted in close proximity to the enclosure. Bulk bin enclosure dimensions must exceed the size of the nominated bin size by at least 300 mm at the rear and both sides and 600 mm at the front; and be oriented to allow convenient access by thecollection vehicle. Where mobile waste containers are inuse, an adequate storage areamust be provided. Facilities must be enclosed/screened such thatthey are not visible from anystreet frontage.

	(d) Trade Waste is to be managed in accordance with Council's Liquid Trade Waste Management Plan 2019		

Table SC6.4.22.2 Bin/Wheelie Bin Equivalency

Bin Volume	No. of equivalent bins
660L	3 x 240L
1100L	5 x 240L
1500L	6 x 240L
3000L	12 x 240L

Table SC6.4.22.3 Bin Allocations for Types of Development

Recycling and Waste bins available for units, multi dwelling units and commercial units
240 L plastic
360 L plastic (recycling)
Bulk Recycling and Waste bins available for multi dwelling units and commercial units
660 L plastic/metal
1100 L plastic/metal
Bulk Waste bins available for multi dwelling units and commercial units
1 m^3 metal
1.5 m^3 metal
3.0 m^3 metal

Table SC6.4.22.4 - Waste Bin Types and Dimensions

Bin type	Capacity	Dimensions (width x height x depth in mm)
Side lift	140L 240L	535 x 915 x 615 585 x 1060 x 730
Rear lift	140L 240L 660L	535 x 915 x 615 585 x 1060 x 730 1260 x 1235 x 780

	1100L	1280 x 1340 x 1080
Front lift	1100L 1500L 3000L	1480 x 1300 x 1040 2080 x 1300 x 1040 2080 x 1538 x 1505
Roll on-roll off	10/15/30m^3	Various

Development manual planning scheme policy (PSP)

SC6.4.23 Construction management, quality management, inspection and testing

Index

SC6.4.23.1 Construction Management

(1) Introduction

(2) Reference and sourced documents

(3) Pre-construction guidelines

(4) Construction standards and guidelines

(5) Quality management system

(6) Works inspection fees

SC6.4.23.2 Maximum lot sizes and minimum test frequencies

(1) Tables of lot sizes and testing frequencies

SC6.4.23.3 Random sampling

(1) General

(2) Locations

SC6.4.23.4 Method statement requirements

SC6.4.23.5 Minimum inspection and test plan

(1) Tables of construction hold points and witness points

SC6.4.23.6 Forms

Form A - Non-Conformance Certificate (NCC) - Template
Form B - Non-Conformance Report (NCR) - Template
Form C - Notice of Non-Conformance Report (NNC) - Template
Form D - Corrective and Preventive Action Request (CPAR) – Template
Form E - Notice to Commence Works

SC6.4.23.1 Construction management

(1) Introduction

(a) This section outlines the standards and provides advice and guidelines for construction management of development and covers pre-construction, construction, quality management systems, and testing frequency.

(b) All development works shall be inspected by a Registered Professional Engineer of Queensland with relevant experience. Where the owner or Developer does not have such a Professional Engineer in their employ, a Registered Consulting Professional Engineer shall be retained for the purpose of inspecting the development works, prior to the commencement of work.

(c) This section aims to clearly define the role of Council, Superintendent, Consultant, Principal Contractor and the Developer. This section seeks to ensure that inherited development works are constructed to achieve a cost-effective operation and maintenance asset and perform adequately for their design lives.

(2) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(a) SC6.4 Development manual planning scheme policy sections:

Section SC6.4.10 Stormwater quality

Section SC6.4.11 Water and sewerage (Pipeline testing and restoration)

Section SC6.4.6 Road works and traffic control

(b) Australian Standards:

AS 1012.1	*Methods of testing concrete - Method 1: Sampling of fresh concrete*
AS 1012.3.1	*Methods of testing concrete - Method 3.1: Determination of properties related to the consistency of concrete - Slump test*
AS 1012.14	*Methods of testing concrete - Method 14: Method for securing and testing cores from hardened concrete for compressive strength*
AS 1012.4	*Methods of testing concrete - Method 4: Determination of properties related to the consistency of concrete - Compactibility index*
AS 1012.8	*Methods of testing concrete - Method 8: Method of making and curing concrete*
AS 1012.9	*Methods of testing concrete - Method 9: Determination of the compressive strength of concrete specimens*
AS 1141.11	*Methods for sampling and testing aggregates Method 11: Particle size distribution,*
AS 1141.12	*Methods for sampling and testing of aggregates - Method 12: Materials finer than 75 micrometre in aggregates (by washing)*
AS 1141.14	*Methods for sampling and testing aggregates - Method 14: Particle shape, by proportional calliper*
AS 1141.15	*Methods for sampling and testing aggregates - Method 15: Flakiness index*
AS 1141.18	*Methods for sampling and testing aggregates - Method 18: Crushed particles in coarse aggregate derived from gravel*
AS 1141.22	*Methods for sampling and testing aggregates - Method 22: Wet/dry strength variation*
AS 1141.23	*Methods for sampling and testing aggregates - Method 23: Los Angeles value*
AS 1141.24	*Methods for sampling and testing aggregates - Method 24: Aggregate soundness -*

	Evaluation by exposure to sodium sulphate solution
AS 1141.25	*Methods for sampling and testing aggregates - Method 25: Degradation factor*
AS 1141.25.1	*Methods for sampling and testing aggregates - Method 25.1: Degradation factor - Source rock*
AS 1141.42	*Methods for sampling and testing aggregates - Method 42 Pendulum friction test*
AS 1160	*Bituminous emulsions for the construction and maintenance of pavements*
AS 1289.3.2.1	*Methods of testing soils for engineering purposes - Method 3.2.1: Soil classification tests - Determination of the plastic limit of a soil - Standard method*
AS 1289.3.3.1	*Methods of testing soils for engineering purposes - Method 3.3.1: Soil classification tests - Calculation of the plasticity index of a soil*
AS 1289.3.6.1	*Methods of testing soils for engineering purposes - Method 3.6.1: Soil classification tests - Determination of the particle size distribution of a soil - Standard method of analysis by sieving*
AS 1289.3.7.1	*Methods of testing soils for engineering purposes - Method 3.7.1: Soil classification tests - Determination of the sand equivalent of a soil using a power- operated shaker*
AS 1289.4.2.1	*Methods of testing soils for engineering purposes - Method 4.2.1: Soil chemical tests - Determination of the sulphate content of a natural soil and the sulphate content of the groundwater - Normal method*
AS 1289.4.3.1	*Methods of testing soils for engineering purposes - Method 4.3.1: Soil chemical tests - Determination of the pH value of a soil - Electrometric method*
AS 1289.4.4.1	*Methods of testing soils for engineering purposes - Method 4.4.1: Soil chemical tests - Determination of the electrical resistivity of a soil - Method for sands and granular materials*
AS 1289.5.1.1	*Methods of testing soils for engineering purposes - Method 5.1.1: Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using standard compactive effort*
AS 1289.5.4.1	*Methods of testing soils for engineering purposes - Method 5.4.1: Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio*
AS 1289.5.5.1	*Methods of testing soils for engineering purposes - Method 5.5.1: Soil compaction and density tests - Determination of the minimum and maximum dry density of a cohesionless material - Standard method*
AS 1289.5.7.1	*Methods of testing soils for engineering purposes - Method 5.7.1: Soil compaction and density tests - Compaction control test - Hilf density ratio and Hilf moisture variation (rapid method)*
AS 1289.5.8.1	*Methods of testing soils for engineering purposes - Method 5.8.1: Soil compaction and density tests - Determination of field density and field moisture content of a soil using a nuclear surface moisture–Density gauge - Direct transmission mode*
AS 1289.6.1.1	*Methods of testing soils for engineering purposes - Method 6.1.1: Soil strength and consolidation tests - Determination of the California Bearing Ratio of a soil - Standard laboratory method for a remoulded specimen*
AS 1432	*Copper tubes for plumbing, gas fitting and drainage applications*
AS 1477	*PVC pipes and fittings for pressure applications*

AS 1478	*Chemical admixtures for concrete, mortar, and grout (Set)*
AS 1580.107.3	*Paints and related materials - Methods of test - Method 107.3: Determination of wet film thickness by gauge*
AS 1741	*Vitrified clay pipes and fittings with flexible joints - Sewer quality*
AS 1742.3	*Manual of uniform traffic control devices - Part 3: Traffic control for works onroads*
AS 2008	*Bitumen for pavements*
AS/NZS 2032	*Installation of PVC pipe systems*
AS 2129	*Flanges for pipes, valves, and fittings*
AS 2280	*Ductile iron pipes and fittings*
AS 2150	*Asphalt - A guide to good practice*
AS 2544	*Grey iron pressure fittings*
AS 2638.1	*Gate valves for waterworks purposes - Part 1: Metal seated*
AS 2638.2	*Gate valves for waterworks purposes – Part 2: Resilient seated*
AS 2758.1	*Aggregates and rock for engineering purposes - Part 1: Concrete aggregates*
AS 2891.9.3	*Methods of sampling and testing asphalt - Method 9.3: Determination of bulk density of compacted asphalt - Mensuration method*
AS/NZS 1477	*PVC pipes and fittings for pressure applications*
AS 3439	*Low-voltage switchgear and control gear assemblies*
AS/NZS 3582.1	*Supplementary cementitious materials – Part 1: Fly ash*
AS 3583.1	*Methods of test for supplementary cementitious materials for use with Portland and blended cement - Method 1: Determination of fineness by the 45 micrometre sieve*
AS 3583.12	*Methods of test for supplementary cementitious materials for use with Portland cement - Method 12: Determination of available alkali*
AS 3583.13	*Methods of test for supplementary cementitious materials for use with Portland cement - Method 13: Determination of chloride ion content*
AS 3583.14	*Methods of test for supplementary cementitious materials for use with Portland cement - Method 14: Determination of insoluble residue content*
AS 3583.2	*Methods of test for supplementary cementitious materials for use with Portland cement - Method 2: Determination of moisture content*
AS 3799	*Liquid membrane-forming curing compounds for concrete*
AS/NZS 3905.12	*Quality system guidelines - Part 12: Guide to AS/NZS ISO 9001 for architectural and engineering design practices*
AS 3952	*Water supply - Spring hydrant valve for waterworks purposes*
AS 3972	*General purpose and blended cements*
AS 4198	*Precast concrete access and maintenance chambers for sewerage applications*
AS 4373	*Pruning of Amenity Trees*
AS/NZS 4455	*Masonry units, pavers, flags, and segmental retaining wall units (Set)*
AS 4687	*Temporary Fencing and Hoardings*
AS 4970	*Protection of trees on development sites*

AS 5101.4 *Methods for preparation and testing of stabilized materials - Method 4- Unconfined compressive strength of compacted materials*

AS/NZS ISO 9001 *Quality management systems - Requirements*

AS ISO 10006 *Quality management systems - Guidelines for quality management in projects*

AS ISO 10013 *Guidelines for quality management system documentation*

(c) Department of Transport and Main Roads:

Standard Specifications Roads

MRTS17 *Bitumen and Multigrade Bitumen*

MRTS18 *Polymer Modified Binder (including Crumb Rubber)*

MRTS21 *Bituminous Emulsion*

MRTS22 *Supply of Cover Aggregate*

MRTS30 *Asphalt Pavements*

Materials Testing Manual

Q103A *Particle size distribution of soil – wet sieving*

Q104A *Liquid limit of soil*

Q104D *Liquid limit of soil – one point*

Q105 *Plastic limit and plasticity index of soil*

Q115 *Unconfined compressive strength of stabilised materials*

Q142A *Dry density – moisture relationship of soils and crushed rock – standard*

Q201 *Flakiness index of aggregate*

Q208B *Degradation factor of coarse aggregate*

(d) Other:

American Society for Testing and Materials (ASTM) International ASTM-D 2434-19 - *Standard Test Method for Permeability of Granular Soils (Constant Head)*

Environmental Protection (Noise) Policy (EPP (Noise)) 2019

International Erosion Control Association *Best Practice Erosion and Sediment Control Document(BPESC)*

NSW Department of Transport, Roads and Maritime Services (RMS), *Test method T432: Rate of slaking of quicklime, October 2012*

Work Health and Safety Act 2011

(3) Pre-construction guidelines

(a) Pre-construction steps

The chart presented below indicates the steps required to be undertaken prior to commencement of works.

(b) Notice to commence work

The Developer must give Council's Development Assessment Unit (DAU) notification of at least 5 business days (in writing) of their intention to commence construction works. Refer to the Development works - notice to commence works form (Refer to SC6.4.23.1 (7) Form E or click here to view document) for a list of requirements to be submitted prior to or at the pre-start meeting.

(c) Prestart meeting

The nominated Consultant must ensure that a pre-start meeting is conducted on the premises between the Contractor, Inspecting engineer (RPEQ), the design consultant and Council representatives. This meeting represents a hold point and works may not proceed until the meeting is held and any further requirements identified have been satisfied. The pre-start meeting must be based on an agenda which includes:

(i) introduction of the Principal Contractor, inspecting engineer (RPEQ), design consultant (including any specialist) and Council representative. A statement of their respective roles and relevant personnel contact details must also be tabled and distributed at that meeting;

(ii) confirmation that all relevant statutory permits/approvals have been obtained;

(iii) evidence of current public liability insurance. Refer to Clause SC6.4.23.1 (4)(u) Insurance and indemnity;

(iv) review and discussion of all relevant conditions of the development approval;

(v) review and confirmation of the site establishment and access arrangements including all necessary site security fencing and signage requirements;

(vi) review and discussion of the approved traffic management plan and haulage routes if applicable;

(vii) review and discussion on a schedule of "hold-points" to be adopted throughout the construction phase. This schedule of "hold-points" is to be approved by Council prior to construction proceeding;

(viii) discussion of site specific workplace health and safety issues and an approved work method statement and safety plan in compliance with the *Work Health and Safety Act 2011*;

(ix) review of the approved erosion and sediment control plan including site base stormwater management plans and sediment controls during and post construction. Refer to Clause SC6.4.23.1 (4)(k) Erosion and sediment control and Section SC6.4.8 Stormwater management for further details regarding this requirement;

(x) location confirmation and identification of all existing public utilities, services, and Council assets if applicable, including any approved demolition/rectification actions if required;

(xi) scheduling and identification of all necessary responsible persons to undertake any Council requiredworks (e.g., disconnection of irrigation systems, sewer line connections etc.);

(xii) review of the vegetation protection plan if applicable and confirmation that any necessary vegetation protection measures are in place;

(xiii) construction schedule and program and any other details that requires review before construction work commences e.g., work quality plan and/or quality manual review of quality requirements Clause SC6.4.23.1 (5) Quality management system) and inspection test plan requirements;

(xiv) if required, a development notice (project sign in accordance with Clause SC6.4.23.1 (4)(f) Development notice) is to be erected;

(xv) confirmation of possession of site by the Contractor; and

(xvi) any other relevant matters specified by the Principal Contractor, inspecting engineer (RPEQ), consultant/s and/or Council representative that may be pertinent to the successful completion of the project.

(4) Construction standards and guidelines

The following are general standards and guidelines during the construction of development works:

(a) Superintendent

The Superintendent to administer the construction contract is to be appointed by the principal. The works must be inspected by a suitably qualified person under the control of an RPEQ throughout the construction period. The inspecting engineer (RPEQ) is to take full responsibility to ensure that all works are constructed in accordance with the approved drawings and specifications.

Editor's Note - The "Superintendent" is appointed by the "Principal" to administer the construction contract between the Principal and the Contractor and can be an independent third party from the design engineer.

(b) Hours of work

Unless otherwise approved by Council (in writing), works involving machinery of any description shall only be carried out on site from 6.30 am to 6:30 pm Monday to Saturday, subject to legislative requirements. No construction work is to take place on Sundays and public holidays without prior approval. Construction work includes deliveries to the site of the works and the onsite servicing of equipment.

(c) Relocation/alteration and repair to existing utility services

The location and level of all existing public utilities and services and the alignment for any new service utility or service in association are to be identified with the relevant authority or Council asset owner. The Developer is responsible for any relocation and/or alteration to any public utility installation required as a result of any works carried out in connection with this development at no cost to Council.

The Contractor is to ensure that utmost care is to be exercised during the progress of the development works to prevent damage to any existing utility or service. Any damage to existing utilities or services directly resulting from the development works shall be the responsibility of the Developer.

(d) Provision for traffic management

No works shall be conducted within an existing public road without approval (i.e., Road work permit). Any proposed road closure (partial or full), or traffic diversion is to be presented (with full details of proposed traffic management) for approval. Proposed traffic management is to comply with the relevant sections of Section SC6.4.6 Road works and traffic control.

The Developer is to ensure that all appropriate approvals and permits are obtained from Council for work zones, gantries and scaffolding prior to commencement of construction.

The Developer shall be held responsible for implementing the approved traffic management plan including the safety of all vehicles, pedestrians and cyclists and must provide all necessary measures to prevent any accident, damage, and loss.

(e) Condition of entry to adjoining properties

The Developer or its representative must effectively protect all adjoining properties against any loss, damage or injury that may occur as a result of development works.

Works must not be undertaken on adjoining properties without prior written consent of the lawful owner. All adjoining property which has been disturbed as a result of the development shall be reinstated to a finish similar to its pre-development state or to an alternative state agreed to in writing by the affected property owner.

Upon completion of the development works, written approval from any affected property owners will be required by Council prior to acceptance of the completed development works.

(f) Development notice (project sign)

Where required, a project sign is to be erected within the site boundaries on the road frontage of the subject site or any other Council approved location that is prominent and visible to the public. The Developer is responsible for maintaining the signage for the duration of the construction. The signage shall have the following information (as a minimum):

(i) description of development (include an overall concept plan);

(ii) name of developer;

(iii) name of project;

(iv) street address of the site;

(v) inspecting engineer’s name and phone number;

(vi) consultant’s name and phone number;

(vii) principal contractor’s name and phone number; and

(viii) other specialist consultants’ names and phone numbers.

(g) Signage and security

All necessary signage and site security shall be provided wholly within the site and in strict accordance with current Workplace Health and Safety (QLD) guidelines and requirements.

(h) Site access

The construction site shall be accessed via one convenient access from a public road. The location and details of this access point is to be approved by Council prior to construction commencing. This access point shall be used by all vehicles, equipment, and personnel during the approved construction

hours of the site. Appropriate vehicle “shake-down” facilities are to be provided at the point of access in accordance with appropriate water quality management objectives for the site. The vehicle shake-down facility is to be a minimum 1.5 m long by 3 m wide for one-way or 6 m wide for two-way entrances.

(i) Site fencing

The Developer must erect a temporary security fence to restrict unauthorised access into the construction site. The fence is to extend around the entire perimeter of the site with access being provided as outlined above. The Developer is to refer to Section SC6.4.6 Road work and traffic control for details of the temporary fence.

(j) Site management

The Contractor is responsible for the management of the construction site and control of construction activities throughout the period of works, with particular attention to reducing the impact of the construction work on the public, adjacent and nearby properties, and other areas of the site not part of the works. The primary objective is to eliminate the impacts of the temporary and permanent works having regard to:

(i) work health and safety;

(ii) erosion control;

(iii) acid sulphate soils;

(iv) run-off;

(v) traffic management;

(vi) disposal of all materials;

(vii) gaseous discharges and odour;

(viii) noise; and

(ix) dust.

Adjacent waterways shall be regularly monitored for turbidity plumes, algal blooms and dead marine life which may be attributable to the construction of the works.

(k) Erosion and sediment control

During the construction phase and up until Council accepts the development works or at the end of the defect liability period, the Contractor shall be responsible for the installation and maintenance of all erosion and sediment control measures on site.

The approved erosion and sediment control plan (ESCP) submitted as part of the operational works or compliance application must be presented during the pre-start meeting. This plan must be presented to Council’s nominated representative for review and “fit-for-purpose” implementation on the site. If the ESCP requires revision to suit the current conditions of the development site, the plan must be amended to achieve the approved set of water quality outcomes required by Council. Work must not commence until the revised ESCP has been approved by Council. Upon approval of the ESCP, the procedures and guidelines outlined in the plan for establishing, managing (inspection and monitoring) and maintaining water quality across the development site shall be the responsibility of the Contractor.

The Developer/Superintendent must submit to Council the as constructed plans for ESCP, at least 5 days prior to requesting the on maintenance inspection.

At the end of the agreed period of implementation and maintenance, all identified temporary sediment control measures must be removed by the Developer and the ground reinstated to Council’s satisfaction.

(l) Suppression of dust

At all times, the Contractor shall ensure that dust resulting from the proposed works, including excavation, backfilling, grading, and stockpiles, is kept to an absolute minimum and to the satisfaction of Council, by approved methods.

(m) Noise control

All construction work is to be undertaken pursuant to the *Environmental Protection (Noise) Policy (EPP (Noise))*. Construction works shall be carried out in accordance with the requirements and restrictions relating to hours of work specified in Clause SC6.4.23.1 (4)(b) above; and the *Environmental Protection Act 1994*.

(n) Hazardous materials

Hazardous materials are to be stored in a hazardous goods store such that it is free from flood and storm tide inundation. The hazardous goods store must ensure that materials cannot enter the environment or cause a public safety nuisance or hazard. Hazardous goods may only be kept on site for the duration of construction and are to be safely removed from site at completion of works, unless otherwise approved by Council.

(o) Machinery refuelling

During construction, fuel and petroleum products shall not be stored on the site nor shall construction equipment and machinery be serviced on the site. Procedures shall be developed and implemented by the Contractor for the refuelling of machinery and equipment which will minimise any potential for contamination of the site by way of spillage. The procedures shall ensure that refuelling on the site occurs within a designated area that does not drain directly into adjacent stormwater systems or waterways. Any procedures developed and implemented in this regard must include bunding of the refuelling area.

Any spillage of fuels and petroleum products during construction shall be reported to the Superintendent. All steps necessary to rectify the contamination shall be undertaken by the Contractor prior to the completion of the works and at no cost to Council.

(p) Materials storage

Materials shall not be stored on site unless approved in writing by the Superintendent or unless material storage details are shown on the drawings and approved by Council.

All necessary measures shall be implemented to reduce the potential for environmental damage, which mayarise from the storage of materials.

(q) Stockpiling of materials

Wherever possible, materials shall be installed directly in place or continually removed from site, eliminating the need for stockpiles. In all other cases, stockpiling of materials shall be on a temporary basis at the discretion of Superintendent.

The location of approved stockpiles shall be in accordance with the ESCP and as a minimum, stockpiles shall:

(i) Remain on site for as little time as practical;

(ii) Be limited to a height of 2 m;

(iii) Not to be located within 10 m of a residential boundary;

(iv) Have batter slopes, covers, and drainage, which limit the potential for erosion and/or segregation;

(v) The Contractor is to erect and maintain a temporary sediment fence around all stockpiles for the duration of the stockpile being on the site.

(r) Vegetation disposal

Burning or burying of waste vegetation on site is not permitted unless otherwise approved by Council. Clearing and grubbing of the development site shall otherwise be undertaken in accordance with Section SC6.4.9 Clearing, grubbing, and earthworks.

(s) Work adjacent to trees and protection of environmentally significant vegetation

(i) Protection of trees and vegetation – general

All existing and newly planted trees and vegetation should be noted on the drawings and protected from damage during construction. The approved vegetation protection plan should be available onsite prior to commencement and during works. The vegetation protection plan will identify key stages where monitoring and certification will be required.

As specified in the vegetation protection plan, a vegetation protection zone must be established on site to ensure the required retention of existing trees and vegetation identified for protection and retention. The vegetation protection zones must be identified as *"no-go"* areas for construction traffic and meet the following requirements:

1. For trees, the extent of the vegetation protection zone is to be determined in accordance with the tree protection zone (TPZ) requirements of AS 4970 - Protection of trees on development sites.
2. For areas of vegetation not including trees, other areas of natural heritage or hydrologically sensitive features, the extent of the Vegetation Protection Zone is to be determined by a qualified arborist, ecologist, or other approved officer.
3. The vegetation protection zone is to be fenced or barricaded to prevent unauthorised vehicle and machinery access, as per AS4970 *Protection of trees on development sites* and AS4687 *Temporary Fencing and Hoardings.*
4. Signage to indicate "Vegetation Protection Zone - No Access" should be installed as per AS4970 *Protection of trees on development sites* and AS1319 *Safety signs for the occupational environment*.
5. Where required, the tree bark is to be protected by wrapping a triple layer of hessian or rubber matting around the tree trunk.
6. Fixing of temporary service wires, nails, screws, stays, guys, and or any other fixing device to trees should be avoided.
7. No fuel, oil dumps or chemicals are allowed to be used or stored within the vegetation protection zone and the servicing or re-fuelling of equipment and vehicles must be carried out away from the vegetation protection zones.
8. Deposition of wind-blown materials (such as cement) into the protection area should be avoided through the attaching of cloth to the vegetation protection zone fencing.
9. Soil compaction and removal of topsoil within the vegetation protection zone is to be avoided. Where compaction occurs, hand methods to de-compact the soil should be used.
10. No vehicles are to access or be parked within the vegetation protection zone. Where traffic is unavoidable within the zone, a 300 mm thick layer of mulch over a geotextile fabric should be placed in the area to protect the trees surface roots and to reduce the risk of soil compaction.
11. No storage of material, equipment or temporary building is to take place within the vegetation protection zone, including the placing of spoil from excavation against tree trunks.

(ii) Fill and excavation near trees and vegetation

1. Any underground service installations within the Vegetation Protection Zone must be bored and the utility authorities must utilise a common trench where possible. Where practical, trenching is to be combined with locations where roots need to be severed for other reasons.
2. Within the vegetation protection zone, all excavation must be carried out by hand digging or with the use of “air-excavation” techniques.
3. Where required, trees, roots or branches are to be cut cleanly without tearing, with clean, sharp tools (chainsaw, secateurs or hand saw) in accordance with the AS 4373 - Pruning of Amenity Trees and under the supervision of a qualified arborist with formal qualifications (Level 3 Australian Qualification Framework) or at least 5 years recognised experience in arboriculture.
4. Cutting of tree roots exceeding 50 mm in diameter should be avoided. Where roots must be cut, this should not unduly disturb the remaining root system.
5. Any ripped or torn roots are cleanly re-cut as soon as noted.
6. Roots to be left exposed for any period of time are covered with wet hessian and maintained in a moist condition until recovered.
7. Immediately after cutting of any roots, Copper Naphthenate or an equivalent alternative solution is to be applied to the cut surface to prevent the incursion of rot or disease - as deemed necessary.
8. Backfill to excavations around tree roots should be with a soil mix similar in consistency and pH value to that of the existing soil.
9. Backfill layers should generally match the soil horizon of the surrounding soil.
10. The depth of fill within the vegetation protection zone should not exceed 200 mm from the original surface level. Immediately after placing any fill around a tree, the area should be watered thoroughly.

(iii) Trees to be transplanted

1 Trees to be transplanted shall be noted on the drawings and/or shall be marked on site by the Superintendent prior to the commencement of construction.

2 Requirements and procedures for transplanting of trees are to be issued by Council for each particular species.

(iv) Damage to trees or vegetation

1 Any unauthorised removal, damage or disturbance undertaken prior to the identification of the protected zone/s (without the required approval) or within the identified protected zone/s shall be rehabilitated by the Contractor to the satisfaction of Council and at no cost to Council.

2 In the event of an unauthorised removal and that rectification works to damaged tree/s or vegetation is impractical, or the rectification work has been carried out by the Contractor and is rejected by Council, then Council may direct the Contractor to remove the trees/vegetation as part of the rectification work. The Contractor will:

a) replace the damaged tree/vegetation with a tree/vegetation of the same species and similar size to Council’s satisfaction; or

b) replace the damaged tree/vegetation with a tree/vegetation of a similar size but different species to Council’s satisfaction; or

c) pay for the cost of replacing the tree/vegetation with the same size and species to Council's satisfaction; or

d) replace the damaged tree/vegetation with a smaller tree/vegetation of an approved species and pay for the difference in cost between the new replacement and a specimen of the same size and species, to Council's satisfaction.

3 The replacement value of an existing tree/vegetation will be calculated using the Revised Burnley Method under the Draft Australian Standard DR 99307 *Amenity Trees – Guide to Valuation system*.

(t) Stormwater quality

Development works may cause changes to the quality, quantity, and flow rate of stormwater discharged from the site. During the construction phase where soil disturbance and construction activity significantly increases the risk of soil erosion or where the development is required to implement a Stormwater Quality Management Plan (SQMP) that has been approved during the operational works approval phase. Council will then require a detailed maintenance regime to control stormwater quality during the construction phase to be presented during the pre-start meeting for review and acceptance by Council unless a detailed maintenance regime has been presented and accepted by Council during the design process.

If the development works involves construction of stormwater quality device/s or is part of a catchment with an existing stormwater quality device, then the Developer and his Contractor must ensure that no stormwater discharge will be permitted to enter such device (directly or indirectly) unless otherwise permitted by Council.Refer to Section SC6.4.10 Stormwater quality.

Any temporary stormwater quality device proposed as part of the development works is to be removed and any land or existing infrastructure disturbed or damaged during the installation of any temporary stormwater quality device shall be reinstated to its former condition to the satisfaction of and at no cost to Council.

(u) Insurance and indemnity

From the commencement of construction until Council accepts the development works or the commencement of the maintenance period, the Developer or Contractor must insure the works against public liability (public liability insurance in the amount of at least $20,000,000 in respect of any one occurrence and for an unlimited number of claims) and other claims arising from the works and indemnify Council against that liability. Council must be included as an interested party to the insurance policy. The Developer must provide Council with evidence and a certificate of currency for the insurance and indemnification before commencing the construction works.

(v) Dilapidation survey

Where required by Council and where development is directly adjacent to existing infrastructure and improvements, it may be prudent for the Developer or his Contractor to carry out a dilapidation survey of all the existing adjoining structures prior to construction commencing. This may reduce any damage claims during the construction period. Any damages to adjacent structures as a result of the development works shall be the responsibility of the Developer.

(w) Fencing

While undertaking development works, and where appropriate, site security fencing is to be erected for the duration of construction activities. Fencing is required to restrict unauthorised site access and to ensure the safety of persons from the subject site and any works on the adjoining road reserve and/or premises.

If existing fencing is to be altered or if there is no existing site fencing, temporary security fencing, as a minimum, shall be provided and maintained for the duration of the construction to prevent unauthorised entry into the property or work area from any adjoining road reserve or property. The

reinstatement of fencing and removal of temporary fencing on completion of the work shall be undertaken.

A construction site may provide any additional amount of security and/or fencing that is considered necessary that will improve the safety of the public or persons working on the site.

(x) Environment

All work shall be carried out in such a manner as to avoid nuisance and/or Environmental Harm. Development shall be planned and executed so that the works undertaken avoid contamination of the site and its surroundings by taking all reasonable and practical measures to prevent or minimise harm (general environmental duty).

Herbicides and other toxic chemicals shall not be used on the site without the prior written approval of the Council or other relevant authority.

(y) Lighting

All lighting associated with the construction activity shall be installed and used so that lighting does not adversely affect the adjoining amenity of nearby sensitive uses, sensitive environmental areas or pose a safety hazard on adjacent road networks. All public road/street lighting systems must be designed in accordance with AS 1158 and must be approved by Ergon prior to construction.

(z) Blasting

Blasting will generally not be permitted. If blasting is necessary and there are no alternatives, it shall be carried out strictly in accordance with Section SC6.4.7 Clearing, grubbing and earthworks clause SC6.4.7.7 and any other relevant requirements found in SC6.4 Development manual planning scheme policy.

(aa) Vibration

Ground vibration levels, transmitted from the construction works, rock breaking, drilling, and piling, operating items of plant, or other noisy activities shall not exceed levels that are close to the lower level of human perception nor is it to cause any unacceptable damage to any adjoining buildings or infrastructure.

Acceptable practices and vibration thresholds shall be determined in accordance with current StatutoryRegulations.

A complaints management system should be devised which includes corrective and preventative actions. Consultation with and information supplied to nearby residents, workers, and any other sensitive noise receptors is to be undertaken when vibration is known to be generated and is considered sufficient to warrant notification.

Editor's Note - The results and recommendations of reporting on noise and vibration, as detailed in Section 6.4.19 Noise and Vibration, associated with a particular development will be required to be implemented.

Editor's Note - The Contractor shall be responsible for any damage and compensation payments as a result of vibration.

(5) Quality management system

(a) Quality controlled and assured development

Council requires an emphasis on quality for the development works being delivered by developers. Where a condition for the approval of the development works requires the works to be completed as a "Quality Controlled and Assured Development", the Developer must engage consultants and Contractors with the necessary level of quality assurance accreditation to undertake and certify the development works.

(b) Quality management system

It is a requirement for a "Quality Controlled and Assured Development Contract" that the Contractor shall plan, develop, and maintain a documented quality system in accordance with this

section and the current requirements of AS/NZS ISO 9001.

(i) Quality manual

This is a document setting out the general quality policies, procedures, and practices of an organisation. The development of this document shall cover and include the requirements as specified in the Quality System Documentation section of AS/NZS 3905.12 with guidance to preparation by AS/NZS ISO 10013. Additionally, it must include standard method statements and inspection and test plans for the activities undertaken by the Contractor. The following details shall be provided by appropriate annexures to the company quality manual:

1 Organisational structure

This provides information regarding the management structure of theproject with details of the specific responsibilities and authorities of the nominated personnel, which includes but is not limited to:

a) a project quality management representative – is appointed by the Contractor for a specific project with the authority and responsibility for the implementation and operation of the quality plan, to ensure that Quality System requirements are not subordinated to design and productivity. Details of this person's qualifications, technical experience and presentposition are also to be provided;

b) the contracted testing organisation – details of the personnel who will be conducting each type of compliance inspection of testing; and

c) the person authorised to change construction processes on site; and

2 Register of method statements

The register shall list all method statements that are to be included in the project quality plan for the development contract and shall include any suitable method statements already incorporated in the company quality manual.

(ii) Project quality plan

The quality system as expressed in the project quality plan shall be used throughout the course of the construction to ensure that the quality of the Contractor's and any sub-contractor's work complies with all the requirements under this section. The company quality manual, method statements and checklists and other project specific components shall make up the project quality plan. The project quality plan must generally conform to the recommendations of AS/NZS ISO 10006. A concept illustration is shown in Figure SC6.4.23.1 Project Quality Management System Documentation.

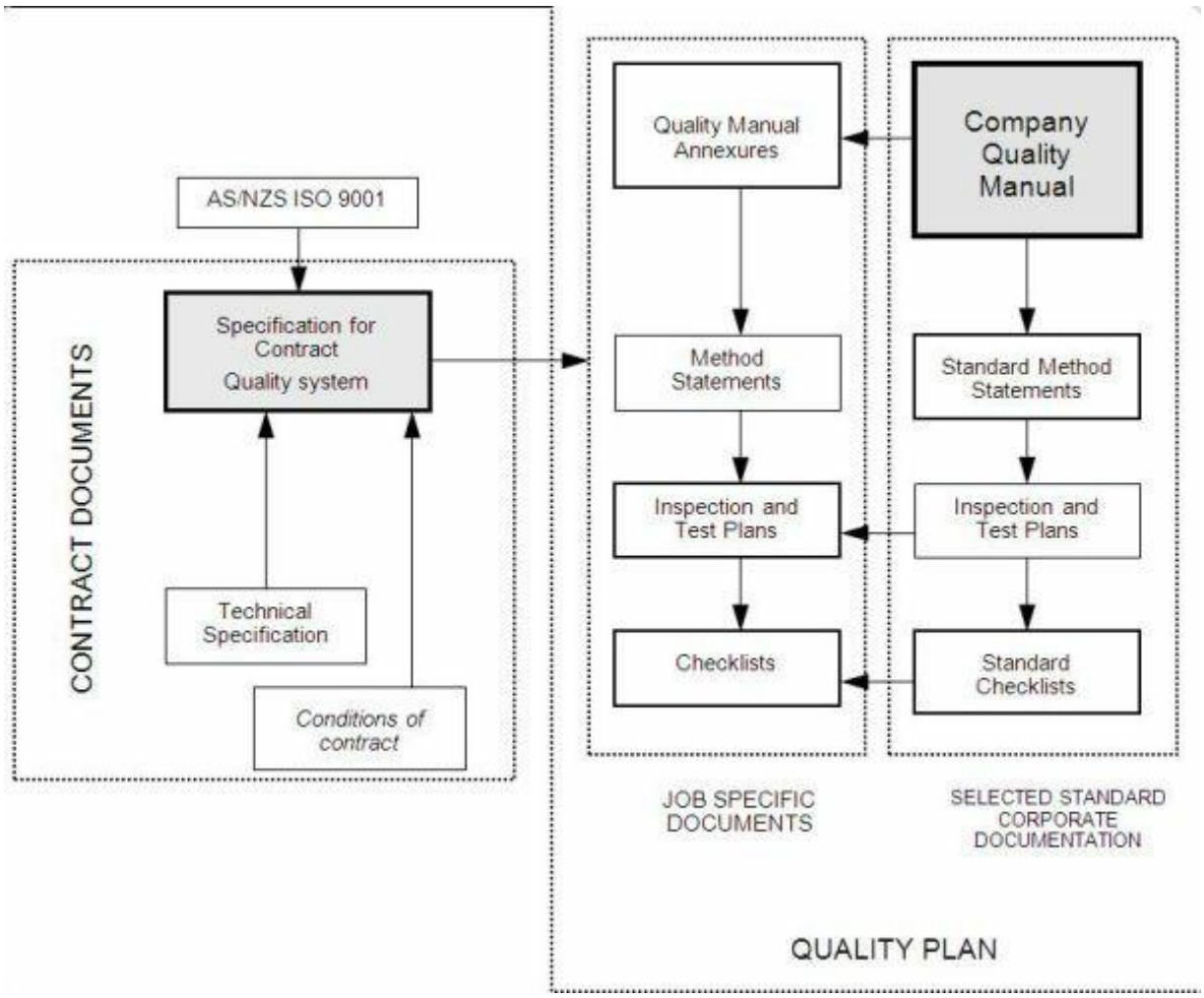


Figure SC6.4.23.1 Project Quality Management System Documentation

(c) Where a "Quality Controlled and Assured Development" is not a requirement, a quality plan is not therefore required to be provided but it will be necessary as a minimum requirement that:

(i) the nominated Superintendent or consultant are suitably and appropriately qualified and experienced;

(ii) a work quality plan must be submitted to Council for review and acceptance prior the pre-start meeting or commencement of works. The work plan must outline a program of inspection and testing regime that will ensure an adequate control of the progress and correctness of the work in accordance with the accepted design plans and specification;

(iii) upon completion of the development works and prior to Council accepting the completed development works, all records as required on the work quality plan must be submitted to Council to demonstrate compliance with the accepted work quality plan; and

(iv) the full cost of all required testing as per the work plan shall be the responsibility of the Contractor. These tests are required to ensure that the materials and the works that were carried out conform to the accepted design specification and standard.

(d) Quality management system procedures

(i) Quality control system

1 Lots

All items of work shall be subdivided into lots. Each lot shall be given a unique lot number and shall be chosen by the Contractor but must be within the limits given in Clause SC6.4.23.2 Maximum Lot Sizes and Minimum Test Frequencies. In general, the size of the lot shall not exceed one day's output for each work process designated for lot testing.

The lot numbers shall be used as identifiers on all surveys and test results. The Contractor shall determine the bounds of each lot before sampling and shall identify each lot clearly. The boundaries of a lot may be changed if subsequent events cause the original lot to be no longer essentially homogeneous.

The lot identification system and sample numbering system shall allow test results to be positively identified with material incorporated in the works.

2 Sampling and testing

All compliance inspections and tests shall be based on lots. The maximum lot sizes and minimum testing frequencies are listed in the relevant sections and/or in Clause SC6.4.23.2 Maximum Lot Sizes and Minimum Test Frequencies.

Where no minimum frequency of testing, or maximum lot size is stated in the section, the Contractor shall nominate appropriate frequencies for the Superintendent's approval. Sampling shall not be restricted to locations dimensioned or otherwise defined for setting out the works in the drawings or section but shall be undertaken in a random or unbiased manner, as approved by the Superintendent, at any location within the works to demonstrate its compliance with the section.

Where test methods are nominated in the section, sampling and testing shall be carried out by a (NATA) National Association of Testing Authorities registered laboratory accredited for those test methods and sampling procedures. Sampling shall be conducted by personnel from the NATA registered laboratory which has been accredited for that sampling procedure and shall be supervised by the approved signatory from that laboratory. Test results shall be reported on NATA endorsed test documentation which shall include a statement by the approved signatory certifying that the correct sampling procedures have been followed.

Random sampling techniques shall be used for each lot for the control of compaction of each continuous layer of earthworks, flexible pavement, and asphalt. Clause SC6.4.23.3 Random sampling defines the method to be used for determining test locations of random sampling in each lot. For quality control of processes other than compaction of layers of earthworks, flexible pavement and asphalt, the sampling locations will be proposed by the Contractor and will require the approval of the Superintendent. All samples shall be each considered to be representative of the lot and all test results will be required to meet the appropriate tolerances for the lot.

The latest NATA advice of the terms of registration and current signatories for the laboratories are to be included within the quality plan which will be providing the compliance test reports.

The NATA registered laboratory must provide inspection, testing and measuring equipment capable of producing the precision and/or degree of accuracy specified in the referenced test methods, and this shall be made available by providing evidence or records of calibration.

3 Surveying

The Contractor shall engage qualified surveyors who are eligible for membership of the Institution of Surveyors, Australia or the Institution of Engineering and Mining Surveyors, Australia to supervise and take responsibility for all surveying control.

4 Survey control

Surveying control shall include all measurement, calculation, and record procedures necessary to:

a) set out the works;

b) verify conformance to the drawings and section in relation to dimensions, tolerances, and three-dimensional position; and

c) determine lengths, areas or volumes of materials or products, where required for measurement of work.

The procedures and equipment used must be capable of attaining the tolerances required in the relevant construction specification. Sampling for conformance verification purposes shall not be restricted to the locations used to set out the works.

The Contractor shall submit a survey conformance report to the Superintendent for each lot or component where design levels, position and/or tolerances have been specified. The report shall show “specified vs. actual” for position (defined by co-ordinates or chainage and offset), level and tolerance as appropriate and shall be certified by the qualified surveyor responsible for the verification survey.

5 Records and quality control documentation

Conformance records shall be stored and maintained such that they are readily retrievable and in facilities that provide a suitable environment to minimise deterioration or damage and to prevent loss.

The Contractor shall submit all conformance records to the Superintendent for inspection and approval. If requested by the Superintendent, the Contractor shall provide copies of the records or test results at no cost to the Developer.

The Contractor shall maintain a quality register which contains all quality control records such as test results, completed check lists, certificates of compliance, and consignment dockets for materials procured.

Prior to achieving practical completion or the commencement of the defects-liability period or prior to acceptance of work as “Finally Complete”, the Contractor shall provide Council through the Superintendent a copy of the quality register and other required quality control documents as required in this section.

(e) Quality assurance system

It is the management of actions covering planning, quality control testing, inspection and verification procedures integrated with production to provide a product fit for the purpose.

(i) Inspection and test plan (ITP)

It is the document which identifies the specific inspections and tests required to be carried out for on development works including hold points. The ITP is to be prepared by an appropriately experienced consultant identifying specific inspections and tests to be carried out for each item of development works. Refer to Council’s minimum ITP requirement on Clause SC6.4.23.5 Minimum Inspection and Test Plan.

As a minimum, the inspection and test plans must contain the following information:

1. lot references;
2. activity description;
3. specification requirements (if not provided, referenced specification) ;
4. sampling methodology;

5. test frequency and method; and

6. identify responsibilities for inspection and testing and approval.

The Superintendent shall audit the Contractor's work on a regular basis and provide sufficient site presence and at inspection points identified in the Inspection and testing plan as set out in the construction schedules and agreed to and accepted by Council. Inspections by Council shall not in any way diminish the responsibility of the consultant and the Superintendent to adequately audit the works. Auditing shall include regular site inspections which will be conducted with the presence of the Contractor's representative to confirm acceptability of works as complying with the design intent and other Council requirements.

Inspection and test plans will typically have an associated check list which shall require completion for each particular lot. Prior to Council's acceptance of completed development works all documentation relating to compliance to the agreed and accepted ITP are to be submitted by the Contractor and/or the Superintendent which will form part of the Consultants' certification that the works have been carried out and inspected in accordance with the agreed and accepted ITP.

1 Inspections

The Contractor shall ensure that any stage of work to be inspected has been satisfactorily completed before requesting an inspection by the Superintendent and/or Council. A minimum of 48 hours' notice (except for on maintenance, off maintenance and final inspections which require a minimum of 5 business days) is required to enable arrangements to be made for an inspection. Responses to the requests within the prescribed minimums are not guaranteed, although every effort will be made by Council to accommodate request where possible. All Council required inspections must be carried out Monday to Friday unless other arrangements have been agreed.

Incoming inspections shall be required for deliveries of materials that will be subsequently included in one or more lots. When completing check lists for lots the inspection status shall be cited.

In-process and compliance inspections shall be completed by a responsible officer nominated in the check list and certified by the Contractor's Quality Management Register (QMR) indicating that the work has been completed in accordance with the contract documents.

The Contractor shall establish and maintain a system to ensure and demonstrate that all products or parts of products requiring inspection and/or testing are so inspected and/or tested. The Contractor shall also establish and maintain a system for identifying the inspection status for all lots of work.

2 Hold points and witness points

To assure compliance with the specified standards and requirements, mandatory hold points shall apply. Hold points are those stages during the construction/manufacturing process where the technical specifications require "approval by the Superintendent" or where a non-conformance report (NCR) or notice of non-conformance (NNC) has been issued. The Contractor shall not proceed past the hold point until approval has been received from the Superintendent to proceed. For ease of identification hold points may also be annotated on the margins of technical specifications.

To obtain the approval to proceed from the Superintendent, the Contractor shall:

a) provide the information required by the technical specifications;

b) ensure and certify that the lot/process is conforming;

c) ensure and certify that all underlying and adjacent lots affected by the lot in question

are conforming; and

d) submit the appropriate form (check list, NCR or NNC) at least 24 hours prior to the time the Contractor wishes to proceed with the placement/construction of the next lot, unless some alternative arrangements have been agreed with the Superintendent.

If the hold point has resulted from an NCR or NNC, the Superintendent's approval may be conditional on a witness point being included.

(ii) Quality assurance activities

1 Document control

In addition to the requirements of AS/NZS ISO 9001 and AS/NZS 3905.2, the quality plan shall specify the method of keeping quality registers, tracking, and handling of NCRs, NCC, NNCs and other site correspondence.

2 Method statements

A document that specifies the key steps and sequence in the manufacture/construction for an activity; what, how and by whom it shall be done; what materials and equipment shall be used to achieve the required quality standards.

Method statements shall be provided for all activities scheduled in Clause SC6.4.23.4Method statement requirements. This requirement applies to both contract and subcontracted work. The documentation shall cover, as applicable, planning, methods, verification, and control.

The presentation of method statements may be either descriptive, in the form of flow charts, or a combination of both. In either case it must be accompanied by a check list which shall include the relevant inspection and test points, surveying control points and Hold Points and the officer responsible to verify each check point.

A system audit of each method statement shall be carried out by the Contractor whilst the process is in effect. In the absence of a method statement for activities where it has been specified, this will automatically create a hold point.

3 Identification of lots and traceability

All items of work shall be subdivided into lots. Lots shall be chosen by the Contractor but shall be within the limits given in Clause SC6.4.23.2 Lot numbers are to be used as identifiers on all quality system data. Each lot shall be given a unique lot number. The allocation of lot numbers shall be carried out by the Contractor specific to each item of work and provides a lot numbering system which conforms to these requirements:

The quality register must contain records of lot number which provides information such as:

a) location of the lot (e.g., start and end chainage, layer and lateral location or a particular structure);

b) note regarding conformance/non-conformance (e.g., NCR, CPAR Registers); and

c) table of test results (summary) and their respective locations and numerical identification.

In cases where non-conforming lots are identified, a new identification number shall be allocated to the resubmitted documentation, but reference to the original lot number must be included.

The Contractor is responsible in determining the bounds of each lot before sampling and shall physically identify each lot clearly. The physical identification of a lot shall be maintained until the Contractor has ensured that the lot has achieved the specified quality.

To ensure all site personnel can readily identify where the lots are in the field, the Contractor shall implement a field identification system which will clearly identify the bounds of each lot and the lot number. This identification system shall be detailed in the quality plan and shall be maintained during all stages of construction of the lot.

The boundaries of a lot may be changed if subsequent events cause the original lot to be no longer essentially homogeneous. This will require appropriate notation in the Quality Register by the QMR.

The lot identification system, site records and sample numbering system shall allow test results to be positively identified with material incorporated in the works. Traceability is required for concrete loads, asphalt loads, and steel plate as follows:

a) concrete used in bridge components, cast-in-place box culverts, retaining walls, road pavement sub-base, and base. Asphalt used in wearing courses, intermediate courses, and drainage layers;

b) the trace shall start at the batch plant and finish at the location where the concrete or asphalt is incorporated in the Works. Records shall be kept of the batch quantities, mix and despatch time, testing details, and location of placement; and

c) steel plate in bridge girders and bridge columns. The trace shall start at the steelworks and finish at the location of the plate in the girder or column. Records shall be kept of the steel heat number, testing details, and location of the plate in the girder or column.

4 Survey control

Surveying control shall be treated as a separate system element and shall include all measurement, calculation, and record procedures necessary to:

a) set out the works;

b) verify conformance to the drawings and specification in relation to dimensions, tolerances, and three-dimensional position; and

c) determine lengths, areas or volumes of materials or products, where required for measurement of work.

The method statements for surveying control shall address the process control parameters in AS/NZS 3905.2 for special processes which cannot be fully verified by subsequent inspection and test.

The Contractor shall appoint qualified surveyors who are eligible for membership of the Institution of Surveyors Australia, or the Institution of Engineering and Mining Surveyors, Australia to supervise and take responsibility for all surveying control.

The procedures and equipment used must be capable of attaining the tolerances nominated in the specification. Sampling for conformance verification purposes shall not be restricted to the locations used to set out the Works.

The Contractor shall submit a survey conformance report for each lot or component where design levels, position and/or tolerances have been specified.

The survey conformance report shall show “specified vs. actual” for position (defined by co-ordinates or chainage and offset), level and tolerance as appropriate and shall be certified by the qualified surveyor responsible for the verification survey.

Where work is to be covered up after conformance has been achieved, a hold point shall apply until the survey conformance report has been submitted.

All survey records shall be included in the quality records and recorded in the quality register. Verification field book pages shall be clearly labelled, dated, and signed by the surveyor with cross indexed references to equipment used lot/component identification

and associated survey conformance reports. Where automatic data recording systems are used for verification surveys, a printout of both raw (field) data and reduced data shall be retained in a similar manner as recorded in conventional field books.

5 Sampling and testing

The inspection and test plans shall include details of the sampling methods. Sampling shall not be restricted to locations dimensioned or otherwise defined for setting out the works in the drawings or specification but shall be undertaken in a random or unbiased manner, as approved by the Superintendent, at any location within the works to demonstrate its compliance with the specification.

The maximum lot sizes and minimum testing frequencies are listed in the relevant sections and/or in SC6.4.23.2 of this section. Where no minimum frequency of testing, or maximum lot size is stated in the specification, the inspection and test plan(s) shall nominate appropriate frequencies for the Superintendent's approval.

The inspection and test plans shall also uphold any time limits for testing which may be imposed by the specifications. The responsibility for completion of inspections, tests and documentation shall be stated in the quality plan.

Statistical techniques - random sampling techniques shall be used for each lot for the control of compaction of each continuous layer of earthworks, flexible pavement, and asphalt. Clause SC6.4.23.3 defines the method to be used for determining test locations of random sampling in each lot. Clause SC6.4.23.2 lists the maximum lot sizes and minimum test frequencies for the specified activities.

For compaction control of processes other than layers of earthworks, flexible pavement, and asphalt, the sampling procedure will be proposed by the Contractor in his method statement and will require the approval of the Superintendent. In such cases the samples shall be each considered to be representative, and all test results will be required to meet the appropriate tolerances for the lot.

Every testing agency or person providing written test reports for testing undertaken shall use unique consecutive project specific serial numbering of the reports for identification and auditing purposes.

The Contractor shall reinstate all core holes, test holes, excavations and any other disturbance resulting from any testing activity. The reinstatement shall be to a standard which is at least equal to the specified requirements for the work.

6 Records and quality assurance documentation

The Contractor shall keep and maintain all quality system records in a quality register as required by AS/NZS ISO 9001, AS/NZS 3905.2 and this section. They shall be systematically recorded, indexed, and filed so as to be retrievable and accessible to the Superintendent or an appointed quality auditor on a job basis within 1 working day of requisition.

Conformance records shall be stored and maintained such that they are readily retrievable and in facilities that provide a suitable environment to minimise deterioration or damage and to prevent loss.

The Contractor shall make the quality records available to the Superintendent at all reasonable times. If requested by the Superintendent, the Contractor shall provide copies of the records or test results at no cost to the Developer.

Prior to achieving practical completion or the commencement of the defects-liability period or prior to acceptance of work as "Finally Complete", the Contractor shall provide Council, through the Superintendent, a copy of the quality register and other required

quality assurance documents as required in this section.

7 Non-conformance

In circumstances where there is a concern about workmanship, construction methodology or materials (e.g., variation to the approved work specification), Council's representative and/or Superintendent may require the Consultant and/ or Contractor respectively to provide a non-conformance certificate (NCC) (template provided at Clause SC6.4.23.6 Form A Non-Conformance Certificate template). The NCC will be required to be endorsed by the relevant design Consultant. A Non-Conformance Report (NCR) (template provided at Clause SC6.4.23.6 Form B "Non-conformance Report" template) is required to be issued by the Contractor addressing intended variations to approved specifications, work method statements or standards by providing proposed disposition.

In the event that the above has not been satisfied and to ensure compliance with the required standards, Superintendent and/or Council may issue a Notice of Non-Conformance (NNC) (template provided at Clause SC6.4.23.6 Form C "Notice of Non-Conformance" template) to the Contractor. The NNC shall be issued within 1 working day of the non-conformance being identified during an inspection or during scheduled audit inspections, I.e., hold points and witness points.

Upon issuance of the NNC, the Contractor must not continue the work in question unless an appropriate disposition (to be provided within five working days from issuance of the corrective and preventive action request (CPAR)) has been provided and agreed in accordance with the CPAR (template provided on Clause SC6.4.23.6Form D "Corrective and Preventative Action Request" template). This is to be undertaken by the Contractor if the NNC identifies non-conforming work which has been provided by the relevant design or construction consultant (Superintendent). Similarly, for Council initiated NNC, work shall commence upon Council's acceptance of the proposed disposition in accordance with the CPAR. To avoid recurrence of non-conformance issues, all CPARs shall require joint sign off by the Contractor and Superintendent, and Council for a Council issued NNC. This procedure will require the Contractor to record the CPAR on the relevant issued NNC. Under no circumstances will the deliberation on the disposition of a non-conformance issue be used to justify delays to the construction schedule/period.

The Contractor shall advise the Superintendent in the NCR of the proposed disposition of the non-conformance. This proposed disposition will constitute corrective action for the lot or lots referred to in the NCR and may comprise one of the following:

a) propose additional works to bring the lot up to the specified standard; or

b) replace all or part of the lot to bring it up to the specified standard; or

c) request utilisation of a lot for a reduced level of service if such a clause exists in the relevant technical specification; or

d) for incidental defects, request that the Superintendent accept the lot without alteration as an exception with or without alteration to the respective unit rates.

Any proposed disposition shall be subject to the approval of the Superintendent. Reworked/replaced lots shall be verified to conform to the specified requirements.

The Contractor shall establish a suitable numbering and registration system for all NCRs and NNCs. All non-conformance reports and relevant documentation are required to be submitted to Council prior acceptance of development works, to ensure that all departure from the originally accepted requirement and appropriate disposition has been done in accordance with the agreed CPAR.
A process flow diagram of the above processes is shown on Figure SC6.4.23.2.

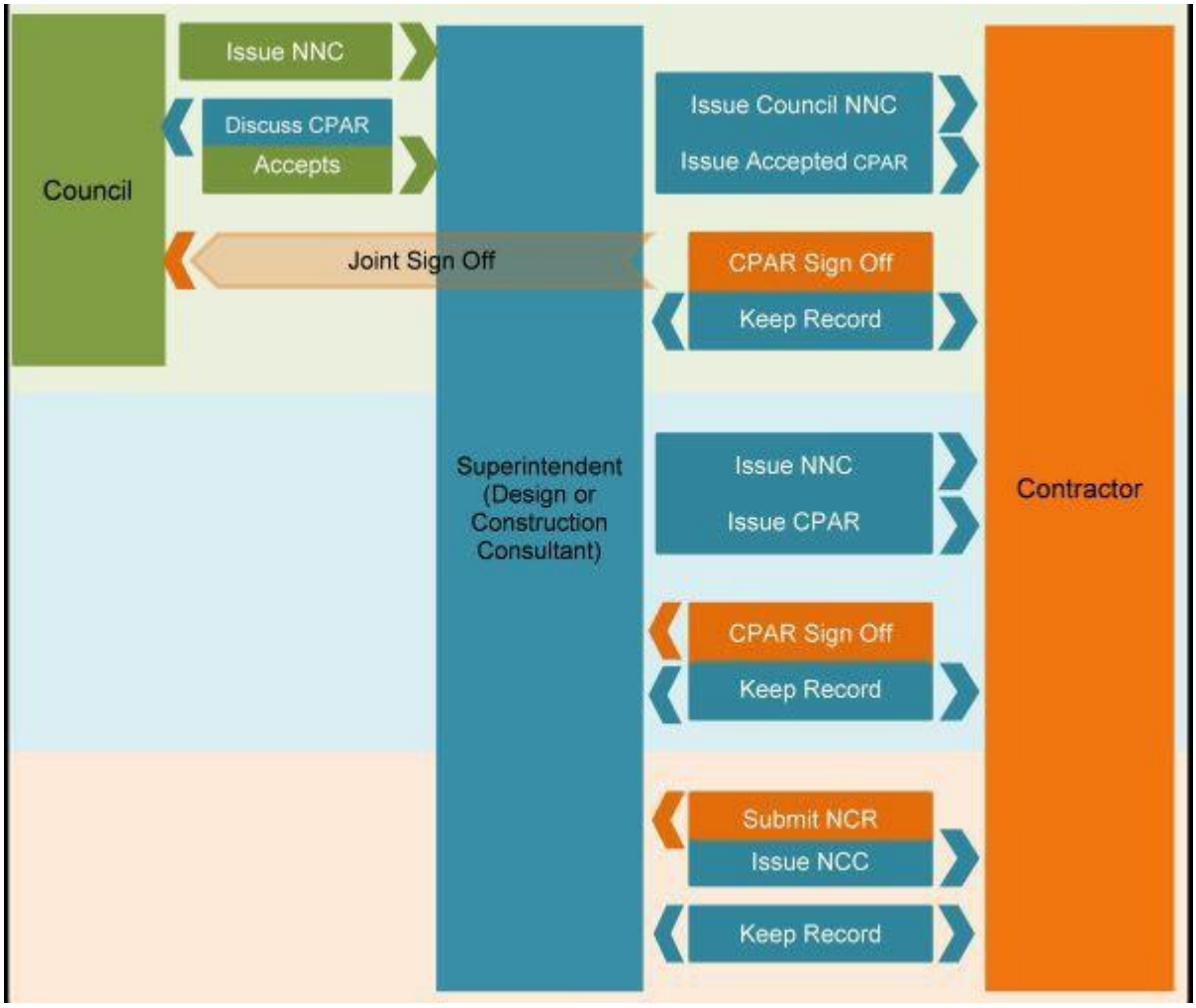


Figure SC6.4.23.2 Non-conformance Flow Diagram

(6) Works inspection fees

A works inspection fee (at the rate applicable at the time of payment) must be paid prior to the development works being accepted by Council at on maintenance or final completion.

SC6.4.23.2 Maximum lot sizes and minimum test frequencies

(1) Tables of lot sizes and testing frequencies

Where material/product quality certification can be obtained from the supplier, tests listed per contract/separable part need not be repeated and where no Queensland Department of Transport and Main Roads (DTMR) Test Methods are available, Australian Standards or NSW Roads and Traffic Authority (RTA) Test Methods are specified.

Table SC6.4.23.1 - Earthworks

Activity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
Stripping Topsoil	Surface Levels	10,000 m2	1 Cross Section per 25 m	Survey
Excavation	Geometry	10,000 m2	1 Cross Section per 25 m	Survey
Floor of Cuttings	Material Quality—CBR	5,000 m2	1 per 1,000 m2* or MaterialType	AS 1289.6.1.1 DTMR Materials Testing Manual
	Compaction	10,000 m2	1 per 500 m2	AS 1289.5.4.1
Deflection Control	Benkelman Beam Deflection orEquivalent	Per days production	4 per 1000 m2 or minimum 10 per lot	DTMR Materials Testing Manual
	No visible vertical movement under proof roll	One layer 5,000m2 or max 1 day's placement	Whole area	Visual
Foundation for Embankments	Compaction	5,000 m2	1 per 500 m2	AS 1289.5.4.1
Embankments • General	Geometry	One layer 10,000 m2	1 Cross Section per 25 m	Survey
	Material Quality - CBR	One layer 5,000 m2	1 per 800 m3 or Material Type	AS 1289.6.1.1
	Compaction/Moisture Content	One layer 5,000 m2	1 per 250 m3	AS 1289.5.1.1 AS 1289.5.4.1 AS 1289.5.7.1
Road Carriageway Embankments • Select Zone		One layer	1 Cross Section per	Survey

	Geometry	10,000 m2	25 m	
	Material Quality • Maximum Particle Size • CBR	10,000 m2 10,000 m2	1 per 1,000 m3* 1 per 500 m3* or Material Type	AS 1289.6.1.1
	Compaction/Moisture Content	One layer5,000 m2	1 per 500 m2	AS 1289.5.1.1, AS 1289.5.4.1 AS 1289.5.7.1
Fill Adjacent to Structures: Bridges, Retaining Walls and Cast-in-Situ Culverts	Material Quality			
	• Maximum Particle Size	1 Structure	1 per 200 m3	AS 1289.3.3.1 AS 1141.11
		1 Structure	1 per 200 m3	AS1289.3.3.1
	•• Plasticity Index Compaction/Moisture Content	1 Structure	2 per lot	AS 1289.5.1.1, AS 1289.5.4.1 AS 1289.5.7.1

* **Editor's note**—or part thereof, per lot.

Table SC6.4.23.2 Stormwater Drainage, Drainage Structures, Pipe Drainage, Precast Box Culverts and Open Drains

Activity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
Supply of PrecastUnits	Precast Quality— Suppliers documentary evidence andcertification	1 batch	1 per type/size/class per batch	
Siting and Excavation	Geometry	1 drainage line/structure	1 per drainage line/structure	Survey
Foundation	Compaction	1 drainage line/structure	1 per 40 lin m*	AS 1289.5.4.1, AS 1289.5.7.1 Visual

Material surrounding Steel Structures	Material Quality pH/Electrical Resistivity	1 drainage line/structure	1 per material	AS 1289.4.3.1 AS 1289.4.4.1
Bedding *(Bed, haunch, sides and overlay for HS type support)*	Material Quality Particle Size Distribution Compaction/Moisture Content	1 contract 1 drainage line/structure	1 per 200 m^3* 1 per layer, per 40 lin m	AS 1141.11 AS 1289.5.7.1, AS 1289.5.4.1
Concrete Bedding or Lining	Geometry		1 Cross Section per 25 m	Survey and 3m Straight Edge
Installation of Precast Units	Geometry	1 drainage line/structure	1 per drainage line/structure	Survey
Selected Backfill *(Backfill, sides and overlay for non-HS type support)*	Material Quality Maximum Particle Size Plasticity Index Compaction/Moisture Content	1 contract 1 contract 1 drainage line/structure	1 per 500 m^3* 1 per 500 m^3* 2 per lot	 AS 1289.3.3.1 AS 1289.5.7.1, AS 1289.5.4.1
Rock Fill for Gabions/ Wire Mattresses	Material Quality: Wet Strength Wet/Dry Strength Variation	1 contract 1 contract	1 per contract 1 per contract	AS 1141.22 AS 1141.22
Kerb and Gutter	Geometry	1,000 lin m	1 Cross Section per 25 m and change of direction	Survey and 3m Straight Edge

Editor's Note—or part thereof, per lot.

Table SC6.4.23.3 Subsoil, Foundation and Pavement Drains, Subsurface Drainage, Drainage Mats

Activity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
Material Supply	Material Quality- Supplier's documentary evidence and certification of: Pipe	1 contract/size	1 per type/size	

	Filter Material Grading (Type A, B, C, D) Coefficient of Permeability (Type B) Grading Variation after Treatment (Type B) Wet Strength (Type C, D) 10% Fines Wet/Dry (Type C, D) Appearance (Type D) Geotextile - Supplier's documentaryevidence	 1 contract/size 1 contract/size 1 contract/size 1 contract/size 1 contract/size 1 contract 1 contract	1 per type 1 per type 1 per type 1 per type 1 per type 1 per type 1 per type	 AS1141.11 AS1289.5.5.1 ASTM-D2434-19 AS1141.11 AS1141.22 AS1141.22 Table B1 Appendix B of AS2758.1 AS3706 (Test) AS3705
Excavation - TrenchBase	Line and Grade	1 drainage line	1 per drainage line	Survey
Bedding and Backfill Filter Material Selected Backfill Earth Backfill	Geometry Compaction Geometry CompactionGeometry	1 drainage line 1 drainage line 1 drainage line 1 drainage line 1 drainage line	Visual 1 per lineVisual 1 per line Visual	Survey AS1289.5.6.1 Survey AS1289.4.1 Survey
Drainage Mat	Geometry	2000 m²	1 Cross Section per 25m	Survey

Table SC6.4.23.4 Stabilisation

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Material Supply	Material Quality - Supplier's documentary evidenceand certification of (as per MRTS07A, MRTS07B, MRTS07C and MRTS08):	1 contract	Type	AS 3972
	Cement Quicklime			
	Available Lime (CaO content) Slaking Rate	1 contract	Type	AS 3588.12
	Particle Size Distribution	1 contract	1 per contract	T432
	Hydrated Lime	1 contract	1 per contract	AS 1141.11
	Available Lime ($CaOH_2$)Residue on Sieving			
	Ground Blast Furnace Slag	1 contract	1 per contract	AS 3583.12
	Flyash	1 contract	1 per contract	AS 3583.14
	Blended Stabilising AgentWater			
	Chloride ion content Sulphate ion content	1 contract	1 per contract	AS 3583.2
	Undissolved solids	1 contract	1 per contract	AS 3583.1
		1 contract	1 per contract	
		1 contract	1 per contract	AS 3583.13
		1 contract	1 per contract	AS 1289.4.2.1
		1 contract	1 per contract	
Mix Design	NATA certification - Supplier's documentaryevidence and	1 mix	1 per mix	

	certification			
Stationary Mixing Plant	Application rate of stabilising agent	1 day's production	1 per 100t	
	Unconfined Compressive strength of product	1 day's production	1 per 400t	AS 5101.4
In-Situ Spreading	Spread rate	1 layer 1,000m^2	1 per lot or1 per 500m^2	DTMR Materials Testing Manual
	Mix uniformity	1 layer 1,000m^2	1 per 500m^2	Visual
	Unconfined Compressive Strength of product	1 day's production	1 per 100t	AS 5101.4
Trimming and Compaction	Geometry	1 layer 3,000m^2, or 1day's placement	One cross section per 25 m	Survey
	Surface Quality	"	10 per 200 m lane length*	3m Straight Edge
	Average Layer thickness	"	1 per lot	
	Average Width	"	1 per lot	Measure/Survey
	Compaction	1 layer 5000m^2 or min. of 3 if less than 5000 m^2	1 per lot	As specified in SC6.4.6.19 (5)

Editor's note— or part thereof, per lot.

Table SC6.4.23.5 Flexible Pavements

Activity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
Pavement Materials Supply	Material Quality - Supplier's documentary evidence and certification to meet MRTS05, MRTS07B and MRTS08 requirements - Type 2.1 for base, Type 2.3 for subbase and Type 2.4 for lower subbase.	1 contract		
	Particle Size Distribution		1 per 1,000 t	Q103A, AS 1289.3.6.1
	Fine and Particle Size DistributionRatio		1 per 1,000 t	Q104A, Q104D

	Liquid Limit		1 per 1,000 t	Q105, AS 1289.3.2.1
	Plastic Limit		1 per 1,000 t	Q105, AS 1289.3.2.1
			1 per 5,000 t	Q113A
	Plasticity Index		1 per 1,000 t	Q201, AS 1141.15
			1 per 5,000 t	Q205B, AS 1141.22
	California Bearing Ration		1 per 5,000 t	Q205C, AS 1141.22
	(soaked) Particle Shape		1 per contract	Q208A, AS 1141.25.1
	Ten Percent Fines Value (Wet)		1 per 5,000 t	TCC-001, Q115, AS 5101.4
	Wet/Dry Strength Variation			
	Degradation Factor (Source Rock)			
	Unconfined Compressive Strength (Standard Compaction)			
	Unconfined Compressive Strength(Bound/Modified)	1 contract	1 per mix design	Q115, AS5101.4
	Lime modified/Modified pavementmaterials	1 contract	1 per type	As specified in SC6.4.5.3.4 Stabilisation
Compaction Assessment	Geometry: Alignment and Level	One layer 2,000m² or	1 Cross Section per 15 m	Survey
	Width and Surface Trim	max 1 day's placement	10 per selected 200 lin m*	Measure and 3m Straight Edge
	Compaction/Moisture Content/ Dry Density Testing	One layer 5,000m² or max 1 day's placement	10 per 5,000 m² layer or 3 per lot if less	AS1289.5.1.1, Q142A, AS1289.5.4.1 AS1289.5.8.1
Deflection Control	Benkelman Beam Deflection or Equivalent	Per days production	4 per 1000 m² or minimum 10 perlot	Q701
	No visible vertical movement under proof roll	One layer	Whole area	Visual

		5,000m² or max1 day's placement		

Editor's note—or part thereof, per lot.

Table SC6.4.23.6 - Sprayed Bituminous Surfacing

Activity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
Materials Supply	Material Quality - Suppliers documentary evidence and certificationof:	1 contract	1 per contract	MRTS.17
	Class 170 Bitumen			
	Refinery Cutback	1 contract	1 per contract	MRTS.17
	BitumenPolymer	1 contract	1 per contract	MRTS.18
	Modified Binder	1 contract	1 per contract	
	Bitumen Adhesion	1 contract	1 per contract	
	Agent Cutback Oils	1 contract	1 per contract	
	Aggregate Precoating Agent	1 contract	1 per contract	MRTS.22
	Aggregate			
Application Rates	Binder	1 day's operation	Calculate per spray run	As per spray sheet
	Aggregate	1 day's operation	Calculate per spray run	As per spray sheet

Editor's note— one per contract or change in material.

Table SC6.4.23.7 - Asphaltic Concrete

Activity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
Materials Supply	Material Quality - Supplier's documentary evidence and certificationof:			
	Coarse and Fine			MRTS 30
	AggregatesGrading	1 week's production	1 per contract ormaterial change	MRTS 30
	- Moisture Content	1 week's production	1 per contract ormaterial change	MRTS 30
	- Wet Strength	1 contract	1 per contract ormaterial	MRTS 30

	- Wet/Dry Strength Variation		change	
	- Particle Shape	1 contract	1 per contract ormaterial change	MRTS 30
	- Fractured Faces	1 contract	1 per contract ormaterial change	MRTS 30
	Polishing Agg Friction Value	1 contract	1 per contract ormaterial change	MRTS 30
	- Mineral Filler	1 contract	1 per contract ormaterial change	MRTS 30
	- Bitumen	1 contract or 1 month's productio n	1 per contract ormaterial change	MRTS 30
	Binder Polymer Modified Bitumen Elasticity Recovery at 60ºC	1 refinery batching	1 per contract ormaterial change	MRTS 17
	Viscosity on ER at 60ºC			MRTS 18
	Torsional Recovery at 25ºC	1 production batch by supplier	1 per contract ormaterial change	MRTS 30
	Viscosity at 180ºC - Bitumen Adhesion Agent			MRTS 30
	Resistance to Stripping			MRTS 30
		1 contract	1 per contract ormaterial change	MRTS 30
	Reclaimed Asphalt Pavement (RAP)	1 stockpile	1 per contract ormaterial change	MRTS 30
	Bitumen Emulsion	1 contract	1 per contract ormaterial change	MRTS 21
Mix Design NominatedMix	Approval of mix and NATA certification. Supplier's documentary evidence and certification	1 mix per contrac t	1 per mix	

Production Mix	Temperature Moisture Content Grading Binder Content	1 per truck load Section SC6.4.6 clause SC6.4.6.7 Asphaltic concrete as included as separate table below. Additionally, max lot size one 12 hr shift's production.		Measur eMRTS 30 MRTS 30 MRTS 30
Laying and Compaction	Temperatur eLevels Shape Relative Compaction/Layer Thickness	1 day's layingper site 1 day's layingper site 1 day's laying 1 day's laying	1 per truck load 1 cross sectionper 25 m 10 per 200 m* lane 6 cores per lot or 10 nuclear density tests perlot	Measur e Survey 3m Straight Edge As per MRTS30 Compaction requirements or Nuclear Density Meter

Editor's note—* or part thereof, per lot.

Table SC6.4.23.8 Minimum Testing Frequencies for Asphalt Production

Quantity of Asphalt in production lot	Minimum Frequency of Testing
Less than 100 tonnes	MRTS 30
101 to 300 tonnes	MRTS 30
301 to 600 tonnes	MRTS 30
Over 600 tonnes	MRTS 30

Table SC6.4.23.9 Ready-Mixed Concrete Production and Supply

Activity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
Raw Materials Supply	Material Quality— Supplier's documentary evidence and certificationof:	1 contract	1 per contract or material change	
	Cement	1 contract	1 per contract or material change	AS 3972
	Flyash	1 contract	1 per contract or material change	AS/NZS 3582.1
	Water	1 contract	1 per contract or material change	AS3583.13, AS1289.4.2.1
	Admixtures	1 contract	1 per contract or	AS 1478

			material change	
	Fine Aggregates (Section SC6.4.6. Clause SC6.4.6.6 (3)(e)(ii) only)	1 contract	1 per contract or material change	
	Grading	1 contract	1 per contract or material change	AS1141.11
	Moisture Content	1 contract	1 per contract or material change	Q102A, Q102B or Q102D
	Sulphate Soundness	1 contract	1 per contract or material change	AS1141.24
	Bulk Density	1 contract	1 per contract or material change	AS 2758.1
	Unit Mass (particle density)	1 contract	1 per contract or material change	AS 2758.1
	Water Absorption	1 contract	1 per contract or material change	AS 2758.1
	Material Finer 2µm	1 contract	1 per contract or material change	AS 2758.1
	Deleterious Material (Impurities/Reactive)	1 contract	1 per contract or material change	AS 2758.1
	Combined Aggregates	1 contract	1 per contract or material change	Q102A, Q102B or Q102D
	Section SC6.4.6 Clauses SC6.4.6.6 (2)(e)(ii) and SC6.4.6.6 (3)(e)(ii)	1 contract	1 per contract or material change	AS1141.11
	Grading	1 contract	1 per contract or material change	
	Moisture Content			
Activity	**Key Quality Verification Requirements**	**Maximum Lot Size**	**Minimum Test Frequency**	**Test Method**
	Wet Strength	1 contract	1 per contract or material change	AS1141.22
	Wet/Dry Strength Variations	1 contract	1 per contract or material change	AS1141.22
	Sulphate Soundness	1 contract	1 per contract or material change	AS1141.24
	Particle Shape	1 contract	1 per contract or	AS1141.14

			material change	
	Fractured Faces	1 contract	1 per contract or material change	AS1141.18
	Bulk Density	1 contract	1 per contract or material change	AS 2758.1
	Unit Mass (particle density)	1 contract	1 per contract or material change	AS 2758.1
	Water Absorption	1 contract	1 per contract or material change	AS 2758.1
	Material Finer 75µm	1 contract	1 per contract or material change	AS 2758.1
Raw Materials Supply	Weak Particles	1 contract	1 per contract	AS 2758.1
	Light Particles	1 contract	1 per contract	AS 2758.1
	Deleterious Materials (Impurities/Reactive)	1 contract	1 per contract	AS 2758.1
	Iron Unsoundness	1 contract	1 per contract	AS 2758.1
	Falling/Dusting Unsoundness	1 contract	1 per contract	AS 2758.1
Mix Design (kerb mix)	Compressive Strength	1 contract mix	1 per mix per contract	AS1012.1, AS1012.8, AS1012.9
	Aggregate Moisture Content	1 contract mix	1 per mix per contract	Q102A, Q102B or Q102D
	Non Conformance - Compressive Strength	Superintendent to determine		AS1012.14
	Consistency - Slump	1 contract mix	1 per mix per contract	AS1012.3.1
	Air Content	1 contract mix	1 per mix per contract	AS1012.4.2 (Method 4.2)
	Shrinkage	1 contract mix	1 per mix per contract	AS1012.13

Table SC6.4.23.10 Mass Concrete Subbase

Activity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
Concrete Supply				

	Refer to Table SC6.4.3.30 Concrete/Air	50m^3	1 per 50 m^3	Measure
	Temperature	50m^3	1 per 50 m^3	AS1012.4.2 (Method 4.2)
	Air Content	50m^3	1 per load	AS1012.3.1
	Consistency - Slump	50m^3	1 per load	AS1012.3.4
	- Compactibility IndexCompressive Strength (7 day)	50m^3	1 pair per 50 m^3	AS1012.1 AS1012.8 AS1012.9
	Compressive Strength (28 day)	50m^3	1 pair per 50 m^3	AS1012.1 AS1012.8 AS1012.9
	Non Conformance - CompressiveStrength	Superintendent to determine		AS1012.14
Placement	Thickness	50m^3	5 m grid on plan area	Survey and check with subgrade survey
	Geometry	50 m^3	1 cross section	Survey and 3m
: Curing	Material Quality - Supplier's documentary evidence and certification	1 contract	1 per production batch	AS1160 (Bitumen Emulsion)
	Application Rate	1 day's work	1 per 1000 m2*	AS3799 - Liquid membrane forming curing compound for concrete
Joints	Geometry	50 m^3	All joints	Survey

Editor's note - or part thereof, per lot

Table SC6.4.23.11 Plain or Reinforced Concrete Base

Activity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
Concrete Supply	Refer to Table SC6.4.23.30			
	Concrete/Air Temperature	50 m3	1 per 50 m3	Measure
	Air Content	50 m3	1 per 50 m3	AS1012.4 Method 2

	Consistency - Slump	50 m^3	1 per load	AS1012.3.1
	Mass per unit volume (prior crushing of 7-day specimen)	50 m^3	1 per 50m^3	AS1012.12.2
	Compressive Strength (7 day)	50 m^3	1 pair per 50m^3*	AS1012.1 AS1012.8 AS1012.9
	Compressive Strength (28 day)	50m^3	1 pair per 50m^3*	AS1012.1 AS1012.8 AS1012.9
	Non Conformance - Compressive Strength	Superintendent to determine		AS1012.14
Steel Reinforcement	Material Quality - Supplier's documentary evidence and certification	1 contract	1 per production batch	AS4671
	- Splicing (welded)	1 contract		AS1554.3
Placement	Relative Compaction			
	Machine Placed	50m^3	1 per 50 m^3*	AS1012.14 AS1012.2
	Hand Placed	Area between 2 consecutive const. joints or 50m^3 (whichever is the lesser)	2 per lot	AS1012.14 AS1012.2
	Thickness	50 m^3	5 m grid on plan area	Survey
	Geometry	50 m^3	1 cross section per 15 m	Survey and 3m Straight Edge
Ride Quality	Profile Factor	1000 m^2	10/lane/lot	3m Straight Edge
Surface Texture	Texture Depth	1000 m^2	2 per lot	Survey
Curing	Material Quality—Supplier's documentary evidence and certification	1 contract	1 per production batch	AS1160 (Bitumen Emulsion)
	Application Rate	1 day's work	1 per 1000 m^2*	AS3799 - Liquid membrane

Joints	Sealant Material Quality Supplier's documentary evidence and certification Geometry	1 contract 50 m^3	1 per production batch All joints	 Survey

Editor's note—or part thereof, per lot

Table SC6.4.23.12 Bituminous Micro-surfacing

Activity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
Materials Supply	Material Quality—Supplier's documentary evidence and certification of:			
	Bitumen (prior to emulsification)	1 contract	1 per contractor change in material	AS2008
	Bitumen Emulsion	1 contract		AS1160, App. D
	- Residual Binder Content (Residue from Evaporation)	1 contract	2 per bulk delivery	AS1141.25
	Mineral Aggregates			
	- Degradation Factor	1 contract	1 per contract or 6-month period	AS1141.23
	- Los Angeles Value	1 contract		AS1141.22
	- Aggregate Wet Strength	1 contract		AS1141.22
	- Wet/Dry Strength Variation	1 contract		AS1141.42
	- Polished Aggregate FrictionValue	1 contract		AS1289.3.7.1
	- Sand Equivalent	1 month's prod'n 1 contract		AS2350
	Mineral Filler			AS1141.11 AS1141.12
	Combined Aggregate Grading			
Mix Design—Nominated Mix	Approval of mix and NATA certification—Supplier's documentaryevidence and certification	1 contract	1 per mix	
Production Mix	Grading	1 day's prod'n or50m³ (whicheveris the lesser)	2 per 50 m³*	AS2891.3.1
	Residual Binder Content		2 per 50 m³*	AS2891.3.1
Laying	Levels	1 layer, max200 m3	1 cross sectionper 15 m	Survey
	Surface Quality	1 layer, max200 m3	10 per 100 m* lane length	3m Straight Edge

Editor's note—or part thereof per lot

Table SC6.4.23.13 Segmental Paving

Activity	Key QualityVerification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
Materials Supply	Material Quality— Supplier's documentary evidence and certification of:			
	Concrete Segmental Paving Units	1 contract	1 per contract	AS/NZS 4455
	Clay Segmental Paving Units	1 contract	1 per contract	AS/NZS 4455
	Bedding Sand - Grading	1 contract	1 per contract or change in material	AS1141.11
	Joint Filling Sand - Grading	1 contract	1 per contract or change in material	AS1141.11
Base	Geometry	One layer 5000 m^2,max 1 day's placement	One cross section per 25 m	Survey
	Surface Quality	"	10 per 200 m^2 or lot	3 m Straight Edge
Edge Restraints	Refer Section SC6.4.18 Concrete Work	1 day's placement	1 per 10 lin m	Measure/Survey
Laying Paver Units	Joint Width	1 day's placement	All joints	Measure
	Geometry	1 day's placement	One cross section per 15 m	Survey
	Surface Quality	1 day's placement	10 per 200 m^2 or lot	3 m Straight Edge

Table SC6.4.14 Concrete Works

Activity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
Subgrade	Compaction	1000 lin m or 1000 m^2	1 per 200 lin mor 200 m^2	AS1289.5.4.1
Gravel Subbase Construction	Compaction	1 days' placement	1 per 100 lin mor 100 m^2	AS1289.5.4.1

	Subbase Geometry	1 days ‘placement	1 per 25 lin m	3m Straight Edge
Steel Reinforcement	Material Quality—Suppliers documentary evidence and certification	1 delivery	1 per production batch	AS4671
Fibre Reinforcement concrete	Requirements as per Reinforcement of concrete (Section SC6.4.18 (Concrete Works)			
Ready-Mixed Concrete Supply	Material Quality—Suppliers documentary evidence and certification	1 contract	1 per mix type	
	Consistency - Slump	15m^3	1 per load	AS1012.3.1 (Method1)
	Compressive Strength (7 and 28 day)	15m^3	2 pairs per 15m^3	AS1012.1, AS1012.8, AS1012.9
	ALL TESTING—MINIMUM LOT SIZE 3 m^3. No testing on loads less than 3 m^3 if supplier can provide documentation of in production testing.			
Raw Materials Supply	Material Quality - Supplier's documentary evidence and certification	1 contract	1 per contract or material change	
	Cement	1 contract	1 per contract or material change	AS3972
	Water	1 contract	1 per contract or material change	AS3583.13 AS1289.4.2.1
	Admixtures	1 contract	1 per contract or material change	AS1478.1

Activity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
	Fine Aggregates			
	Grading	1 contract	1 per contract or material change	AS1141.11
	Moisture Content	1 contract	1 per contract or	Q102A, Q102B,

			material change	Q102D
	Bulk Density	1 contract	1 per contract or material change	AS2758.1
	Water Absorption	1 contract	1 per contract or material change	AS2758.1
	Mineral Finer 2µm	1 contract	1 per contract or material change	AS2758.1
	Deleterious Material (Impurities/Reactive)	1 contract	1 per contract or material change	AS2758.1
	Coarse Aggregate Grading	1 contract	1 per contract or material change	AS2758.1
	Moisture Content			
	Crushing Value	1 contract	1 per contract or material change	AS1141.11
	Soundness	1 contract	1 per contract or material change	Q102A, Q102B, Q102D
	Particle Shape	1 contract	1 per contract or material change	AS1141.21
	Bulk Density Unit Mass (particle density)	1 contract	1 per contract or material change	AS1141.24
	Water Absorption	1 contract	1 per contract or material change	AS1141.14
	Mineral Finer 75 µm	1 contract	1 per contract or material change	AS2758.1
	Weak Particles	1 contract	1 per contract or material change	AS2758.1
	Light Particles	1 contract	1 per contract or material change	AS2758.1
		1 contract	1 per contract or material change	AS2758.1
		1 contract	1 per contract or material change	AS2758.1
		1 contract	1 per contract or	AS2758.1

			material change	
		1 contract	1 per contract or material change	AS2758.1

Activity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
	Deleterious Materials (Impurities/Reactive	1 contract	1 per contract or material change	AS2758.1
	Iron Unsoundness	1 contract	1 per contract or material change	AS2758.1
	Fall/Dusting Unsoundness	1 contract	1 per contract or material change	AS2758.1
	Percentage Wear	1 contract	1 per contract or material change	AS1141.23
Concrete Supply (Mixing at site)	Consistency - Slump	15 m^3	1 per load	AS1012.3.1
	Compressive Strength (7 days)	15 m^3	2 pairs per 15m^3	AS1012.1,
	Compressive Strength (28 days)	15 m^3	or part thereof, 1 pair for 7-day test and the other pair for the 28-day test	AS1012.8
Concrete Placement	Finished Levels	15m^3	1 cross sectionper 15 m	Survey and 3 m Straight Edge
	Surface Dimensions	Single fabrication	As required to confirm design dimensions	Measure
	Finishing of unformed surfacesGeometry	15 m^3	1 cross sectionper 15 m^3	Survey and 3 m Straight Edge
	Joints - Geometry	50 m^3	All joints	Survey
Curing	Material Quality - Supplier's documentary evidence and certification	1 contract	1 per production batch	AS3799
	Application Rate	1 day's work	1 per 1000 m^{2*}	
Backfilling	Material Quality			

	Maximum particle size	1 contract/ material type	1 per 200 m^3	Q103
	Plasticity Index	1 contract/ material type	1 per 200 m^3	AS1289.3.3.1
	Compaction	1-days work or max 200m^2	1 per 200 m^2	AS1289.5.4.1
Sprayed Concrete	Test Panels and Cores	1 contract	3 test panels and 4 cores per mix design	AS1012.4, AS1012.9 AS1012.14

Editor's note—or part thereof, per lot

Activity	**Key Quality Verification Requirements**	**Maximum Lot Size**	**Minimum Test Frequency**	**Test Method**
	Compressive Strength Cores	15 m^3	per 15 m^3	AS1012.4 AS1012.9 AS1012.14
	Curing Material Quality— Supplier's documentary evidence and certification	1 contract	1 per production batch	

Editor's note—or part thereof, per lot

Table SC6.4.23.15 Pavement Markings

Activity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
Materials Supply	Material Quality - Supplier's documentary evidence and certificationof:			
	Paint	1 contract	1 per contract or change in material	
	Glass Beads	1 contract	1 per contract or change in material	
	Thermoplastic	1 contract	1 per contract or change in material	
	Material	1 contract	1 per contract or change in material	
	Raised Pavement Markers (including temporary raised pavement markers)		1 per contract or change in material	
Paint Application	Wet Film Thickness	1 contract	1 per site visit	AS 1580.107.3
	Application Rate of Glass Beads	1 contract	1 per contract	Or Q513 Section SC6.4.6
Thermoplastic Application	Cold Film Thickness	1 contract	1 per site visit	Measure by micrometer
	Application Rate of Glass Beads	1 contract	1 per contract	Section SC6.4.6

Table SC6.4.23.16 Signposting

ctivity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
Materials Supply	Material Quality—Supplier's documentary evidence and certification of:			
	Sign Blanks	1 contract	1 per contract, or change in material	
	Aluminium Extrusion	1 contract	1 per contract or change in material	
	Backing	1 contract	1 per contract or change in material	
	Retro-reflective Material Non-reflective	1 contract	1 per contract or change in material	
	Paint Non-reflective Sheet Material Steel	1 contract	1 per contract or change in material	
	Sign Support Structures	1 contract	1 per contract or change in material	
Concrete Foundations	Refer Section SC6.4.18 Concrete works			

Table SC6.4.23.17 Water Reticulation

Activity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
Materials Supply	Material Quality—Supplier's documentary evidence and certificationof:			
	uPVC Pipes Ductile Iron	1 contract	1 per contract	AS2977
	Pipes	1 contract	1 per contract	AS2280 and AS2129
	Copper Pipe	1 contract	1 per contract	AS1432
	Polyethylene Pipe Stop	1 contract	1 per contract	AS1159
	Valves Material	1 contract	1 per contract	AS2638 and
	Non Return ValvesSpring	1 contract	1 per contract	AS2129
	Hydrants	1 contract	1 per contract	AS3578
				AS2544 or AS3952
Siting and Excavation	Geometry	1 line	1 per line	Survey
Bedding	Material Quality			
Activity	**Key Quality Verification Requirements**	**Maximum Lot Size**	**Minimum Test Frequency**	**Test Method**
	Grading	1 contract	1 per contract per source	AS2032
Thrust and Anchor Blocks	Refer to Table SC6.4.23.14			
Chamber Covers and Frames	Geometry	1 cover/frame	1 per cover/frame	survey
Testing of Pipelines	Pressure testing	1 line	1 per line	As specified in Section
	Bacteriological testing	1 line	1 per line	SC6.4.11, Clause SC6.4.11.3 (5)
				As specified in

				Section SC6.4.11, Clause SC6.4.11.3 (5)
Backfill and Compaction	Compaction	1 line	1 per 2 layers max 100 m^2	AS1289.5.7.1, AS1289.5.4.1
Switchgear and Control gear Assembly	Electrical function	each installation	1 factory test per installation	AS3439
Commissioning of Pumping Station	Certification testing of electrical installation in accordance with relevant Australian Standards	1 installation	1 per installation	

Table SC6.4.23.18 Sewerage System

Activity	Key Quality Verification Requirements	Maximum Lot Size	Minimum Test Frequency	Test Method
Materials Supply	Material Quality—Supplier's documentary evidence and certificationof:			
	uPVC	1 contract	1 per contract	AS1477
	Pipes	1 contract	1 per contract	AS2280 and
	Ductile Iron	1 contract	1 per contract	AS2129 AS1741
	Pipes	1 contract	1 per contract	
	Vitrified			AS4198
	Clay Pipes			
	Precast Access Chambers			
Siting and Excavation	Geometry	1 line/structure	1 per line/ structure	Survey
Bedding	Material Quality Grading	1 contract	1 per contract per source	Q103
Concrete Bedding	Refer Table SC6.4.23.14			
Activity	**Key Quality Verification Requirements**	**Maximum Lot Size**	**Minimum Test Frequency**	**Test Method**

Laying and Jointing of Pipes, Access Chambers, Structures	Geometry	1 line	1 per line	Survey
Thrust and Anchor Blocks	Table SC6.4.23.14			
Cast-in-situ Access Chambers	Material Quality Tri-Calcium Aluminate Content Fineness Index Minimum Cement Content	1 contract 1 contract 1 contract	1 per contract per source 1 per contract per source 1 per contract per source	AS3972 AS3972 AS3972
Acceptance Test of Gravitation Mains and Access Chambers	Compressed Air Testing	1 line	1 per line	As specified Section SC6.4.11, Clause SC6.4.11. 5(4)
Testing of Rising Mains	Hydrostatic test pressure	1 line	1 per line (max 1000m)	As specified in Section SC6.4.11, Clause SC6.4.11.5(3)
Backfill and Compaction	Compaction	1 line	1 per 2 layers max 100m^2	AS1289.5.7.1, AS1289.5.4.1 per Section SC6.4.11, Clause SC6.4.11.5(4)
Switchgear and Control gear Assembly	Electrical Compliance	each installation	1 factory test per installation	AS3439
Commissioning of Pumping Station	Certification testing of electrical installation in accordance with relevant Australian Standards	1 installation	1 per installation	As specified inSection SC6.4.11, Clause SC6.4.11.5(5)

SC6.4.23.3 Random sampling

(1) General

Random sampling of test locations shall be used to control relative compaction of each layer of (which aregenerally rectangular in area):

(a) earthworks;

(b) selected material zone; and

(c) stormwater drainage.

The number of samples (n) per lot shall be as indicated in the specific sections which are summarised inSC6.4.23.2.

(2) Locations

Sampling locations within a lot for the control of relative compaction shall be determined by the Superintendent.

SC6.4.23.4 Method statement requirements

(1) General

(a) Method statements are required to describe the key steps and sequence in the construction activities, how and by whom each step shall be undertaken and what materials and equipment shall be used. Method statements may include a flow chart to clarify the sequence of key steps. One or more method statements may address a construction activity.

(b) Each method statement will be supported by a check list which shall identify relevant inspections, test points, materials requirements and hold points. Each requirement on the check list will have an officer responsible identified and will require the nominated officer to sign off the requirement so indicating its satisfactory execution.

(c) Method statements and check lists shall be compatible with the appropriate Inspection and test plan. Check lists will be completed for each lot of work during construction and compiled with other documents to comprise the quality register.

(d) The Contractor shall submit method statements and check lists to describe the key steps in those construction activities listed below that are identified with a preceding asterisk (*).

Item	Enter * here if required	Activity	Planning Scheme Policy
1		Control of Traffic	SC6.4.6.4
2		Temporary Roadways and Detours	SC6.4.6.4
3		Clearing and Grubbing	SC6.4.7.1
4		Earthworks - Cut	SC6.4.7.6
5		Earthworks - Unsuitable Material	SC6.4.7.8
6		Earthworks - Embankment	SC6.4.7.9
7		Compaction and Quality Control	SC6.4.7.11
8		Siting, Excavation, Bedding, Backfilling and Compaction of Stormwater Drainage	SC6.4.9.11
9		Installation of Pipe Drainage	SC6.4.9.13

Item	Enter * here if required	Activity	Planning Scheme Policy
10		Installation of Precast Box Culverts	SC6.4.9.14
11		Siting and Installation of Drainage Structures	SC6.4.9.11
12		Construction of Lined Open Drains including Kerb and Gutter	SC6.4.9.17
13		Stabilisation of Pavement or Subgrade Materials	SC6.4.6.2
14		Provision of Subsurface Drainage as subsoil drains, pavement drains or free draining layer	SC6.4.6.3
15		Construction of Flexible Pavement Layers	SC6.4.6.2
16		Construction of Concrete Pavement Layers	SC6.4.6.2
17		Construction of Asphaltic Concrete Pavement Layers	SC6.4.6.2
18		Sprayed Bituminous Surfacing	SC6.4.6.2
19		Construction of Segmental Paving	SC6.4.6.2
20		Pavement Marking	SC6.4.14
21		Minor Concrete Works	SC6.4.18
22		Landscaping	SC6.4.12 and SC6.4.13

SC6.4.23.5 Minimum inspection and test plan

Table SC6.4.23.20 Water Supply-Hold Points

Clause title/ Item	Requirement	Notice for Inspection	Release by
Materials			
General	Submit alternative products and materials for approval.	2 weeks before ordering	Council (Water Authority)
Pipeline Construction			
General – Work accreditation	Provide proof of accreditation for approval.	1 week prior commencement of work	Superintendent
General – Change of pipeline alignment	Approval of the proposed alignment from the Water Authority.	1 week	Council (Water Authority)
Earthworks – Excavation near existing services	Approval from relevant Authority for the excavation.	1 week	Superintendent

Clause title/ Item	Requirement	Notice for Inspection	Release by
Minimum Trench Width for Pipelines – Excavation across paved or improved surfaces	Approval from the Authority or Owner prior to commencing any excavation across paved or improved surfaces.	1 week	Superintendent
Pipe Bedding – Trench completed	Present the completed excavated trench prior to pipe laying, jointing and bedding.	2 working days	Superintendent
Laying and Jointing of Pipes – Existing asbestos cement pipe cutting and disposal	Submit method statement for approval.	2 working days	Superintendent
Pipe testing and restoration			
Testing of Pipelines	Conduct pressure testing.	7 days	Superintendent and Council
Testing of Pipelines – **U**nsatisfactory test results, defects and leakage	Conduct pressure testing upon completion of rectification work.	3 days	Superintendent and Council
Backfill and Compaction – Completion of work	Present the laid and jointed pipes for approval prior to the commencement of trench backfilling.	2 working days	Superintendent
Restoration of Surfaces	Restore progressively and as soon as possible after the section of works is completed.	2 working days	Superintendent
Pump stations			
Pumps	Provide written warranty from the manufacturer for approval.	2 weeks before ordering	Superintendent
Electrical Compliance – **C**ompliance with required standard	Supply a proof of compliance**–**Test certificate.	1 week	Superintendent
Electrical Installation – **R**oute of underground cabling	Submit underground cabling requirements and route for approval.	2 weeks	Superintendent

Clause title/ Item	Requirement	Notice for Inspection	Release by
Testing and Commissioning of Pump Station – Compliance with the specification requirements	Submit required test results.	1 week	Water Authority and Superintendent
Testing and Commissioning of Pump Station – Commissioning	Give notice of intention to undertake commissioning. Provide pre-commissioning record sheets.	2 weeks	Water Authority and Superintendent
Construction compliance			
Works–as–executed details and Operation and Maintenance Manuals	Submit work-as executed drawing and Operating and Maintenance Manuals.	2 weeks before operating	Water Authority and Superintendent

Table SC6.4.23.21 Water Supply Witness-Points

Editor's Note- The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause title/ Item	Requirement	Notice for inspection
Materials		
General – Compliance with manufacturers recommendations	Contractor to inspect material and products at time of delivery for compliance.	2 working days
General – Certification	Provide product or material certification prior to delivery to the works.	3 working days (Pipes and Fittings)1 week (Valves and Hydrants)
Pipeline construction		
Location – Set out	Confirm the set-out locations prior to construction.	3 working days
Crossings – Crossings - Authority approvals	Approval from relevant Authority and payment of fees.	2 weeks
Earthworks – Open excavation	Contractor to provide appropriate safety measures for open excavation.	Progressive
Laying and Jointing of Pipes – Inspection prior laying	Contractor to present to the Superintendent materials prior laying (if required).	Progressive
Pipe testing and restoration		
Disinfection and Flushing of Pipelines	Provide evidence of compliance with this requirement.	2 working days upon completion of activity.
Restoration of Surfaces – Disposal of surplus material	Superintendent approval is required prior spreading/disposal.	2 working days progressive

Table SC6.4.23.22 Sewerage Systems Hold-Points

Clause title/ Item	Requirement	Notice for inspection	Release by
Materials			
General	Submit alternative products and materials for approval.	2 weeks before ordering	Superintendent
Pipeline construction			
General – Work accreditation	Provide proof of accreditation for approval.	1 week prior commencement of work	Superintendent

General – Change of pipelinealignment	Approval of the proposed alignment from the Sewer Authority.	1 week	Superintendent and Council
Earthworks – Prior excavation	Approval from relevant Authority for the excavation.	1 week	Superintendent
Excavation near underground services– Protection of other services	Submit for approval give notice of any interference to the works caused by an existing service and submita proposed work method statement.	1 week	Superintendent
Pipe Bedding – Foundation condition/water charged ground	Notify Superintendent and confirm method of foundation support from the designer.	Progressive	Superintendent
Wrapping Pipelines– Damage to sleeving	Rectify any damage to sleeving before backfilling trench.	Progressive	Superintendent
Bedding and Backfill Compaction Requirements – Notification of pipeline laid and jointed.	Present the laid and jointedpipes for approval before thetrench backfilling.	Progressive	Superintendent
Bedding and Backfill Compaction Requirements – Embankment	Submit proposal for construction of embankments.	1 week	Superintendent
Pipeline testing and restoration			
Acceptance Test of Gravitation Sewers andMaintenance Holes – Acceptance Testing	Present all sewers andmaintenance holes for acceptance testing.	1 week	Superintendent and Council
Acceptance Test of Gravitation Sewers andMaintenance **Holes –** Hydrostatic testing	Submit proposed alternative testing regime for approval.	1 week	Superintendent and Council
Connection to Existing Sewers	Submit request to connect to the existing sewer and give notice of works including any affected occupants.	3 weeks before connection	Superintendent and Council
Testing of Rising Mains – Pressure Test	Present rising main for acceptance testing.	1 week	Superintendent and Council

Restoration of Surfaces– Original condition requirement	Restore progressively and as soon as possible after the section of works is completed.	2 working days	Superintendent
Pump stations			
General – Authorised products and materials	Submit alternative products and materials for approval.	2 weeks before ordering	Superintendent
Pumps	Provide written warranty of the equipment.	Upon delivery on site	Superintendent
Electrical Compliance – Compliance with required standard	Supply a proof of compliance – Test certificate.	1 week	Superintendent
Electrical Installation – Route of underground cabling	Submit underground cablingrequirements and route for approval.	2 weeks	Superintendent
Testing and Commissioning of Pump Station – Compliance with the Specification Requirements	Submit required test results.	1 week	Superintendent and Council
Testing and Commissioning of Pump Station – Commissioning	Give notice of intention to undertake commissioning. Provide pre commissioning record sheets.	2 weeks	Superintendent and Council
Practical Completion of Pump Station	Fulfil all the requirements forissuance of Certificate of Practical Completion.	2 weeks	Superintendent
Construction compliance			
Works–as–executed details and Operation and Maintenance Manuals	Submit work as-executed drawing and Operating and Maintenance Manuals.	1 week before operating	Superintendent and Council

Table SC6.4.23.23 Sewerage Systems Witness-Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause title/item	Requirement	Notice for inspection
Materials		

General – Compliance with manufacturer's recommendations	Contractor to Inspect material and products at time of delivery for compliance.	2 working days
General – Certification	Provide product or material certification prior to delivery to the works.	3 working days (Pipes and Fittings)1 week (Valves)
Pipeline construction		
Crossings – Crossings Authority approvals	Approval from relevant Authority and payment of fees.	2 weeks
Earthworks – Open excavation	Contractor to provide appropriate safety measures for open excavation	Progressive
Bedding and Backfill Compaction Requirements – NATA	Provide NATA certified test results for all testing.	2 working days progressive
Thrust and Anchor Blocks for Rising Main – Verification of BearingPressures	Give notice if the allowable bearing pressure of the ground and the design pressure of the pipeline differ from actual pressures on site.	1 week
Pipeline testing and restoration		
General – Initial Tests (Sewers and Maintenance Holes)	Give notice prior commencement of initial testing.	2 days progressive
Ovality Test and CCTV Inspection – Deflection testing and pipeline verification	Submit proposal for deflection testing (Ovality Test). Submit CCTV Results.	1 week (Ovality Test) 2 days upon completion of inspection
Acceptance Test of Gravitation Sewers and Maintenance Holes	Submit acceptance test results.	Progressive
Visual Inspection and Measurement of Infiltration – Infiltration testing	Submit method of infiltration testing.	1 week
Testing of Rising Main	Submit acceptance test results.	Progressive
Restoration of Surfaces – Disposal of surplus material	Superintendent approval is required prior to spreading/disposal.	2 working days progressive
Pump stations		
General - Conformance with manufacturers	Inspect material and products at time of delivery.	2 working days

recommendations		
Electrical Compliance – Approval of all design and materials	Submit all design drawings and materials to each Authority having jurisdiction for approval.	2 weeks before ordering

Table SC6.4.23.24 Stormwater Drainage Hold-Points

Clause title/Item	Requirement	Notice for inspection	Release by
Construction			
Temporary drainage – Erosion and Sediment Control	Confirmation of accepted project ESCP and completion of erosion and sedimentation control measures.	1 week prior to site commencement	Superintendent and Council
Siting of Culverts – Surveyset out	Submit survey set out of culvert inlets and outlets for approval.	1 week prior to proceeding	Superintendent
Siting of Culverts – Changes by Contractor	Submit proposed changes for approval.	1 week prior to proceeding	Superintendent
Excavation – Public utilities	Obtain approval for adjacent excavation with relevant authorities.	1 week prior to proceeding	Superintendent
Construction traffic – Protection measures	Submit certification and verification of protection measures.	3 working days	Superintendent

Table SC6.4.23.25 Stormwater Drainage Witness-Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause title/Item	Requirement	Notice for inspection
Construction		
Excavation – Notice	Identify unsuitable materials and inadequate support material for removal and disposal at the foundation level of the structure.	progressive
Backfilling – In situ concretestructures	Do not backfill against in situ concrete structures within 14 days of concrete placement.	progressive
Backfilling – Tolerance	Check shape of culvert during backfilling.	progressive
Compaction adjacent to culverts or drainage structures	Inform the Superintendent prior rectification any damage.	2 working days before proceeding

Table SC6.4.23.26 Drainage Structures Hold-Points

Clause title/Item	Requirement	Notice for inspection	Release by
Construction			
Precast Units – Productdrawings and Quality	Submit details of precast or proprietary items for approval and Submit quality test results.	1 working day and 3 workingdays before delivery respectively	Superintendent
Excavation	Excavation and compactionof foundation as documented.	1 working day	Superintendent
Backfill – Commencement	Obtain approval for commencement.	1 workday day	Superintendent

Table SC6.4.23.27 Drainage Structures Witness-Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause title/Item	Requirement	Notice for inspection
Construction		
Headwalls and Wingwalls – Batterretention	If dimensions on drawings are unable to satisfy batter retention, notify the Superintendent.	3 working days
Precast units	Give notice of installation of precast pits and junction boxes.	1 week
Construction	Submit for approval part omission of concrete lining.	3 working days

Table SC6.4.23.28 Pipe Drainage Hold-Points

Clause title/Item	Requirement	Notice for inspection	Release by
Common requirements			
General – Material Certification	Submit conformance certificate and other relevant manufacturer quality documentation.	24 hours in advance of dispatch to site	Superintendent
General – Alternative materials	Submit full product details in accordance with AS/NZS 2566.1.	4 weeks prior to commencing work	Superintendent and Council
General – Backfilling	Present the completed installation and jointed pipes for inspection.	Progressive before backfilling	Superintendent and Council

General – Protection ofstructures	Submit design proposal for protective measures for approval including geotechnical investigation required before the commencement of design of urban residential development to ensure that stormwater infrastructure is provided with adequate cover to avoid damage during construction from equipment.;	3 days prior	Superintendent and Council
Steel pipes and pipe arches			
Materials and Surface Treatment	Engineer's certification for the pipe materials and surface treatments.	Prior to practical completion	Superintendent
UPVC pipes			
Materials–Proprietary product with external diameter of ≥450mm	Submit for approval prior to construction.	4 weeks	Superintendent and Council

Table SC6.4.23.29 Pipe Drainage Witness-Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council

Clause title/Item	Requirement	Notice for inspection
Precast reinforced concrete and fibre reinforced concrete pipes		
Excavation – Wide Trench Condition	If deemed as a wide trench, confirm appropriate pipe strength/trench support.	Progressive
Bedding	Source of bedding material -advise Superintendent.	Progressive
Bedding – Cementitious stabilisation	Provide if erosion of bedding material may occur.	1 week

Table SC6.4.23.30 Precast Box Culverts Hold-Points

Clause title/Item	Requirement	Notice for inspection	Release by
Materials			
Culvert Units, Link and Base	Submit certificate of	3 working days prior to	Superintendent

Slabs	conformance.	dispatch	
Proof load testing	Submit certificate and test results.	3 working days prior to dispatch	Superintendent
Construction			
Construction of coffer dams	Submit construction details for approval.	1 week prior to construction	Superintendent
Prior placement of bedding	Inspection of foundation and approval of proposed bedding.	2 days before placing material	Superintendent
Backfill — Inspection of seals	Present joints and seals for before backfilling.	1 working day	Superintendent
Construction loading on culvert — Constraint	Do not load base slab until strength has reached 20 MPa.	1 working day	Superintendent

Table SC6.4.23.31 Precast Box Culverts Witness-Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause title/Item	Requirement	Notice for inspection
Materials		
Handling, Delivery and Storage	Inspect box culvert units for conformance.	1 week prior to installation
Construction		
Coffer Dams - Timber or bracing removal	Inspect removal of bracing materials.	1 working day
Installation of Precast in situ base slabs	Attainment of concrete minimum compressive strength.	1 working day

Table SC6.4.23.32 Drainage Mats Hold-Points

Item/Clause title	Requirement	Notice for inspection	Release by
Type A mats / Type B mats			
Geotextile, Damaged geotextile	Approval of condition or repair of geotextile.	1 working day before next activity	Superintendent
Filter material, Thickness	Approval of thickness and	3 working days before	Superintendent

	layers of filter material.	placing filters	

Table SC6.4.23.33 Drainage Mats Witness-Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Item	Requirement	Notice for inspection
Type A mats /Type B mats		
Filter material, Protective layer	Inspection of placement of protective layer over mat extension.	3 working days before placing materials
Discharge, Outlets	Inspection of outlet proposals.	7 days before set out of layers

Table SC6.4.23.34 Open Drains Hold-Points

Clause title/Item	Requirement	Notice for inspection	Release by
Pre-construction planning			
Provision for traffic	Submit Traffic Guidance Scheme for approval.	2 weeks prior to site commencement	Superintendent
Temporary drainage	Submit details of procedures/devices for approval.	2 weeks prior to site commencement	Superintendent
Materials			
Proprietary Products	Submit proprietary products and manufacturer's instructions.	7 days prior to commencement on site	Superintendent
Gabions/Wire mattresses	NATA compliance certificates for proposed Gabions.	7 days prior to commencement on site	Superintendent
Rock fill material	NATA compliance certificates for proposed rock fill material.	7 days prior to commencement on site	Superintendent
Geotextile	NATA compliance certificates for proposed Geotextile material.	7 days prior to commencement on site	Superintendent
Open drains			
Excavation	Approval to divert drain to avoid trees and/or rocks.	1 working day before set out.	Superintendent.
Excavation	Location and construction of drains to prevent salination.	1 working day before set out.	Superintendent.

Kerb and channel (gutter)			
Foundation	Approval for shape and compaction of foundation material.	1 working day before forming	Superintendent

Table SC6.4.23.35 Open Drains Witness-Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause title/Item	Requirement	Notice for inspection
Open drains		
Excavation	Unsuitable material removal and disposal.	Progressive
Excavation	Spoil site locations.	Prior to placement
Embankment	Embankment compaction and revegetation.	Progressive
Construction	Grade and compaction of open drains.	Progressive
Construction	Proprietary items installed to manufacturers recommendations.	Progressive
Types	Maintain catch drains.	Progressive
Types	Construct minor diversion and contour drains, table drains, swales and depressed medians.	Progressive
Types	Channels preserving the existing stream bed.	Progressive
Lining		
Concrete lining	Instruction on weephole location.	1 working day before concreting
Concrete lining	Joints and tolerances.	1 working day before concreting
Stone pitching	Bedding material and placement.	✓ 1 working day before concreting
Kerb and channel (gutter)		
Stormwater outlets	Positive drainage to channel.	Progressive
Vehicular or pedestrian access	Siting, location, and bedding compaction.	Progressive
Backfilling and reinstatement		
Backfill behind kerbs	Backfilling timing, material and compaction.	1 working day prior to backfilling

Pavement backfill	Backfill adjacent new gutter material and location.	1 working day prior to backfilling
Rock filled wire mattresses and gabion– Completion	Inspection of rockfill material and filling method.	On completion of works

Table SC6.4.23.36 Earthworks Hold-Points

Clause/subclause	Requirement	Notice for inspection	Release by
Stockpile Sites	Approval to use any stockpile site not shown on the Drawings.	3 working days before stockpiling	Superintendent
Treatment of Floors of Cuttings – Prior ripping floorsof cuttings	Present in situ material for inspection to determine suitability of pavement support.	Before ripping commences	Superintendent
Treatment of Floors of Cuttings – Compacting floors of cuttings	Inspection of compacted cutting floor.	Prior to placing any subsequent layers over the completed cutting floor	Superintendent and Council
Unsuitable material – Floorinspection	Re-present the floor of the excavation after the removal of unsuitable material.	Prior to backfilling with replacement material	Superintendent
Foundations for Embankments	Inspection of the embankment foundation area.	1 working day prior to next activity	Superintendent
Foundation for Embankments – Other embankments (Bridging layer)	Inspection and direction for bridging layer where required	3 working days before proceeding	Superintendent
Trimming tops of embankments	Inspection of the completed surface to receive subsequent pavement layers.	Prior to placing any subsequent pavement layers	Superintendent
Selected material zone	Inspection of the completed select material zone surface prior to placing any subsequent pavement layers.	1 working day before proceeding	Superintendent
Fill adjacent to structures – General	Concrete strength required for early filling to structures.	3 working days prior to fill placement	Superintendent

Deflection monitoring or proof rolling	Present the completed work for deflection monitoring or proof rolling.	2 working days before next activity	Superintendent and Council

Table SC6.4.23.37 Earthworks Witness-Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause/subclause	Requirement	Notice for inspection
Natural Surface and Earthworks Materials	Survey method and results, including any discrepancies.	At least 7-days' notice
Cuttings – Floors of cuttings	Floors to be no more than 50 mm above or below the designed floor and provide suitable support.	1 working day before next activity
Batters – Excavation beyond the batter line	Minor change in the general slope of the batter to suit the site conditions.	1 working day before next activity
Transition from cut to fill – Terrace	Excavate a terrace for the width of the selected material zone to a depth of 900 mm below and parallel to the cutting floor.	1 working day before excavatingterrace
Unsuitable Material	Material deemed unsuitable for embankment or pavement support in its present position.	Progressive
Placing Fill for Embankment Construction – Rock material	Modify grading of fill material to achieve compaction.	Progressive
Fill adjacent to structures – Treatment at weepholes	Proposal to use synthetic membrane geotextile.	3 working days before proposed use
Spoil – Haulage disposal	Obtain planning approval and any permits.	3 working days before commencing activity
Borrow – Requirement	Obtain planning approval and any permits.	3 working days before commencing activity

Table SC6.4.23.38 Clearing and Grubbing Hold-Points

Clause/subclause	Requirement	Notice for inspection	Release by
Limits of clearing			
Survey	Decision on the removal of miscellaneous items.	7 days before proposed removal	Superintendent

Extent of clearing	Submit peg out and extent of clearing survey.	7 days before proposed commencement of clearing	Superintendent and Council
Clearing Operations			
Tagging	Confirm clearing perimeters and mark trees to be preserved.	7 days before proposed site clearing	Superintendent and Authorised Council Officer
Work near trees noted for protection	Work method statement for works within the exclusion zone.	7 days before proposed works	Superintendent
Excavation within 4m of tree trunks	Develop appropriate work methods to avoid damage to the tree for approval.	7 days before proposed excavation	Superintendent
Trees within proposed embankment areas	Direction to remove or protect trees within proposed embankments.	7 days before proposed site clearing	Superintendent
Unsound trees in road reserve	Direction on removal of trees or branches not within the clearing limits.	7 days before proposed site clearing	Superintendent
Timber falling on private property	Written consent of owner to leave in place or to enter property to remove.	Prior to carrying out works	Superintendent
Damage	Approval for any rehabilitation of vegetation or fauna habitat.	3 working days prior to carrying out works	Superintendent and Authorised Council Officer
Grubbing			
Blasting	Explosives not permitted without prior approval.	Progressive	Superintendent
Disposal of materials			
Burning of material	Approval prior to disposal of timber and other combustible materials by burning.	Prior to burning	Superintendent

Table SC6.4.23.39 Clearing and Grubbing Witness-Points

Editor's note: The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause/subclause	Requirement	Notice for inspection
Existing Utility services – Marking	Locate all underground pipe and cables.	Before commencing any earthworks
Trees to be preserved –	Exclusion zone around protected	Progressive

Work near trees noted for protection	trees.	
Trees to be preserved – Tree protection	Trees and roots not to be cut or damaged.	Progressive
Grubbing – Backfill	Backfill and compact grub holes.	Progressive
Chipping of cleared vegetation – Stockpiling	Stockpile location approval.	Prior to stockpiling

Table SC6.4.23.40 Flexible Pavements Hold-Points

Clause title/Item	Requirement	Notice for inspection	Release by
Activity plan			
Pavement construction plan	Prepare and submit pavement plan.	4 weeks before commencing site work	Superintendent
Inspection, sampling, and testing			
Notification	Written notice for testing times and provide test results.	3 working days prior to testing or inspection	Superintendent
Materials			
Proposed materials	Prepare and submit schedule detailing material properties including NATA test results and certificate.	2 weeks before ordering materials	Superintendent
Bound or modified materials	Complete and submit (SC6.4.6.19 Attachment A).	2 weeks before ordering materials	Superintendent
Variations to approved materials	Submit details of changes to approved materials.	1 week before use in works	Superintendent
Lime modified base and subbase materials			
Lime modification	Submit proposals to modify materials.	2 weeks before placing	Superintendent
Stationary Plant or In-situ lime modification	Submit proposals for the in-situ use of hydrated lime or quicklime.	2 weeks before activity	Superintendent
Spreading			
Underlying layer	Inspection to determine suitability of underlying layer.	1 working day before placing next layer	Superintendent
Temperature	Submit proposal to proceed	1 working day before	Superintendent

	outside allowable conditions.	placement	
Trimming, compaction and curing			
Plant	Submit details of proposed hand operated plant.	1 week before use	Superintendent
Subsequent layers	Submit completed test results of previous layer.	1 working day before placing next layer	Superintendent
Acceptance of compaction			
Lots for acceptance	Submit compaction test results.	1 working day after testing	Superintendent
Compaction requirements and acceptance	Submit evidence that compaction is within tolerances.	1 working day after test results	Superintendent
Tolerances			
General	Submit lot survey reports.	1 working day before next activity	Superintendent
Action on rejection			
Corrective action – **R**ejected unbound layers	Submit proposal for corrective action.	1 working day before next activity	Superintendent
Corrective action – **R**ejected bound layers	Submit proposal for corrective action.	3 working days before next activity	Superintendent
Removal and replacement of rejected course			
Extent of removal	Submit proposal to remove less than full width.	1 working day before next activity	Superintendent
Prior to replacement	Give notice for inspection of underlying material.	1 working day before next activity	Superintendent
Replacement	Submit proposed methods to make good.	1 working day before next activity	Superintendent
Maintenance before completion of wearing course			
Pavement condition before primer-seal	Dry-back, re-prepare and give notice for inspection.	3 working days before next activity	Superintendent and Council
Opening bound pavement to traffic	Give notice of proposed opening to traffic.	3 working days before proposed opening	Superintendent

Table SC6.4.23.41 Flexible Pavements Witness-Points

Editor's note: The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause title/Item	Requirement	Notice for inspection
Delivery to site		
Delivered materials	Give notice for inspection.	Progressive
Delivery of modified or bound materials		
Delivery of materials	Provide delivery dockets at point of delivery.	Progressive
Stockpiling of unbound materials		
Location	Give notice of proposed alternative locations.	2 weeks before stockpiling
Trimming, compaction and curing		
Compaction	Give notice of proposal to use alternative layer thickness.	2 weeks before activity
Rework	Give notice for inspection of reworked wetted up layer.	Progressive
Curing of bound materials	Give notice of water curing activities.	Progressive
Acceptance of compaction		
Nuclear density Meter testing	Give notice of proposal to use Nuclear density meter.	1 working day before use
Tolerances		
Layer width	Give notice of completion of layer width.	Progressive
Levels and Surface Trims	Give notice of completed surface layer.	Progressive

Table SC6.4.23.42 Asphaltic Concrete Hold-Points

Clause/subclause	Requirement	Notice for inspection	Release by
Plant	Evidence that plant is registered and insured.	2 weeks before using plant	Superintendent
Delivery — **W**ork records	Submission for counter signing.	Each day for daily completion	Superintendent
Asphalt mix design			
Approved Mix	Submit approved mix design for Superintendent confirmation.	7 days before using mix	Superintendent
Production Mix— Production sampling and	Submission of all documented test results.	Within 7 days of delivery of material	Superintendent

testing			
Asphalt mixes incorporating RAP	Mixes containing more than 20% RAP to be submitted for assessment.	7 days before using mix	Superintendent
Placing	Present surface prior spreading.		Superintendent
Joints — General	Submit plan of joints location for approval.	7 days before commencing	Superintendent
Preparation of Pavement — Rectification of pavement surface	Prepare surface to the satisfaction of the Superintendent.		Superintendent
Laying — Paver	Provide notice of proposed pavers.		Superintendent
Removal and Replacement of Rejected Material	Present surface after removal of the rejected material.		Superintendent

Table SC6.4.23.43 Asphaltic Concrete Witness-Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause/subclause	Requirement	Notice for inspection
Plant	Superintendent to assess faulty plant.	Progressive
Production	Superintendent to access the mixing plant to verify production procedures and the supplier's compliance with the Contractor's Project Quality Manual and Quality Plan.	Progressive
Aggregate — General	Source subject to inspection and approval of Superintendent.	3 weeks before importing aggregate

Table SC6.4.23.44 Mass Concrete Subbase Hold-Points

Clause title/Item	Requirement	Notice for inspection	Release by
Materials for concrete			
Materials	Submit details of concrete mix and materials.	Submit as part of confirmation of nominated mix	Superintendent

Design and control of concrete mixes			
Nominated mix	Submit details of concrete mix and materials including NATA certificates and test results.	21 working days before using the nominated mix (Progressive)	Superintendent and Council
Variations to nominated mix and materials	Submit details of any change to nominated mix and materials.	21 working days before implementing change	Superintendent
Conformance for concrete strength and thickness			
Sampling, curing and testing of fresh concrete	Inspection of sampling procedure.	Progressive	Superintendent
Acceptance criteria	Submit test results.	Progressive	Superintendent
Acceptance criteria for cored concrete (non-conformance)	Submit test results.	Progressive	Superintendent
Production, transport and consistency of concrete			
Concrete production and transport	Submit proposed work methods.	At least 21 working days before starting	Superintendent
Placing and finishing concrete subbase			
Subbase Paving plan	Submit as part of Quality Plan.	21 working days before starting	Superintendent
Construction — Placing	Written Notice to commence including trial section).	7 days before starting	Superintendent
Trial Concrete Subbase — Construction	Inspection of the trial concrete subbase.	1 working day after placing trial section	Superintendent
Trial Concrete Subbase — Deficient trial section	Provide justification of the methods used in producing deficient work for assessment.	1 working day after deficiency identified	Superintendent

Table SC6.4.23.45 Mass Concrete Subbase Witness-Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause title/Item	Requirement	Notice for inspection
Conformance for concrete strength and thickness		
Testing by specimens cut from the work	Coring witnessed by Superintendent	3 working days

Restoration after coring	Inspection of restoration work	3 working days after cutting
Placing and finishing concrete subbase		
Curing – Efficiency Index	Submit certificate of compliance for the curing compound	Progressive
Average application rate	Average rate checked by the Contractor and certified by the Superintendent	Progressive
Bond breaker and spall treatment		
Treatment of Unplanned Cracks	Check for cracks and repair/reject	Progressive

Table SC6.4.23.46 Plain and Reinforced Concrete Base Hold-Points

Clause title / Item	Requirement	Notice of inspection	Release by
Design and control of concrete mix			
Nominated mix	Submit details and certificates for nominated concrete mix and material constituents including NATA certificates and test results	21 working days before using the nominated mix	Superintendent
Variations to nominated mix and materials	Submit details of any change to nominated mix and materials	21 working days before implementing change	Superintendent
Steel reinforcement			
Placing and cover requirements	Approval of placement and fastening of reinforcing steel	4 working hours before concrete placement	Superintendent
Production, transport and consistency of concrete			
Concrete production and transport	Submit proposed methods and equipment	4 weeks before starting	Superintendent
Placing and finishing concrete base			
Subbase survey	Work-as-executed survey of the subbase.	7 days before starting any works	Superintendent
Surface texture	Submit details of proposed texturing device and method of texturing	Before texturing	Superintendent
Trial of Concrete Base - Construction	Obtain approval for the trial section	5 working days before main works	Superintendent

Trial of Concrete Base — Deficient trial section	Provide justification of the methods used in producing deficient work for assessment	2 working days after construction	Superintendent
Joints			
Permanent sealing — General	Submit proposed method for permanent joint sealing	4 weeks before installation	Superintendent
Slab anchors			
Excavation	Submit compacted excavated surface	1 working day before concreting	Superintendent
Testing of concrete for compressive strength			
Sampling	Inspection of sampling procedure	Progressive	Superintendent
Acceptance criteria	Submit test results	Progressive	Superintendent
Acceptance criteria for cored concrete	Submit test results	Progressive	Superintendent
Removal and replacement of base			
General	Submit proposed method of removal to preserve adjoining base and underlying subbase	7 working days before replacement works	Superintendent

Table SC6.4.23.47 Plain and Reinforced Concrete Base Witness-Points

Editor's note: The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Witness Points Off Site		
Clause/ subclause	**Requirement**	**Notice of inspection**
Materials for concrete		
Aggregates - Storage	Storage and handling to preserve quality of aggregate	Progressive
Steel reinforcement		
General	Provide NATA certificates and manufacturer's information.	Before delivering to site
Bar chairs	Demonstrate load bearing capacity	Before delivering to site
Joints		
Silicone Sealant	Provide NATA certificate and manufacturer's information	4 weeks before joint work

Witness Points On-Site		
Joints		
Permanent Sealant	Locations as shown on drawings and change to spacing	Progressive
Placing and finishing concrete base		
Consistency	Provide slump check test results	Progressive
Protection of Work - Ambient conditions	Provide details of protection methods for cold or hot weather and rain	Progressive
Traffic considerations	Provide traffic management measures	Progressive
Rate of Evaporation and moisture loss	Provide details of precautionary measures to prevent moisture loss when evaporation rate exceeds prescribed limits	Progressive
Paving (Mechanical and Hand Paving)	Construction joint if hand or mechanical paving is disrupted	Progressive
Alignment and Surface Tolerances - Assessment of base thickness	Survey of base surface, edge alignment and thickness	Progressive
Curing – Efficiency Index	Submit certificate of compliance for the curing compound	Progressive
Testing of concrete for compressive strength		
Testing of specimens cut from the work	Carry out coring in presence of the Superintendent	
Repair and Restore work after coring	Restore holes with non-shrink cementitious concrete	After coring
Conformance of concrete strength, compaction and thickness		
Relative Compaction	Testing conformance of required relative compaction	Progressive

Table SC6.4.23.48 Sprayed Bitumen Surfacing Hold-Points

Clause title/Item	Requirement	Notice for inspection	Release by
Design of bituminous surfacing			
Confirmation of Design and Materials Compliance	Submit the sprayed seal design and additional details for approval	2 weeks before commencing work	Superintendent
Plant	Evidence that plant is registered and insured	2 weeks before using plant	Superintendent

Table SC6.4.23.49 Sprayed Bitumen Surfacing Witness-Points

Editor's Note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause title/Item	Requirement	Notice for inspection
Application and rolling of aggregate		
Removal of loose aggregate, Loose aggregate particles	Completion within specified time	Various to allow inspection of performance in conformance with Tables of time limits
Removal of surplus and waste material	Demonstrate that materials are properly disposed	Progressive
Protection - New work	Demonstrate that line-marking and warning signs are in place to protect new work	Progressive

Table SC6.4.23.50 Bituminous Micro-Surfacing Hold-Points

Clause title/Item	Requirement	Notice for inspection	Release by
Mix design			
Nominated Mix—Design and control of bituminous mix	Submit details of nominated mix with NATA Certification	7 days before commencing	Superintendent
Production and paving			
Production mix Bituminous micro-surfacing	Target application rate and nominal layer thickness for approval	7 days before commencing	Superintendent
Sampling and testing of production mix	Compliance with maximum permitted variations from approved mix	During mixing	Superintendent
Weather limitations	Cease works if weather conditions are not appropriate	Progressive	Superintendent
Paving unit calibration	Documentation for detailed calibration	7 days before using paving unit	Superintendent
Preparation of Pavement	Provide cleaned surface for inspection	1 working day prior to spreading works	Superintendent
Spreading—Traffic	Capable of carrying traffic in short period after slurry surfacing to the approval of Superintendent	One hour after spreading	Superintendent
Surface texture—Test run	Demonstrate surface texture	1 working day before commencing	Superintendent

Non-conformance—Materials and finished surfacing	Approval for correction or replacement	1 working day before corrective action	Superintendent

Table SC6.4.23.51 Bituminous Micro-Surfacing Witness-Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause title/Item	Requirement	Notice for inspection
Witness Points Off Site		
Materials		
Binder—Compliance	Submit NATA test results for the nominated binder	7 days prior to commencing works
Mineral Aggregates—Quality	Submit NATA test results for the nominated mineral aggregates	7 days prior to commencing works
Mineral Filler—Quality Compliance	Submit NATA test results for the nominated binder	7 days prior to commencing works
Witness Point On Site		
Spreading—Clean up	Leave road fixtures in clean and satisfactory condition	Progressive

Table SC6.4.23.52 Segmental Paving Hold-Points

Clause title/Item	Requirement	Notice for inspection	Release by
Materials			
General – Nominated materials	Submit segmental paving materials and supplier.	2 weeks before ordering	Superintendent
Construction			
Subgrade Preparation—Dimensions and specification	Present the finished subgrade for approval	1 working day beforeproceeding	Superintendent
Subbase—Dimensions and specification	Present finished subbase for approval	1 working day before proceeding	Superintendent
Base—Dimensions and specification	Present the finished base for approval	2 working days before proceeding	Superintendent

Table SC6.4.23.53 Segmental Paving Witness-Points

Editor's note: The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Item	Requirement	Notice for inspection
Construction		
Opening to Traffic—Inspection	Regularly inspect joints after completion	Progressive

Table SC6.4.23.54 Stabilisation Hold-Points

Clause/subclause	Requirement	Notice for inspection	Release by
Materials proposed for use in the work	Submit NATA certificate of compliance	14 days prior to commencement of works	Superintendent
Field Working Period — Laboratory	Nominate the specific field working period specified in the Stabilisation Mix Design	14 days prior to commencement of works	Superintendent
Materials			
Cement—Storage	Re-test cement stored in excess of 3 months	2 working days prior to usage	Superintendent
Stabilisation Process —Proposed equipment and procedures	Submit a Work Plan nominating proposed plant and work sequence	14 days prior to commencement	Superintendent
Application of stabilising agent—In situ application	Proposals for special processes of supply of stabilising agent into the mixing bowl	7 days prior to mixing	Superintendent
Mixing—In situ mixing process	Demonstration of equipment mixing efficiency in trial section	7 days prior to production stabilisation	Superintendent
Trimming and Compaction—Trimming	Work methods to exclude laminations and slurrying	3 working days prior to production stabilisation	Superintendent
Trimming and Compaction—Survey control methods	Use of trimmed material as fill or spoil	3 working days prior to disposition	Superintendent
Curing—Method statement	Submit details of proposed curing method	As directed	Superintendent
Trial section of stabilised earthworks			
General	Submit a trial section of stabilised earthworks	5 working days prior to commencement of works	Superintendent and Council
General	Any deficient sections will require to be investigated and may be directed to remove	Progressive	Superintendent and Council

Table SC6.4.23.55 Stabilisation Witness-Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause/subclause	Requirement	Notice for inspection
Witness Points Off Site		
Materials		
Cement	Proof of quality and source	Progressive
Quicklime	Proof of quality and source	Progressive
Hydrated lime	Proof of quality and source	Progressive
Ground granulated blast furnace slag	Proof of quality and source	Progressive
Flyash	Proof of quality and source	Progressive
Blended stabilising agent		
Blended stabilising agent — Standard	Proof of quality and source	Progressive
Blended stabilising agent — Handling and storage	Comply with supplier's handling and storage requirements and arrange sampling of agent	Progressive
Witness Points On Site		
Quality Requirements— Compaction	Adjustment of Field Working Period for site conditions	Progressive
Application of stabilising agent — Stationary mixing plant	Monitoring application of stabilising agent at the plant	Progressive
Application of stabilising agent — Stationary mixing plant	Removal of spilled stabilising agent	Immediately upon spillage event
Application of stabilising agent — Spreading out	Actual spread to be recorded and checked	Progressive
Application of stabilising agent — Spreading out	Record average spreading rate using load cells	Progressive
Mixing— Stationary mixing plant	Test unconfined compressive strength	Progressive
Mixing— In situ mixing process	Visual inspection to ensure uniform mixing and record	Progressive
Mixing— In situ mixing process	Additional passes of mixing equipment to improve uniformity	Progressive

Trimming and Compaction— Surveycontrol methods	Survey to confirm pavement layer thickness remains within tolerances after trimming	Progressive
Trimming and Compaction — Straight edge test	Conform to surface tolerances prior tosealing or practical completion of work component	As directed by Superintendent
Dimensions— Width	Random measurement of stabilised layer width	As directed by Superintendent

Table SC6.4.23.56 Subsoil, Foundation, and Pavement Drains Hold-Points

Item/Clause title	Requirement	Notice for inspection	Release by
Construction			
Subsoil and Sub-Pavement Drains / Foundation drains —Excavation	Inspect excavated trench	1 working day prior to filling	Superintendent
Subsoil and Sub-Pavement Drains / Foundation drains— Laying of Pipes	Present bedding of compacted filter material laid to line and grade	3 working days before next activity	Superintendent
General — Filter material	Type of filter material	3 working days before ordering material	Superintendent
Intra pavement drains — Laying of pipe	Provide certification that drain has adequate crushing strength	3 working days before ordering	Superintendent
Intra pavement drains — Laying of pipe	Submit details of proposed method of securing pipes	7 days before pipe laying	Superintendent
Edge drains — Laying of pipe	Submit details of proposed method of securing pipes	7 days before pipe laying	Superintendent

Table SC6.4.23.57 Subsoil, Foundation, and Pavement Drains Witness-Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Item/Clause title	Requirement	Notice for inspection
Construction		
Subsoil and Sub Pavement Drains / Foundation drains— Pipes	Lay on compacted bed to documented line and level	1 working day before filling

Subsoil and Sub Pavement Drains —Backfilling	Backfilling to documented level and relative compaction	1 working day before covering with geotextile
Foundation drains— Backfilling	Backfilling to documented level and relative compaction	1 working day before covering with geotextile
Geotextile— Installation	Placement of fabric conformance	1 working day before filling
Geotextile— Installation	Ensure exposure periods are within the constraints	Progressive
Cleanouts— Field testing	Perform flushing test	Progressive (timing depending on the construction of pavement layers)

Table S C 6 . 4 . 2 3 . 5 8 Subsurface Drainage Witness- Points

Item/Clause title	Requirement	Notice for inspection	Release by
General			
Siting of Work	Submit the proposed set out in addition to the designed Set out	7 days before planned execution	Superintendent
Siting of Work— Proposed changes	Present the proposed new Set out for approval	3 days before planned execution	Superintendent
Excavation— Existing underground services	Submit evidence of approval of the relevant authorities.	14 days before planned excavation	Superintendent
Excavation— Trenches	Approval of completed trenches required prior to installation of drainage work	1 working day prior to installation of drainage work	Superintendent
Materials			
Subsurface drainage pipes— General	Submit compliance certificates	7 days before proceeding to provide pipes	Superintendent
Other subsurface drainage pipes	Submit details of proposed alternative pipes and evidence of conformity for approval.	7 days before proceeding to provide pipes	Superintendent
Geotextile— General	Provide documentation of conformity of geotextile and installation process	14 days before proceeding to provide geotextile	Superintendent
Recording of drainage			

Recording of subsurface drainage Information	Progressive supply of subsurface drainage details	5 working days after completion of each drain or drainage system	Superintendent

Table SC6.4.23.59 Temporary Drainage Witness- Points

Editor's note -The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Item/Clause title	Requirement	Notice for inspection
General		
Temporary drainage during construction	Locate materials and equipment clear of water courses	7 days prior to positioning

Table SC6.4.23.60 Pavement Markings Hold-Points

Clause title/subclause	Requirement	Notice for inspection	Release by
General			
Material Quality	Submit NATA Test Reports on materials	7 days before work is scheduled to commence	Superintendent
Surface preparation— Wet Weather	Superintendent direction on suspension of work	Progressive	Superintendent
Removal of pavement markings			
General— Removal ofredundant markings	Submit method for approval	1 working day before commencement of activity	Superintendent

Table SC6.4.23.61 Pavement Markings Witness- Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by theSuperintendent and Council.

Clause title/subclause	Requirement	Notice for inspection
General		
Setting Out—Net	Set out in accordance with the drawings	Progressive
Pavement marking paint		
Application of Paint Beads— Glass beads applied to other paint markings	Application method to be approved by Superintendent	Progressive
Field testing— Application Rate	Application to be checked for quality	Progressive
Thermoplastic pavement marking material		
Field testing—	Application to be checked for quality	Progressive

Application Rate		
Pavement marking tape		
Removal of Pavement Marking Tape	Direction to remove pavement marking tape	Progressive
Raised pavement markers		
Installation of Raised Pavement Markers	Installation to be checked for quality (Allow adhesive to set)	Progressive

Table SC6.4.23.62 Guideposts Hold-Points

Clause/subclause	Requirement	Notice for inspection	Release by
General			
Materials—Proprietary posts— Proposed supplier	Supply details of the proposed guideposts	Two weeks before manufacture	Superintendent
Construction			
Erection of Guideposts — Proprietary guideposts	Provide manufacturers anchorage instructions	5 working days	Superintendent
Erection of Guideposts — Guideposts on concrete pavements	Provide fixing details	5 working days	Superintendent

Table SC6.4.23.63 Guideposts Witness-Points

Editor's note: The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause/ subclause	Requirement	Notice for inspection
Construction		
General— Location of guideposts andproximity to underground services	Locations shown on drawings or as specified Check for existing underground services	Two weeks before installation
Erection of Guideposts— Backfilling	Firm embedment in ground	Progressive
Delineators— Fixing	Arrangement of delineators relative to traffic direction	Progressive

Table SC6.4.23.64 Signposting Hold-Points

Clause/subclause	Requirement	Notice for inspection	Release by
Materials			
General— ApprovedSupplier	Details of proposed suppliers provided to the Superintendent including documentary evidence	1 week prior to ordering	Superintendent
General— Documentary Evidence	Evidence that materials and parts proposed comply with the requirements of this specification	1 week prior to engagingsupplier	Superintendent
Retro Reflective Materialfor Background and Legend	Details of material and compatibility in application and durability	1 week prior to ordering	Superintendent
Sign Support Structures — Attachment of signs	Details of proposed attachment systems	2 weeks prior to fabricating attachment systems	Superintendent
Erection of new signs			
Setting Out	Approval of the location and alignment of the sign support structure	1 week prior to erection	Superintendent
Setting Out— Existing underground services	Locate services and protect against damage	1 week prior to erection	Superintendent
Special requirements			
Street Name, Service and Tourist Signs	Submit details of manufacturer for approval by Council	1 week prior to ordering	Council

Table SC6.4.23.65 Signposting Witness-Points

Editor's note: The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause/subclause	Requirement	Notice for inspection
Erection of new signs		
Setting Out	Submit details of and set out for each support structure	1 week before installing signs
Clearing	Clear vegetation after set out on advice from Council	3 working days before clearing
Sign Structure Footings — Excavation	Excavation as shown on drawings and as directed, including disposal of material	1 working day before next activity

Erection— Sign Damage	Repair or replace damaged signs	1 week before installing signs
Adjustment of existing signs and support structures		
General	Conform to Drawings and Superintendent direction	1 week before adjusting signs

Table SC6.4.23.66 Non-Rigid Road Safety Barrier System Hold-Points

Item/Clause title	Requirement	Notice for inspection	Release by
Materials			
Certification— Evidence of Conformance	Provide documentary evidence of conformity of steel components	1 week prior to erection	Superintendent
Construction			
General— Set Out	Set out to drawings or as directed	2 working days prior to erection	Superintendent
End Treatment of Road Safety Barriers—MELT	Submit alternative MELT locations	1 week prior to ordering	Superintendent

Table SC6.4.23.67 Non-Rigid Road Safety Barrier System Witness-Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Item	Requirement	Notice for inspection
Construction		
General— Sequence of Construction (pavements)	Erection after pavement activities	1 week before installation – progressive
General— Underground Obstruction	Alternative method due to obstructions	1 week before setting posts
Erection of Steel Posts— Damage to posts	Assessment by Superintendent for replacement	3 working days before removal of damaged post
Erection of Road Safety Barrier Rails— Excessive damage to rails	Assessment and rejection by Superintendent	1 working day after perceived damage

Table SC6.4.23.68 Concrete Works Hold-Points

Clause/subclause	Requirement	Notice for inspection	Release by
General			
Excavation and Foundation General—Ground preparation—Base preparation	Inspect prepared surface or sand underlay	1 working day prior tocovering	Superintendent

Excavation and Foundation General—Ground preparation—Polymeric film underlay installation	Inspect membrane or film underlay installed	1 working days prior tocovering	Superintendent
Approval of Formworks Design	Formwork design certificates	3 working days	Superintendent
Erection—Formwork	Certification of installed formwork and inspection	1 working day prior to covering	Superintendent
Materials for concrete			
Nominated Mix	Submit details of nominated mix for approval	7 working days	Superintendent
Reinforcement for concrete			
Steel reinforcement placement—Approval of reinforcement before concrete placement	Inspect reinforcement placement	1 working day prior tocovering	Superintendent
Cores, fixings and embedded items—General	Shop drawings for cores, fixings and embedded items	7 working days prior to commencing works	Superintendent

Clause/subclause	Requirement	Notice for inspection	Release by
Loads on minor concrete structures	Approval for early loading of the structure by design strength in situ tests	3 working days	Superintendent
Sprayed concrete general—Method statement	Submit proposal for spraying	14 days prior	Superintendent

Table SC6.4.23.69 Concrete Works Witness-Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause title/Item	Requirement	Notice for inspection
General		
Ground preparation— Mass concrete bedding on earth foundations	Inspect concrete blinding slab prior to placing forms or materials	1 working day prior to covering
Concrete quality requirements — Formwork	Check erection tolerances	1 working day
Materials for concrete		
Certificate of compliance	NATA certificates for all materials	7 days prior to commencing on site
Handling and treatment of concrete		
Mixing of concrete— Hand mix on site	Submit proposal for use	7 days prior
Mixing of concrete— Pre-mixed supply	Submit delivery dockets and Subcontractors' details	Progressive
Concrete quality requirements — Flatness	Confirm unformed surfaces	1 working day
Concrete quality requirements — Surface quality	Confirm surface quality	1 working day
Concrete curing	Certified test results for curing compound	7 days prior
Joints	Submit proposal for sawn joints	7 days prior
Concrete placing and compaction — Testing	Certified test results for compressive strength	Progressive
Reinforcement for concrete		
Steel reinforcement placement — Delivery and receipt of reinforcement	Submit notice for test inspection	7 days
Steel reinforcement placement — Placing	Submit proposed changes to reinforcement	2 days prior to commencing on site
Steel reinforcement placement — Damaged galvanising	Submit proposed repair method	2 working days prior

Steel reinforcement placement — Provision for concrete placement	Submit proposed changes to spacing,cover, splicing or welding or reinforcement	2 working days prior
Cores, fixings and embedded items— Cutting or coring	Approval for cutting or coring hardened concrete	2 working days prior
Sprayed concrete— Sprayed concrete test panel	Approval of sample panels	7 days

Table SC6.4.23.70 Boundary Fencing Hold-Points

Clause title / item	Requirement	Notice for inspection	Release by
Materials			
General— Material approval	Submit source, type, Certificate of compliance and manufacturer for each type of material	One week before orderingeach type	Superintendent
Construction			
General— Clearing and grubbing	Confirm approval for tree removal	One week before next activity	Superintendent
Erection of posts			
Depth of posts	Method of installing and proposed type of posts to be used	One week before manufacture or order	Superintendent
Erection of wires— General	Approval for any proprietary fasteners	One week before manufacture or order	Superintendent
Flood gates— General	Approval to proceed with flood gates and type	One week before fabricating flood gates	Superintendent
Removal and disposal of surplus material and rubbish	Approval required for burn off for combustible materials	Prior to burning	Superintendent
Bedding— Cattle Grids	Approval for bedding requirements	One week before fabricating flood gate	Superintendent

Table SC6.4.23.71 Boundary Fencing Witness-Points

Editor's note: The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Item	Requirement	Notice for inspection
Materials		
Galvanised Posts, Braces and Rails —Welded Joints	Welding sites to be cleaned and painted	Progressive
Gates— Dimensions and Fittings	Fitting alternatives	3 working days before fabrication
Construction		
Stock Proof Fencing—Erection of posts—Depth of posts	Posts sunk to the required depths	Progressive
Crossing of Watercourses and Depressions	Secure by installing longer posts as directed	Progressive
Flood gates— Small water courses	Provide required waterway area	Progressive
Erection of Gates	Double gates to be directed	One week before ordering
Removal and disposal of surplus material and rubbish	All surplus material to be removed	Progressive

Table SC6.4.23.72 Control of Traffic Hold-Points

Clause title/Item	Requirement	Notice for inspection	Release by
General			
Traffic guidance scheme (TGS)— Approval	Approval of Traffic guidance scheme	2 weeks before proposed commencement on site	Superintendent
Traffic guidance scheme (TGS)— Relevant Authority Approval	Provide evidence of approvals from Council and other Authorities	4 weeks before proposed commencement on site	Superintendent
Traffic Guidance Scheme (TGS)— Non-complex TGS	Carry out a risk assessment for works not involving complex TGS or staged works	4 weeks before proposed commencement on site	Superintendent
Side Roads and Property Accesses— Proposed access	Provide Proposal for access	5 working days prior to carrying out works	Superintendent
Side Roads and Property Accesses— Notice to property owners	Approval to deny vehicular access and provide notice to property owners	3 working days prior to carrying out works	Superintendent
Temporary roadways and detours			

Approval	Submit design of allproposed temporary roadways and detours	5 working days prior to carrying out works	Superintendent
Opening to Traffic	Present completed temporary roadways and detours to the Superintendent for approval prior allowing traffic	5 working days prior to carrying out works	Superintendent
Arrangements for traffic			
Construction Under Traffic —Approval	Approval required to construct under traffic	3 working days prior to carrying out works	Superintendent
Construction Under Traffic— Details	Submit full details of temporary signposting, traffic control devices and traffic control methods for approval	5 working days prior to carrying out works	Superintendent
Opening Completed Work —Written Notice	Provide written notice to the Superintendent confirming date of opening of completed works.	5 working days prior to opening of completed works	Superintendent
Traffic control devices			
Adequate Traffic Control Devices— Default by Contractor	Rectify inadequate traffic control devices	1 working day of notice	Superintendent

Table SC6.4.23.73 Control of Traffic Witness-Points

Editor's note - The Contractor must notify the Superintendent and/or Council of impeding works, where the option of attendance may be exercised by the Superintendent and Council.

Clause/Item	Requirement	Notice for inspection by the Superintendent
General		
Traffic Guidance Scheme (TGS) — Site Copy	A copy of the approved Traffic Guidance Scheme must be kept on site	Progressive
Traffic Guidance Scheme— Safety Audit	For complex traffic arrangements and staged works carry out safety audits	Progressive
Traffic Controllers— Personnel	Submit names and declaration of proposed traffic controllers	Prior to commencing work
Temporary Speed Zoning— Record	Diary and method of works	Progressive
Temporary roadways and detours		

Drainage— Pavements	Pavement designed and constructed not to pond water	Progressive
Surfacing— Extent	Width of wearing surface and position of finish tying into existing works	3 working days prior to carrying out works
Traffic control devices		
Arrangement of traffic control devices	Arrangement and placement as per the approved TGS	Progressive
Temporary markings— Line Marking	Ineffective line marking, remark within 48 hours.	Progressive
Temporary markings— Old Markings Removed	Obliterate or remove old markings.	Progressive
Raised Pavement Markers — Ineffective Markers	Replace ineffective markers within 24 hours.	Progressive

SC6.4.23.6 Forms

Form A - Non-Conformance Certificate (NCC) - Template	Click here
Form B - Non-Conformance Report (NCR) - Template	Click here
Form C - Notice of Non-Conformance Report (NNC) - Template	Click here
Form D - Corrective and Preventive Action Request (CPAR) - Template	Click here
Form E - Notice to Commence Works	Click here

Development manual planning scheme policy (PSP)
SC6.4.24 Acceptance of completed works

Index

SC6.4.24.1 Release of the plan of survey

(1) Introduction

SC6.4.24.2 Release of plan of survey requirements

(1) Certification

(2) As constructed drawings

(3) Ongoing operational requirements

(4) On maintenance inspection

(5) Bonds

(6) Early release of the plan of survey

SC6.4.24.3 On maintenance/final completion/off maintenance requirements

(1) Introduction

(2) Lodgement

(3) Sewer

(4) Water

(5) Earthworks

(6) Roads

(7) Stormwater

(8) Landscaping and irrigation

(9) On maintenance inspection and final inspection and compliance check

(10) Off maintenance

SC6.4.24.4 Quality assurance documentation

(1) Requirements for on maintenance

(2) Defects liability period

(3) Bonds and fees advice

SC6.4.24.5 Sewage pump-out agreements

(1) Introduction

(2) Sewage pump-out deed of agreement requirements

(3) Template agreement

SC6.4.24.6 Attachments and forms

Form A - Open Space Asset Data Collection Form

Form B - Asset Change Form

Form C - Irrigation Asset Data Collection Form

Form D - Irrigation Asset Change Form

Form E - Irrigation Network Controller Setup Request Form

Form F - Irrigation Program Setup Request Form

Form G - Plumbing and Drainage Application Forms 1, 2 and 7

Form H - The Backflow Test Certificate (Form 9)

Form I – Form 15 – Compliance Certificate for Building Design or Specification

Form J – Form 16 – Inspection Certificate

Form K – Form 21 – Final Inspection Certificate – Class 1a and Class 10

Attachment A1 – Sewerage Pump - Out Agreement

Attachment A2 – Sewerage Tankering Management Plan

Attachment B - Supervision Certificate Template

Attachment C - Workmanship Guarantee Template

SC6.4.24.1 Release of the plan of survey

(1) Introduction

The release of the plan of survey section details the requirements that must be met prior to the release of the plan of survey.

(a) Principles

Prior to the release of the plan of survey the developer must:

(i) comply with all conditions of the development permit; and
(ii) ensure that all required fees, bonds, contributions, infrastructure charges and outstanding rates are paid.

Works will not be accepted on maintenance until the formal plan of survey has been released. Where exceptional circumstances exist and an early release of the plan of survey is agreed to by the Director Planning and Development, the Developer is required to bond any outstanding work.

(b) Terminology

Terms in this policy have the same definition as in the *Planning Act 2016*, unless otherwise defined.

DEHP	Department of Environmental and Heritage Protection
Plan of Survey	Includes all surveys undertaken by a cadastral surveyor as defined by the *Surveyors Act 2003* and for the purpose of: (i) subdividing one or more lots; or (ii) dedicating land to public use; or (iii) redefining a lot by resurvey; or (iv) amalgamating two or more lots to create a smaller number of lots; or (v) defining an area for an easement, lease, profit a prendre or covenant; or (vi) any other purpose that the Registrar may require the registered proprietor to undertake.
On Maintenance Date	The date the works have been inspected and are complete, relevant conditions of the development permit have been satisfied, Council has accepted maintenance responsibility for agreed public infrastructure and the Developer commences the defects liability period.
Off Maintenance Date	The date the works are fully accepted by Council following an inspection by Council, which considers that all works are satisfactory, and the defects liability period concludes.
Maintenance Period	The period of time between when Council accepts the works on maintenance until Council accepts the works off maintenance. This includes any establishment periods and the defect liability period, the period of time during which the developer is required to repair defects that occur. A defect is an imperfection, fault or deficiency in the works and does not include general wear and tear of items or damage due to

misuse.

SC6.4.24.2 Release of plan of survey requirements

The following must be received or completed prior to the release of the plan of survey.

(1) Certification

(a) The Developer must submit one digital copy of each drawing, excluding Council's standard drawings:

(i) as originally approved by Council;

(ii) including amendments incorporated in the construction of the development; and

(iii) overprinted with a certificate from a Licensed Surveyor or Registered Professional Engineer of Queensland (RPEQ) as detailed below.

(b) An RPEQ and/or a Registered Landscape Architect must certify that the completed works comply with the development approval, the specific outcomes of the applicable regulations and good engineering practice.

The RPEQ and/or Registered Landscape Architect must also certify the 'as constructed' drawings by including the following statement on each drawing:

"I/We (Name) of (Firm) hereby certify that the works as shown on the 'as constructed' drawings reflect any changes that were made during the course of construction (signed with RPEQ No and dated)".

(c) A Registered Surveyor must certify that the locations, surface and invert levels of all works and infrastructure presented on the 'as constructed' drawings and digital submissions have been surveyed and are true and accurate representations of the works by including the following statement on each as constructed drawing:

"I/We (Name) of (Firm) herby certify that this drawing accurately describes and records the nature and the location of the works depicted hereon as they have been constructed for the purposes of the development (signed and dated)".

(2) As constructed drawings

One signed digital copy of the as constructed drawings (AutoCAD, DWG and a copy converted to PDF A1 format correctly scaled to A3 size) must be submitted and approved by Council prior to the request for an on maintenance inspection. As constructed information must be provided for all completed works and must include the following information.

(a) Lot

(i) The lot layout as approved and as shown on the plan of survey.

(ii) Approved street names.

(b) Earthworks

(i) As constructed contours or where allotments are under 2000 m^2 spot levels will be adequate to verify a minimum as constructed surface gradient of 1 in 250. The levels in 3D format must also be provided in electronic format suitable to be able to create a 3D surface (will be used during flood model updates).

(ii) Denote location, extent, and depth of fill.

(iii) The maximum depth of fill on each lot must be indicated.

(iv) Flood lines as adopted by Council.

(v) Street names as approved by Council and noted on the plan of survey.

(c) Infrastructure

(i) Pavement and kerb and channel information (e.g., edge of pavement and kerb and channel alignment and depths of pavement, kerb type, road surface type and depth, road pavement details, type and depth, road cross sections).

(ii) Stormwater drainage information, including:

1. pipe alignments denoting sizes and invert levels at each end;

2. manhole location; and

3. inlet pit types to be denoted.

(iii) Major overflow paths and trunk drainage channels located and clearly shown.

(iv) Invert levels and offsets of the junction points and manhole connections where roof water drainage systems have been used.

(v) Sewerage 'as constructed plans', including all required details, lodged, and approved.

1. Location of maintenance structure (MH, MC, JU and end of PCS or house drain connection point); and

2. Material type and sizes.

(vi) Details of all water mains, fittings of consequence and markers, including relevant dimensions, included on as constructed plans, which are to be lodged and approved.

(vii) Location and dimensioning of subsoil cleanout points.

(viii) BOS data to detail location of house drain connection point - building envelop upgraded.

(ix) As constructed street lighting plans.

Editor's Note -

(1) The accuracy of as constructed plans locating house connections is essential.

(2) Council's Inspector, while on site, may take measurements that will permit some cross checking of as constructed plans. Should these checks indicate discrepancies, then reopening of the work will be required for checking measurement of the work.

(3) Ongoing Operational Requirements

Where requested, applicants are required to identify the ongoing operational requirements in a relevant maintenance plan, as detailed in Section SC6.4.2 Development application guidelines.

(4) On maintenance inspection

The on maintenance inspection must be satisfactorily completed prior to the release of the plan of survey. The Consulting Engineer must demonstrate full compliance with all conditions of relevant development approvals, and compliance with SC6.4.24.3 On maintenance/final completion/off maintenance prior to requesting the on maintenance inspection, including the following:

(a) Services

Evidence must be provided of traffic signals, street lighting, telecommunications, and electrical supply works commitments. Satisfactory evidence must be provided to council of a negotiated agreement with service providers for telecommunications and NBN Co infrastructure, reticulation of electricity and the provision of street lighting, and gas service providers for provision of gas (if gas is provided).

(b) Payments and bonds

(i) The full payment of fees and bonds, including the maintenance bond and any bonds for incomplete works. The maintenance bond will be a minimum 5 per cent of the value of the works as certified by the RPEQ and accepted by Council and must be lodged with Council until the development is accepted as off maintenance.

(ii) All outstanding rates paid.

(iii) All infrastructure charges required by the conditions of the development permit must be paid.

(iv) Accompanied by the prescribed form and fee of an amount in accordance with council's fees and charges current at the time of payment.

(c) Land

The developer must covenant that all transfers of land and interests in land to council are free of encumbrances and registered in the Title's Office at the same time as the plan of survey is registered at no cost to Council.

(5) Bonds

To enable early release of the plan of survey it will be necessary to bond all outstanding works and requirements.Security bonds for incomplete works will be subject to a minimum value of $15,000.

(a) Standard bond conditions

(i) Estimates

1. To verify the maintenance bond estimates, Council must be supplied with a schedule of the works together with the appropriate estimated rates and amounts for all the items.

2. To verify the incomplete works bond estimates, Council must be supplied with a schedule of theincomplete works together with the appropriate estimated rates and amounts for the incomplete works.

3. Such estimated prices including GST must be fair and reasonable.

(ii) Conditions

1. The amount of the security for incomplete works must be for an amount of not less than one hundred and fifty per cent (150 per cent) of the certified cost of the works remaining to be completed as at the date of the release of the subject plan of survey.

2. Incomplete works must be itemised, valued, and certified by an RPEQ.

3. All bonds submitted must be clearly identified as to the particulars of the site and the purpose of the bond.

4. Insurance and indemnity certificates must be current and valid to cover the period outstanding works are being completed.

(iii) Acceptable security

1. Cash bonds; or

2. Unconditional bank guarantees:

a) A bank guarantee must include:

(A) a binding contractual relationship between council and the guaranteeing bank;

(B) specific requirements for renunciation of the guarantee; and

(C) a requirement of adequate notice of renunciation.

b) Bank guarantees must not have expiration dates.

(b) Incomplete works bond

(i) Incomplete works conditions in addition to the standard bond conditions:

1. Where Council consents to the early release of a plan of survey in line with the minimum requirements listed in Clause SC6.4.24.2 (6), the Developer will be required to lodge a security (bond) and an undertaking to complete the works within an agreed timeframe. These works must be completed to the satisfaction of Council and the security submitted in a format as detailed in this section.Security bonds for incomplete works will be subject to a minimum value of $15,000.
2. Outstanding works must be itemised, valued, and certified by an RPEQ.
3. Potential purchasers of lots must be advised of the arrangements.

(ii) Required information

The RPEQ must provide the following information:

1. certification of the value of incomplete works;
2. detailed schedule of the scope and cost of the incomplete works for auditing purposes;
3. certification that all external and internal works can be completed and accepted on maintenance within the timeframes detailed elsewhere in this section;
4. certification that the contract has been let for the construction of the remaining internal and external works and the name of the Contractor;
5. proposed finish dates for remaining internal and external works; and
6. security lodgement form completed clearly indicating that the purpose of the bond is forincomplete works.

(c) Revegetation bonds

Revegetation bonds may be required where conditioned by a development permit. At the time of on maintenance Council may accept the drains and earth batters within a subdivision whereby the vegetation is not in accord with the objectives of this and other SC6.4 Development manual planning scheme policy sections, subject to the following requirements.

(i) Revegetation performance bond

1. A bond for the incomplete revegetation must be included as a performance bond for incomplete works along with all other bonds for incomplete works upon that subdivision.
2. The bond for the revegetation works must be 150 per cent of the approved estimated cost of the revegetation works to allow for the typical seasonal weather encountered in the region, due to the risk of erosion and scouring in areas of exposed earth.
3. The revegetation performance bond will be considered for acceptance onto, and off maintenance separate to the general subdivision works.

(ii) Revegetation maintenance bond

1. The revegetation performance bond will be reduced to a revegetation maintenance bond upon achievement of a minimum scour protection, which is deemed as 40 per cent vegetal coverage, which includes 15 per cent of the total area having the specified species. The revegetation maintenance bond must be equal to the approved estimate of the value of the works required to achieve the specified grass coverage by the off maintenance date.

2. The acceptance of revegetation on maintenance will correspond with the reduction of the performance bond for revegetation works. The acceptance of the revegetation works off maintenance and release of the revegetation maintenance bond will require the specified grass coverage to be completed but will not occur prior to the remainder of the development being accepted off maintenance.

(d) Sewer pump station bonds

(i) Where a sewage pump station is a pump station identified by council in the Priority Infrastructure Plan (PIP) and that sewage pump station is identified as minor trunk infrastructure, then consideration will be given to the release of the plan of survey prior to the completion of the works associated with that pump station.

(ii) The pump station must be located upon land that is or will be under the control of the Council upon the registration of the subject plan of survey.

(iii) The working drawings and specifications must have been completed and approved by Council for construction.

(iv) The Consultant Engineer acknowledges that with respect to the nominated works that they are working for Council and not the Developer, and that the specifications nominate Council as the Principal of the Contract.

(v) The tenderers must have been reported to Council and Council must have approved the successful tenderer.

(vi) The Contract must have been let, and a submitted works program must indicate that the trunk infrastructure is programmed to be completed prior to when the commencement of dwelling constructionis envisaged, including provision for a normal wet season.

(vii) The Developer must enter into a Deed of Agreement with Council, as detailed in Clause SC6.24.5 Sewer pump- out agreements that includes provision for a pump-out service and a security for the service. The template in Clause SC6.4.24.6 - Sewer Pump Out Agreements, may be used for the Agreement.

(6) Early release of the plan of survey

(a) Justification for early release

Council may elect to release plans of survey prior to satisfaction of the development permit on the basis that critical works are provided, and security is afforded for the outstanding works. This process requires the Developer to request the early signing in writing at the time of lodging a survey plan and payment of a fee, demonstrating how conditions of the development approval are satisfied or secured.

Early approval and dating of the plan of survey does not discharge the developer from obligations to satisfy the conditions of development approval, and the development may be subject to enforcement action for non-compliance with the development permit(s) and/or the undertaking given to complete the outstanding works.

The aim of this clause is to enable the developer to have the plan of survey released from the Council as early as possible while at the same time ensuring that the allotments being constructed will be fully serviced at the time that the plan of survey is registered, and subsequent sales of the allotment/s takes place.

(b) Early release of survey fees

A fee for the early release of the Plan of Survey in accordance with Council's schedule of fees and charges at the time of payment will also be required as payment separate to the incomplete works bond.

(c) Minimum requirements

Council will not sign any plans of survey where the relevant works or matters are incomplete, unless the following are completed:

(i) Early plan of survey on maintenance inspection

An on maintenance inspection must be satisfactorily completed in accordance with Clause SC6.4.24.3 and as detailed below, however some minor defects may be outstanding, with minor defects defined as those not impacting on public safety and/or the ability of Council to operate and maintain the infrastructure.

(ii) Earthworks

All allotment preparation work and earthworks on allotments to be 100 per cent complete in accordance with the requirements of Section SC6.4.7 Clearing, grubbing and earthworks with finished surface levels, the degree of compaction achieved, and geotechnical assessments required on any of the allotments submitted and approved by Council. All works within allotments must be fully completed and no further disturbance required on the allotments. Appropriate erosion and sediment control measures must also be in place for all disturbed areas.

(iii) Sewerage

All sewerage works including pump stations, rising mains, trunk mains and the proposed sewers have been inspected and certified by the supervising engineer as being 100 per cent complete and in full working order. Sewer systems must be installed, tested and operational. (Bonding of pump stations maybe accepted; refer to Clause SC6.4.24.2 (5)(d) Conduit inspection must be undertaken in accordance with Section SC6.4.14 Public utilities and building over/near services, Clause SC6.4.14.5 Conduit assessment.

(iv) Water

All works associated with water supply on site are 100 per cent complete, and all reticulation has been pressure tested, chlorinated, completed, and connected to an existing supply. All water pumping stations must be certified by an RPEQ as being 100 per cent complete and in full working order.

(v) Roads

Roads must be completed to the point where the pre-seal inspection has been carried out by Council's inspectors and the pavements are approved for application of bitumen or asphalt.

(vi) Stormwater

1. Stormwater drainage works must be installed with all erosion controls in place and able to function without detriment to the system. Allotments must be provided with the nominated flood immunity. All stormwater systems must be constructed, including

kerb and channel. Downstream drainage easements must have been executed in favour of Council, necessary drainage, other easement documentation must have been submitted, and required reserves for drainage, parkland, etc. must have been provided.

2. Stormwater quality measures such as bio-retention basins and wetlands, where the acceptance of the asset and ongoing maintenance requirements is to be in accordance with Sections SC6.4.8 Stormwater management and SC6.4.10 Stormwater quality.

(vii) Services

Evidence must be provided of traffic signals, street lighting, telecommunications, and electrical supply works commitments. Satisfactory evidence must be provided to Council of a negotiated agreement with service providers for telecommunications and broadband infrastructure, reticulation of electricity (e.g., Letter of Supply) and the provision of street lighting and gas service providers for provision of gas (if gas is provided).

(viii) Payments and bonds

1. The full payment of fees and bonds, including the maintenance bond and any bonds for incomplete works. The maintenance bond will be 5 per cent of the value of the works as certified by the RPEQ and accepted by Council and must be lodged with council until the development is accepted as off maintenance.
2. All outstanding levied rates are paid.
3. All infrastructure charges required by the conditions of approval must be paid.
4. Accompanied by the prescribed form and fee of an amount in accordance with Council's fees and charges current at the time of payment.

(ix) Land

The developer must covenant that all transfers of land and interests in land to Council are free of encumbrances and registered in the Title's Office at the same time as the plan of survey is registered at no cost to Council.

(x) As Constructed Plans

As constructed plans must be submitted in accordance with Clause SC6.4.24.2 (2) showing all works completed to date, including as a minimum, the requirements above in Clause SC6.4.24.2 (6)(c). All works not shown on the as constructed drawings at the time of submission for early release of Plan of Survey, will be required to be bonded in accordance with the requirements of this section.

(d) Timing

All incomplete works must be completed and ready for Council inspection within 1 month of Council releasing the plan of survey. Should the developer not be able to meet this requirement they must submit justification to council detailing exceptional circumstances. The RPEQ must submit for the approval of Council, a program of works to certify that the incomplete works can be completed within 1 month (or longer as agreed by council).

(e) Sewer pump stations

Early release of the Plan of Survey may be considered if Council developed sewer pump stations are almost complete. See Clause SC6.4.24.2 (5)(d) above for more information.

SC6.4.24.3 On maintenance/final completion/off maintenance requirements

(1) Introduction

This section provides guidance and advice for the requirement for on maintenance/final completion/off maintenance to facilitate the release of the plan of survey (Refer to Clause SC6.4.24.1 Release of the plan of survey).

(2) Lodgement

(a) Requirements for on maintenance**/f**inal**:**

(i) building approval for all buildings/structures, where required by the *Building Code of Australia* (BCA);

(ii) a supervision certificate from the Consulting Engineer and request to have the works accepted on maintenance (Refer to an example template available in Clause SC6.4.24.6 or on Townsville City Council's website to assist in addressing this item);

(iii) a workmanship guarantee from the Contractor (See example template available in Clause SC6.4.24.6 or on Townsville City Council's website to assist in addressing this item);

(iv) submission to and acceptance by Council of as constructed information prior to the request for an on maintenance inspection. The RPEQ must certify the "as constructed" drawings by including the following statement on each drawing:

I/We (Name) of (Firm) hereby certify that the works as shown on the as constructed drawings reflect any changes that were made during the course of construction (signed with RPEQ No and dated);

(v) a Registered Surveyor must certify that the locations, surface and invert levels of all works and infrastructure presented on the as constructed drawings and digital submissions have been surveyed and are true and accurate representations of the works by including the following statement on each relevant as constructed drawing:

I/We (Name) of (Firm) hereby certify that this drawing accurately describes and records the nature and the location of the works depicted hereon as they have been constructed for the purposes of the development (signed and dated);

(vi) infrastructure agreements, if required, must be in place for the provision of and/or connection to trunk infrastructure;

(vii) approval by other authorities, e.g., evidence of NBN agreement, or certificate of acceptance from Ergon;

(viii) the works must remain on maintenance for a minimum period of 12 months;

(ix) the works subject of other approvals for which the works of this approval are dependent must also have been accepted on maintenance;

(x) where on maintenance can be achieved within 1 month of the release of the plan of survey then the date for the on maintenance will be backdated to the date of the release of the plan of survey. Otherwise, on maintenance will be from the date that all requirements have been satisfied; and

(xi) plan of survey submitted in accordance with approved proposal plan and any approved amendments, or where the plans of survey differ from the approved proposal plan, details of any changes must be provided with the application.

(3) Sewer

(a) Requirements for on maintenance

(i) pressure test all sewers and manholes in accordance with WSA to ensure the requirements of the specification are met;

(ii) check by internal examination (closed circuit television) that all sewers are straight, clean and to grade. Conduit inspection must be undertaken in accordance with Section SC6.4.14 Public utilities and building over/near services, Clause SC6.4.14.5 Conduit assessment;

(iii) check that all manholes are sound, smooth and clean and benched as per the required standard;

(iv) check that house connection “jump up” construction complies with Council's standards;

(v) performance testing of pumping equipment. This testing will require the connection of the electricity supply and water to the pump station;

(vi) certified results of pressure tests on all mains;

(vii) certified results of field tests on pumping equipment;

(viii) operations manual, performance specifications and maintenance requirements for all pump stations;

(ix) certification from the Consultant that the pipes and fittings used are as per the drawings and specifications; and

(x) Obtain licences for overflows to the sewerage system from DEHP.

All sewerage works including pump stations, rising mains, trunk mains and the proposed sewers must have been inspected and certified by the inspecting engineer as being 100 per cent complete and in full working order. Sewer systems must be installed, tested and operational. (Bonding of pump stations may be accepted; refer to Clause SC6.4. 24.5 Sewer pump-out agreements below.

(4) Water

(a) Requirements for on maintenance

(i) pressure test and supervise the swabbing and sterilisation of the water mains (if necessary);

(ii) check location of hydrants and valves to ensure they are in their correct location;

(iii) check that all valves and hydrants are working satisfactorily (include lid arrangement as per SD-350);

(iv) when water mains have been constructed, mains must be commissioned in accordance with Council requirements;

(v) certified results of pressure tests on all mains;

(vi) certified results of field tests on pumping equipment;

(vii) certification from the Consultant that the pipes and fittings used are as per the drawings and specifications;

(viii) no concrete footpaths installed over water main where property connections are yet to be constructed; and

(ix) all works associated with water supply on site must be 100 per cent complete, and all

water mains must be tested and live. Reservoirs and associated pump stations must be commissioned prior to the lodgement of survey plans unless otherwise approved by Council.

(5) Earthworks

(a) Requirements for on maintenance

(i) all survey pegs placed;

(ii) compaction results of each layer of earthworks on roads and on each allotment where depth of fill exceeds 0.5 m. The maximum depth of fill on each lot must be indicated on the as constructed drawings. Allotment fill must be in layers no greater than 200 mm and compacted a minimum standard of 95% standard compaction for residential subdivision and 98% standard compaction for commercial subdivision. The fill material must be free of vegetation and organic material;

(iii) all allotment preparation work and earthworks on allotments must be 100 per cent complete in accordance with the requirements of Section SC6.4.7 Clearing, grubbing and earthworks with finished surface levels, the degree of compaction achieved and geotechnical assessments including compaction test results are required on any of the allotments submitted and approved by Council. All works within allotments must be fully completed and no further disturbance required on the allotments. Appropriate erosion and sediment control measures must also be in place for all disturbed areas; and

(iv) where specific revegetation works have been bonded for future completion, the earthworks and topsoiling must be complete prior to the release of the plan of survey.

(6) Roads

(a) Requirements for on maintenance

(i) roads must be completed and fully sealed;

(ii) all tests and hold point documentation completed and finalised;

(iii) pavement line markings completed, including passing and turning lanes at major intersections;

(iv) where a double coat bitumen seal has been used, copies of bitumen spray sheets and calculated average spray rate and aggregate spread rate are required;

(v) where asphaltic concrete surfacing has been used, test results on samples of the material supplied to the site must be taken at the asphalt plant together with field tests to confirm asphalt depth and percentage of voids filled;

(vi) all traffic control devices, including traffic islands, to be completed;

(vii) all traffic signage to be in place and completed in accordance with Manual of Uniform Traffic Control Devices' requirements;

(viii) traffic signals, if present, to be installed, completed and fully functional in accordance with the relevant requirements and legislation;

(ix) retaining walls within road reserve to be completed and maintenance requirements documented;

(x) fences and noise abatement or screening walls to be completed and maintenance requirements documented;

(xi) compaction results of subgrade and each course of pavement; and

(xii) grading, Atterberg limits and a California Bearing Ratio (CBR) test of each course of pavement material in accordance with Clause SC6.4.23.1 (5) Quality management system.

(7) Stormwater

(a) Requirements for on maintenance – drainage infrastructure

(i) stormwater drainage works must be installed with all erosion controls in place and able to function without detriment to the system. Allotments must be provided with the nominated flood immunity. All stormwater systems must be constructed, including kerb and channel. Downstream drainage easements must have been executed in favour of Council, necessary drainage and other easement documentation must have been submitted, and required reserves for drainage, parkland, etc. must have been provided;

(ii) certification from the Consultant that the pipes and fittings used are as per the drawings and specifications. Conduit inspection must be undertaken in accordance with Section SC6.4.14 Public utilities and building over/near services, Clause SC6.4.14.5 Conduit assessment;

(iii) performance testing of pumping equipment. This testing will require the connection of the electricity supply and water to the pump station;

(iv) certified results of field tests on pumping equipment;

(v) operations manual, performance specifications and maintenance requirements for all pump stations;

(vi) certification from the Consultant that the pipes and fittings used are as per the drawings and specifications; and

(vii) performance testing of pumping equipment must be passed satisfactorily. This testing will require the connection of the electricity supply and water to the pump station.

This excludes large water sensitive urban design (WSUD) measures such as bio-retention basins and wetlands, where the acceptance of the asset and ongoing maintenance requirements is to be in accordance with section SC6.4.8 Stormwater management with the asset acceptance criteria set out in clause (b) below.

(b) Requirements for on maintenance – stormwater quality control/management Infrastructure

(i) Council is required to accept responsibility of stormwater quality control/management infrastructure that is, or will be, located on public land such as in parks, drainage reserves and road reserves. Where the asset is located in a park or drainage reserve, the minimum maintenance period will be 24 months.

(ii) Water quality assets entirely located within road reserves will only require a 12-month maintenance period. These normally constitute swales, small bioretention systems, street tree bioretention treatments and gross pollutant traps.

(iii) Where the bioretention basin is protected by a geo-textile and turf to protect the asset during construction, the planting of the basin will be required after rehabilitation of building and construction works is complete with a following 24 months maintenance period for the planting. This would require an uncompleted works bond to cover turf removal and geo-textile and planting/landscaping.

(iv) Hand-over of vegetated stormwater assets (WSUD assets) should be undertaken as a process rather than an event, in accordance with Section 2 of *Transferring Ownership of Vegetated Stormwater Assets* (Water by Design, 2012).

(v) The asset hand-over process will include a pre-start inspection, practical completion inspection, on maintenance inspection, and off maintenance inspection. Assets considered non-compliant are required to be rectified prior to completion of the off maintenance phase.

(8) Landscaping and irrigation

(a) Introduction

This clause outlines the conditions and timeframes associated with acceptance by Council of landscape and irrigation works (works) constructed as part of a development permit.

(b) Principles

(i) the establishment period will be included within the maintenance period;

(ii) Council will accept works on maintenance that have reached practical completion and have met the relevant conditions of the Development Permit, but may still require time to establish;

(iii) the establishment date will be used to determine satisfactory establishment;

(iv) Council will accept responsibility for maintenance of hard landscape assets from the on maintenance date;

(v) the Developer will remain responsible for maintenance of soft landscape assets during the maintenance period;

(vi) the Developer is responsible for all defects in the works until the off maintenance date; and

(vii) Council will accept responsibility for maintenance of soft landscape assets from the off maintenance date.

(c) Terminology

In addition to the terms previously defined in Clause SC6.4.24.1 (1)(b) the following terms and definitions apply to this clause, specific to landscape and irrigation works:

Contractor	A person or company who has entered into a contract with the developer to supply and install infrastructure, landscaping and/or an irrigation system.
Establishment Period	The period of time between when Council accepts the works on maintenance until when Council accepts the works as established (the established date). Works are deemed established when: (i) all the defects identified at the on maintenance and practical completion; (ii) defects identified at inspection have been rectified unless agreed otherwise; (iii) all turfed areas have "taken root" and there are no obvious gaps between strips of turf; (iv) all turfed areas have been rolled and/or top-dressed to fill any depressions; (v) all plants are showing signs of healthy, new growth, and that the planting design intent is starting to take shape;

(vi) generally, the landscape works indicate that they are being maintained in accordance with the development permit; and

(vii) revegetation areas have achieved specified cover.

Hard Landscaping	Structures, paths, and facilities such as playground equipment constructed from building materials (but excluding irrigation systems).
Maintenance Period	The period of time between when Council accepts the works on maintenance until Council accepts the works off maintenance. This includes any establishment periods and the defect liability period. This is to be: (i) a minimum of 12 calendar months; and (ii) include the establishment period and the defect liability period.
Off Maintenance Date	The date the works are fully accepted by Council following an inspection by Council, which considers that all works are satisfactory, and the defects liability period concludes. This date must be: (i) after the established date; (ii) after all defects have been remedied; (iii) at least 12 months after the on maintenance date; (iv) after an inspection by Council which considers that all works are satisfactory.
Soft Landscaping	Trees, plants, grass, and vegetation generally and any irrigation system associated with such vegetation.

(d) Ownership and responsibilities

The ownership of the works transfers to Council on the earlier of:

(i) the date when the land on which the works are constructed is transferred to Council; or

(ii) the on maintenance date.

(e) Typical timelines

(i) Construction

1. achieve practical completion;
2. conduct inspections to determine the on maintenance date; and
3. release Plan of Survey if applicable.

(ii) 0 weeks

1. on maintenance date.

(iii) 12 weeks

1. normal established date;
2. landscape inspection to be carried out; and
3. if works are unsatisfactory, establishment date will be deferred.

(iv) 52 Weeks

1. normal off maintenance date;
2. landscape inspection to be carried out; and
3. if works are unsatisfactory the off maintenance date will be deferred.

(f) Landscape works on maintenance /practical completion

(i) Requirements for on-maintenance

1. maintenance inspection;
2. the Registered Landscape Architect must certify as constructed drawings by including the following statement on each drawing:

   I/We (Name) of (Firm) hereby certify that the works as shown on the "as constructed" drawingsreflect any changes that were made during the course of construction;
3. all asset transfer documentation is submitted and approved by Council including the following:

   a) Open Space Asset Data Collection Form (Refer to Clause SC6.4.24.6) – This form contains the asset information relating to the construction of new assets; or

   b) Asset Change Form (Refer to Clause SC6.4.24.6)– This form contains information about minor changes to existing assets; and

   c) warranty details for all items with a value greater than $500.00. This information is required by Council to assist in future warranty claims;
4. plantings, gardens, and turfed areas must be exhibiting a "strike", but compliance with full establishment requirements is not essential at on maintenance;
5. the defects liability period for soft landscape works shall be concurrent with the defects liability period for any associated irrigation system; and
6. the defects liability period for landscape works shall not commence until:

   a) the associated irrigation system has been commissioned; and

   b) all requirements of the Special Conditions of Approval have been met.

(g) Landscape works defects liability period

(i) Establishment

1. All soft landscaping will be subject to a 12-week landscape establishment period. The landscape establishment period is included in the 12-month maintenance period. The Developer is responsible for establishing the works during the establishment period until the established date as advised by Council.
2. The Developer may be required to undertake additional works during the establishment period such as additional watering, formative pruning, topdressing, turfing, replenishment of mulch and replacement of plants.
3. At the conclusion of the landscape establishment period a landscape establishment inspection may be conducted, and if the landscaping establishment is not satisfactory additional works may be requested and/or the maintenance period may be extended.

(ii) Landscape maintenance period requirements and responsibilities

1. Council is responsible for maintenance of hard landscaping during the maintenance period.

2. The Developer is responsible for maintenance of soft landscaping during the maintenance period until the off maintenance date.

3. Water costs

    a) The Developer is responsible for the cost of water during the maintenance period.

    b) Council is responsible for cost of water from the off maintenance date.

4. Vandalism, theft, and damage caused by unexpected events or third parties

    a) For soft landscaping, the Developer is responsible for rectification works to remedy vandalism, theft, and damage caused by unexpected events during the maintenance period.

    b) For hard landscaping, the Council is responsible for rectification works to remedy vandalism, theft, and damage caused by unexpected events during the maintenance period.

5. Extended maintenance period

    a) In addition to provisions detailed, negotiated as conditions of the development approval, extended.

    b) Where the landscape maintenance period is extended as a condition of development approval or due to provisions within this policy, this extension may concurrently apply to any irrigation system associated with the landscape works.

6. General maintenance activity requirements

    a) All maintenance activities must be undertaken in accordance with Council's public open space maintenance requirements. Any maintenance activities that deliver a level of service above and beyond Council's requirements is at the discretion and cost of the Developer.

    Editors Note - Council's public open space maintenance frameworks are currently under development.

    b) Maintenance activities include, but are not limited to mowing, top dressing, litter collection,watering, pruning, fertilising, weeding, mulching, pest and disease control.

    c) All maintenance work to new and existing landscaping shall be carried out in accordance with the best horticultural practices.

7. Watering requirements

    a) All soft landscaping shall be watered regularly (either by hand watering or by irrigation) to ensure the continuing healthy establishment and growth of all plants taking into account soil type, plant type and size, prevailing weather conditions and seasonal variations.

    b) Watering methods are to be suitable for watering the root ball of newly planted plants during the critical first several weeks of establishment.

    c) Watering shall not cause displacement of mulch or erosion of garden mix soil.

8. Weed, pest, and disease control

    a) Gardens and turf shall be regularly weeded. Six weeks prior to the end of the defects liability period ("off maintenance"), the area shall be inspected for weed growth and treated with an appropriate selective herbicide. All chemicals shall be used in accordance with the manufacturer's recommendations.

b) Plants shall be regularly inspected for pest and diseases throughout the defects liability period. Any pest or disease detected shall be reported to the Superintendent. Acceptable horticultural techniques shall be employed by the Contractor to manage any infestations as directed by the Superintendent. 12 weeks prior to the end of the defects liability period ("off maintenance"), the area shall be inspected for pests and disease and treated with an appropriate pest and disease control.

9. Planting and tree maintenance

a) All maintenance work to new and existing trees shall be carried out by an arborist with formal qualifications or at least 5 years recognised experience in Arboriculture. The works shall be carried out in accordance with the AS 4373 *Pruning of Amenity Trees* and shall not proceed without the written approval of the Superintendent.

b) Stakes and ties and guying shall be checked for firmness and support and shall be adjusted as necessary to prevent any damage to the bark or roots of the tree. Stakes and ties or guying shall be removed when the tree is self-supporting and/or as directed by the Superintendent.

10. Planting, trees, turf, and hydroseed failure and replacement

a) Plants and trees lost through vandalism, theft, or that have died shall be replaced by the Contractor on a monthly basis.

b) Plants, trees, and turf supplied by the Contractor that have failed to become established during the defects liability period or are diseased and/or dying shall be removed and replaced by the Contractor twelve weeks prior to the end of the defects liability period ("off maintenance") and at no cost to Council. If the loss is significant, it will be at the discretion of the Superintendent if an extension on the defects liability period for the failed landscaping is warranted.

c) Areas of hydro seeding/mulching that have failed to become established or have died during the defects liability period shall be removed and retreated by the Contractor at no cost to Council. If the area is of significant size, it will be at the discretion of the Superintendent if an extension to the defects liability period for the failed area is warranted.

(h) Impacts landscaping inspections during defects liability period

In addition to the requirements outlined in Clause SC6.4.24.3 (8)(b) Principles, the following requirements apply to landscaping works:

(i) any work inspected that does not comply with the specification and/or the design plans or has not been adequately maintained in accordance with Clause SC6.4.24.3 (8)(b) will not be accepted by Council and will be noted for rectification. The Contractor is required to rectify these items as soon as is practical and as a minimum before the next scheduled inspection; and

(ii) failure by the Contractor to rectify unacceptable items prior to the next inspection may result in the defects liability period for those items being extended by the number of weeks that have lapsed prior to the rectification work being completed.

(i) Landscaping off maintenance/final completion

(i) Final inspection and completion

1. Soft landscaping shall be inspected by the Superintendent for acceptance (“off maintenance”) at the end of the defects liability period, subject to any special conditions of approval.
2. In addition to the requirements outlined in Clause SC6.4.24.3 (8)(b), the final inspection and completion requirements apply as detailed below.

(ii) Final acceptance criteria (gardens)

The acceptance criteria for gardens shall be:

1. gardens shall be free from weeds, stones, roots, sticks, rubbish, and other deleterious material;
2. gardens shall be free of disease and pests;
3. mulch shall be to the minimum thickness specified;
4. plants shall be as specified; and
5. plants shall be placed at the spacings nominated and in the quantities nominated as detailed on the drawings or as specified.

(iii) Final acceptance criteria (plantings)

The acceptance criteria for plants shall be:

1. plants shall exhibit signs of healthy active growth;
2. plants shall show no signs of yellowing or wilting;
3. plants shall be well formed;
4. plants shall be free of disease and pests;
5. plants shall have healthy root systems and shall not be root bound; and
6. plants are true to cultivar, type or form as specified.

(iv) Final acceptance criteria (turf)

The acceptance criteria for turf areas shall be:

1. the achievement of an even green colour with a dense sward over the entire area with no open joints;
2. turf shall exhibit signs of healthy active growth;
3. turf shall be free from weeds, stones, roots, sticks, rubbish, and other deleterious material; and
4. turf shall be free of disease and pests.

(v) Final acceptance criteria (hydro seeding/mulch)

The acceptance criteria for hydro seeding/mulch areas shall be:

1. the achievement of an even green colour over the entire area and exhibiting healthy active growth with acceptable vegetative cover. Of this cover 95% shall be the nominated dominate grass species with the remaining 5% made up of annual and perennial grasses;
2. free from weeds, stones, roots, sticks, rubbish, and other deleterious material;
3. free of disease and pests; and
4. the area shall not be mowed for at least 5 days prior to the inspection.

(vi) Final inspection documentation

1. Following the final inspection (off maintenance) council will issue a site inspection report (defects list). Any items not acceptable to Council will be noted for rectification.

2. The Contractor is required to rectify these items and apply for a re-inspection when all rectification items have been completed.

3. A certificate off final completion will be issued by Council following the rectification of all defects noted at the off maintenance inspection.

(j) Irrigation works on maintenance/practical completion

(i) Requirements for on maintenance:

1. all as constructed drawings and documentation nominated in clause SC6.4.24.2 (2) is submitted and approved by Council;

2. all asset transfer documentation including the following:

a) Irrigation Asset Data Collection Form (Refer to Clause SC6.4.24.6) – This form contains the asset information for the construction; or

b) Irrigation Asset Change Form (Refer to Clause SC6.4.24.6) – This form contains information about minor changes to existing assets;

c) Irrigation Network Controller Setup Request Form (Refer to Clause SC6.4.24.6) – This form is used to provide information to the infrastructure Services Irrigation Technician who will configure the telemetry network. The form shall be submitted to Council a minimum of 4 working days prior to commissioning of the system;

d) Irrigation Program Setup Request Form (Refer to Clause SC6.4.24.6) – This form is used to provide information to the infrastructure Services Irrigation Technician who will setup the irrigation controller program. The form shall be submitted to council a minimum of 4 working days prior to commissioning of the system. After the program has been set up, the Infrastructure Services Irrigation Technician will issue a copy of the program to the Contractor;

e) Warranty details for all irrigation components with a value greater than $500.00 excluding GST. This information is required by Council to assist in future warranty claims; and

f) Plumbing and Drainage Application Forms 1, 2 and 7 (Refer to Clause SC6.4.24.6 or click here to view the documents) are to be completed by a licensed plumber and submitted to the Hydraulic and Building Services Unit of the Townsville City Council. The Backflow Test Certificate, Form 9 (Refer to Clause SC6.4.24.6 or click here to view the document) must be lodged with Hydraulic and Building Services Unit of the Townsville City Council. A copy of the Backflow Test Certificate must also be supplied to Infrastructure Services; and

3. Commissioning of the irrigation system shall not proceed until all of the above documentation is submitted and approved by Council.

(k) Irrigation defects liability period

(i) A defects liability period applies to all irrigation systems installed by contractors. The defects liability period shall be undertaken in accordance with this policy and any special conditions of approval.

(ii) If applicable the defects liability period for the irrigation system shall be concurrent with the Defects Liability Period for any associated landscaping works.

(iii) The defects liability period for an irrigation system shall not commence until:

1. all of the documentation nominated in Clause SC6.4.24.3 (8)(i) above is submitted and approved by Council;
2. all requirements of the special conditions of approval have been met;
3. if applicable the associated landscaping works are accepted “on maintenance”;
4. the irrigation system has been commissioned; and
5. the site has been jointly inspected by the Council and contractor and the irrigation system is free of defects at the time of inspection.

(l) Irrigation inspections during the defects liability period

During the defects liability period, Council may require access to the site to undertake the following tests:

(i) main lines pressure test

the main line is pressurised to test for leaks. All valves are shut and the pressure is taken over a determined length of time;

(ii) sprinkler pressure test

the sprinkler pressure is taken at the nozzle using a pitot pressure gauge and is then compared to manufacturer recommendations;

(iii) dripper pressure test

measurement at flushing valves are taken and the pressure gauged to make sure it conforms to the manufacturer recommendations. The inlet pressure is then tested under the same conditions to check it does not exceed 300 Kpa; and

(iv) lateral pressure loss test

the first and last sprinklers of the lateral line are pressure tested. The variation in flow is then calculated and compared with the limits nominated in the specification.

(m) Irrigation off maintenance/final completion

(i) Final inspection and completion

Final completion shall be managed in accordance with this policy and any special conditions of approval.

1. Following the final inspection, council will issue an irrigation inspection defect’s list detailing items that do not comply with the specification and/or design plan.
2. The Contractor is required to rectify these items and apply for a reinspection when all rectification work has been completed.
3. After reinspection of the rectification work, and if the work is satisfactory to Council an Irrigation Inspection Report (Defects List) will be issued with the status noted as “Ready to proceed to off maintenance”.
4. A Certificate of final completion will be issued by the Superintendent when the Contractor has met all obligations under the Contract.

(9) On maintenance inspection and final inspection and compliance check

(a) Requirements for on maintenance:

(i) The Developer must provide council at least 5 business days’ notice, requesting the

works be checked for compliance with the approvals and be accepted on maintenance.

(ii) A report must be submitted, showing the scope of works, date and outcome of works inspected by the supervising Registered Professional Engineer of Queensland or supervising Registered Landscape Architect.

(iii) Council must be satisfied with the results of an on maintenance inspection and compliance checks against the development approvals. Council will issue an on maintenance certificate, identifying the relevant works and any defects applicable.

(iv) Prior to requesting an on maintenance inspection, the developer must correct any defects arising from faulty workmanship, materials or design identified.

(v) The on maintenance date may be backdated to the date of the initial on maintenance inspection date or the release of the plan of survey (whichever is the latter), if all outstanding requirements were met within 4 weeks of identification.

(10) Off maintenance

(a) The works will become off maintenance subject to:

(i) rectification of all defects identified at on maintenance or during the maintenance period;

(ii) Council being satisfied with the results of an off maintenance inspection and compliance check against development approvals conducted by Council officers following the end of the maintenance period;

(iii) the development will only be accepted off maintenance in its entirety and all works must be performing satisfactorily at this stage;

(iv) the Developer, or their representative, must arrange with Council an inspection of all defects 1 month prior to the work being due off maintenance;

(v) prior to requesting an off maintenance inspection, the developer must correct any defects arising from faulty workmanship, materials or design identified in the on maintenance certificate or during the maintenance period (or extended period following rectification of such defects);

(vi) the whole of the works must be inspected at the off maintenance inspection. The consulting engineer is responsible for thoroughly inspecting the development and any necessary remedial work prior to the off maintenance inspection; and

(vii) acceptance of the works off maintenance does not discharge the developer from their obligation to provide a development free of defects. Any defect that is discovered after the acceptance off maintenance, which attributed to the failure to deliver a development in accordance with the conditions of the development permit, must be repaired at the Developer's expense.

SC6.4.24.4 Quality assurance documentation

(1) Requirements for on maintenance

(a) Copies of the test certificates from a National Association of Testing Authorities (NATA) registeredlaboratory; and

(b) A single quality control document must be submitted, including but not be limited to:

(i) pavement levels;

(ii) compaction tests;

(iii) pavement materials tests;

(iv) concrete tests;

(v) asphalt tests;

(vi) sewer pressure tests;

(vii) water pressure tests;

(viii) water bacteriological tests;

(ix) landscaping soil tests;

(x) playground and fitness equipment certification;

(xi) softfall under surfacing certification;

(xii) structural certification

1. Form 15 - Compliance Certificate for Building Design or Specification (Refer to Clause SC6.4.24.6 or click here to view the documents);

2. Form 16 - Inspection Certificate (Refer to Clause SC6.4.24.6 or click here to view the documents); and

3. Form 21 - Final Inspection Certificate - Class 1a and Class 10 (Refer to Clause SC6.4.24.6 or click here to view the documents));

(xiii) electrical safety, testing compliance certification; and

(xiv) backflow certificate.

(2) Defects liability period

The defects liability period for all works is a minimum of 12 months from the date of the release of the formal plan of survey or from the date of acceptance on maintenance, whichever is later, at which time the bond will be refunded subject to the off maintenance requirements being completed to the satisfaction of Council. If for any reason during the maintenance period, a defect of substantial proportions is discovered then Council reserves the right to extend the defects liability period for a further 12 months from the date of correction of the defects, or as negotiated (e.g., infrastructure is required to be reconstructed after a significant failure due to deficiency in design/construction).

(3) Bonds and fees advice

(a) Requirements for on maintenance and final inspections

(i) A works inspection fee (at the rate applicable at the time of payment) must be paid prior to the on maintenance inspection or final inspection. The inspection fee must be based on the final value of works certified by a qualified person refer Section SC6.4.2 Development application guidelines, Clause SC6.4.2.5 (1) or the Superintendent for the project.

(ii) A reinspection fee (at the rate applicable at the time of payment) will be applicable where an additional inspection is required due to works being incomplete or unsatisfactory at the initial inspection. The reinspection fee must be paid prior to the additional inspection being conducted.

(iii) For on maintenance, a maintenance bond (5% of the value of the works as determined and certified by a Registered Professional Engineer of Queensland (RPEQ) or Registered Landscape Architect) and supporting schedule of works with costs certified by the RPEQ or Registered Landscape Architect must be lodged with Council. The bond must be in

favour of Council and in the form of cash or an unconditional bank guarantee (non-expiring). If the security is in the form of a bank guarantee, the guarantor must be a bank or financial institution acceptable to Council.

(iv) In the event of a default by the developer relating to defects, Council may undertake whatever action required to secure compliance with the conditions of approval and may apply the maintenance security for that purpose. The security (or balance) will be returned to the Developer upon satisfaction of the conditions of approval relating to maintenance responsibility.

SC6.4.24.5 Sewage pump-out agreements

(1) Introduction

(a) Purpose

In accordance with Clause SC6.4.24.1 Release of the plan of survey, Council may consider early sealing of the survey plan for a development if:

(i) incomplete or non-commissioned trunk infrastructure is preventing the developer providing infrastructure from being fully commissioned; and

(ii) the non-delivery of this trunk infrastructure is impacting on Council's process for signing of the survey plan.

(b) Scope

This section sets out the circumstances in which a sewage pump out agreement may be entered into, and the mandatory requirements that will be included in such an agreement under the *Planning Act 2016.*

(c) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

Environmental Protection Act 1994

Local *Government Act 2009*

Plumbing and Drainage Act 2018

Planning Act 2016

Water Supply (Safety and Reliability) Act 2008

WSA 02-2002 2.3 *Sewerage Code of Australia*

WSA 04-2005 2.1 *Sewerage Pumping Code of Australia*

(2) Sewage pump-out Deed of Agreement requirements

(a) A Deed of Agreement relating to the incomplete or non-commissioned trunk infrastructure must be entered into. The agreement must ensure that all risks associated with the temporary pumping out and disposal of sewage are adequately addressed by the developer. The following sections must be addressed within the Deed of Agreement at a minimum:

(i) Timing

The trunk infrastructure must be programmed to be commissioned prior to when the completion of dwelling construction is envisaged.

(ii) Supply of electricity

1. Sewer pump stations must be provided with a continuous and reliable electrical supply. Details of the provision of power supply must be provided with the sewage pump station design.

2. Alternatively, if temporary power supply is proposed to be supplied by a generator, details of this arrangement must be included as part of the agreement.

(iii) Lawful effluent disposal and access arrangement

Access arrangements for pump stations and/or other wastewater maintenance holes required for the pump-out service must be specified, and the wastewater maintenance hole or licensed septic disposal facility designated. The disposal of all sewage must be as directed by Council from time to time by a registered operator following agreed transport routes, for the duration of the agreement, and under the supervision of a suitably qualified engineering consultant.

(iv) Developer's provision of pump-out service

A minimum standard for the developer's provision of a pump-out service must be specified.

(v) Management of odour complaints, fish kills, and wastewater spills

Details of management of overflow/spills or environmental harm must be included in the Deed of Agreement and actions undertaken in accordance with the *Environmental Protection Act 1994.*

(3) Template agreement

(a) Sewerage Pump - Out Agreement

Council's Template Agreement for Sewage Pump-Out may be used to assist in the preparation of the Deed of Agreement

Please refer to SC6.4.24.6 or Click here to view the document.

(b) Sewege Tankering Management Plan

Council's Template Agreement for Tankering may be used to assist in the preparation of the Deed of Agreement.

Please refer to SC6.4.24.6 or Click here to view the document.

SC6.4.24.6 Attachments and forms

Attachments and forms	**To obtain a copy of the document**
Form A - Open Space Asset Data Collection Form	Click here
Form B - Asset Change Form	Click here
Form C - Irrigation Asset Data Collection Form	Click here
Form D - Irrigation Asset Change Form	Click here
Form E - Irrigation Network Controller Setup Request Form	Click here
Form F - Irrigation Program Setup Request Form	Click here

Form G - Plumbing and Drainage Application Forms 1, 2 and 7	Click here
Form H - The Backflow Test Certificate (Form 9)	Click here
Form I – Form 15 – Compliance Certificate for Building Design or Specification	Click here
Form J – Form 16 – Inspection Certificate	Click here
Form K – Form 21 – Final Inspection Certificate – Class 1a and Class 10	Click here
Attachment A1 – Deed of Sewage Pump- Out Agreement Template	Click here
Attachment A2 – Sewage Tankering Management Plan Template	Click here
Attachment B - Supervision Certificate Template	Click here
Attachment C - Workmanship Guarantee Template	Click here

SC6.5 Economic impact assessment planning scheme policy

SC6.5.1 Introduction

Short Title - The planning scheme policy (PSP) may be cited as the Economic impact assessment PSP.

SC6.5.1.1 Purpose

(1) The purpose of this planning scheme policy is to provide applicants with direction on how to undertake an economic impact assessment which council request to inform the proper assessment of a development application. Particularly, the policy provides direction on the standard information requirements expected to be incorporated within an economic impact assessment report.

An economic impact assessment report may be required to demonstrate compliance with the Townsville City Plan particularly for significant in-centre or out-of-centre development of a commercial nature. It is likely to be required where there is potential conflict with the Townsville City Plan, or for impact assessable development of a commercial nature in any zone.

SC6.5.1.2 Legislative authority

This planning scheme policy is made under Chapter 2, Part 3 of the *Planning Act 2016.*

SC6.5.1.3 Relationship to the Townsville City Plan

This planning scheme policy is to be read in conjunction with the assessment provisions specified in the Townsville City Plan.

SC6.5.1.4 Terminology

Terms used in this planning scheme policy are defined in Schedule 1 – Definitions. A term used in the planning scheme policy which is not defined in Schedule 1 – Definitions, is to be interpreted in accordance with Part 1.3.1 terminology.

SC6.5.2 Planning scheme policy details

SC6.5.2.1 Terms of Reference for an economic impact assessment report

(1) Council intends to protect the economic viability and the intended role and successful functioning of centres. An economic impact assessment report will need to demonstrate that the proposed development will meet the relevant performance outcomes in the planning scheme codes and the intentions expressed in the strategic framework. Where the development is inconsistent with the planning scheme the assessment may form part of the basis for determining whether sufficient grounds exist to approve such a development.

(2) The standard requirements for the preparation of an economic impact assessment report should typically provide the following information:

(a) an outline of the purpose of the study;

(b) a description of the methodology used;

(c) a description of the proposed size, function and tenancy mix of the proposed development, together with details of any pre-commitment;

(d) the identification of the proposed development's trade area, supported by the reasoning and methodology behind the identification of the area;

Note—Refer to section SC6.5.2.2 Trade Area of this policy for guidance on identification of trade areas.

(e) an examination of the population growth prospects and socio-economic characteristics of the trade area, including socio-economic factors such as expenditure potential;

(f) the identification of any approved or proposed development that may affect the proposed development or be affected by the proposed development;

(g) the identification of the location, size, nature, function and tenancy mix of competitive business, commercial or centre uses likely to be affected by the proposed development;

(h) evidence that any feasible alternative, appropriately zoned location/s have been investigated and discussed so that reasoning behind the selection of the preferred site is clear;

(i) an estimation of the demand, or likely future demand, for business, commercial or centre floor space in

the trade area;

(j) an estimation of the market share of the proposed development;

(k) where an out-of-centre development is proposed, demonstration as to why the proposed development is required, including why the development cannot be accommodated within the existing centres;

(l) commentary on changes to the supply/demand balance upon approval of the proposed development, including whether the proposal represents an excess of supply for the community;

(m) a calculation of the quantitative economic impact upon competitive centres likely to be affected by the proposed development including a description of the consequent effects on the competitive centres;

(n) the identification of the impacts the proposed development would have on the successful trading of other centres (including the period of time) and the identification of the impacts on the Townsville hierarchy and functionality of activity centres;

(o) the changes, if any, to the range of services that existing centres will continue to provide; and

(p) a summary of the overall need for the proposed development including a description of the community benefits.

(3) The economic impact assessment report referred to in (1) above must be prepared by a suitably competent person.

Note — For the purpose of this section of the planning scheme policy, a competent person is an appropriately qualified and experienced economist or economic analyst with appropriate and proven technical experience in providing advice about the economic impacts of development.

SC6.5.2.2 Trade Area

For developments that are trade area based, the definition of the trade area should have due consideration to the following:

(1) the existing centres hierarchy and other relevant competition;

(2) the nature, scale and functionality of the proposed development;

(3) the nature of the potential users of the development (e.g. residents, workers, students, other businesses);

(4) typical travel routes of potential users of the development; and

(5) the attracting capacity of any neighbouring uses.

A map(s) of the trade area should be included in the economic impact assessment report, which clearly defines the trade area boundary, identifies relevant existing centres, identifies the site of the proposed development and includes key transport corridors. The economic impact assessment report should include a justification of the proposed trade area boundary.

SC6.6 Emerging community planning scheme policy

SC6.6.1 Introduction

Short Title - The planning scheme policy (PSP) may be cited as the Emerging community PSP.

SC6.6.1.1 Purpose

The purpose of this planning scheme policy is to provide applicants with direction on how to undertake structure planning for a greenfield development area contained within an emerging community zone. Such a structure plan is likely to be required to demonstrate compliance with the zone code and reconfiguration of a lot code.

The provision of this planning scheme policy may also be relevant to other large scale development within the city.

SC6.6.1.2 Legislative authority

This planning scheme policy is made under Chapter 2, Part 3 of the *Planning Act 2016.*

SC6.6.1.3 Relationship to the Townsville City Plan

This planning scheme policy is to be read in conjunction with the assessment provisions specified in Parts 6 and 9. The Emerging community planning scheme policy specifically relates to the assessment of any development application for a material change of use or reconfiguring a lot within the Emerging community zone.

SC6.6.1.4 Terminology

Terms used in this planning scheme policy are as defined in Schedule 1 – Definitions. A term used in the planning scheme policy which is not defined in Schedule 1 - Definitions is to be interpreted in accordance with Part 1.3.1.

SC6.6.2 Planning scheme policy details

SC6.6.2.1 Structure planning framework

A structure plan prepared under this planning scheme policy will address the following aspects at a minimum:

(1) type of development and land uses proposed;

(2) scale, density and height of development;

(3) servicing of the development by transport and other infrastructure;

(4) how the proposal addresses the relevant planning scheme overlays; and

(5) integration of the development with the local context.

SC6.6.2.2 Structure plan contents

A structure plan should identify the major elements of the locality surrounding a development that can impact on the planning and design of the site. It does not constitute an approval for land outside the development site but ensures the continuation of corridors, networks and linkages.

The major components of the development are to be designed with consideration of this broader context. It must be clear how the proposed development will integrate with the surrounding community and with the existing parks, centres, service and infrastructure networks and the movement system (road network, public transport facilities and pedestrian and cyclist paths) in the area. Where necessary, the structure plan will identify upgrades to infrastructure which are required to achieve the development outcomes proposed in the structure plan.

(1) Preparing a structure plan:

The steps that should be followed and information provided when preparing a structure plan are outlined below. Separate maps and reports may be provided for each step.

(a) Step 1—Site context:

Prior to preparing the structure plan an assessment of the site and its context must be undertaken and a site description of the land prepared, supported by a map containing the following features as a minimum:

(i) topography—contours and levels;

(ii) the street network, intersections and treatments, and public transport routes and stops;

(iii) existing and approved land uses on surrounding sites (including subdivision layouts) and including the location of nearby schools, activity centres, employment generators and other community facilities; and

(iv) the existing and proposed park network and pedestrian and cyclist paths.

(b) Step 2—Constraints mapping (identification):

Land may possess attributes or be subject to constraints which affect the development on the site. State planning regulatory provisions and overlays must be considered as part of the constraints mapping process.

(c) Step 3—Constraints analysis, land use allocation and infrastructure provision:

The site context mapping (step 1) and identification of constraints (step 2) will inform a further detailed analysis of the conditions on the site. This process will seek to 'ground truth' the sites constraints. It will involve technical investigation to identify specific constraints and their implications on future development of the land. The outcomes of the constraints analysis will determine which land is able to be developed for urban purposes and will also provide guidance to suitable uses of the land.

The design response should consider:

(i) the proposed layout and land use mix are integrated appropriately with surrounding land;

(ii) constraints are reflected on the structure plan and are in accordance with their relevant values;

(iii) an appropriate and well-designed proposed transport network;

(iv) the development incorporates appropriate provision for infrastructure (water, sewer, stormwater, parks and community services) for the land and demonstrates how the infrastructure is able to be coordinated with adjoining development where applicable; and

(v) where needed, land uses buffers to other uses or values.

(d) Step 4—Documenting the structure plan:

The structure plan for the land may include the following, as relevant to the land:

(i) the vision and principles for the structure plan area;

(ii) appropriate controls for land use and density, connectivity, open space and public realm and built form and design;

(iii) identification of specific precincts with individual characteristics and development outcomes, as relevant to the land and the site constraints;

(iv) levels of assessment where this is proposed to be altered through a preliminary approval; and

(v) any alternative code provisions where these are proposed to be altered through a preliminary approval. Any proposed code is to be constructed to be consistent with the format of codes within the Townsville City Plan.

SC6.7 Flood hazard planning scheme policy

SC6.7.1 Introduction

Short Title -The planning scheme policy (PSP) may be cited as the Flood hazard PSP.

SC6.7.1.1 Purpose

The purpose of the planning scheme policy is to:

(1) provide background information on the derivation of the Flood hazard overlay identified as overlay maps OM-06.1 and OM-06.2; and

(2) provide applicants with additional information and guidance in meeting the requirements of the Flood hazard overlay code.

SC6.7.1.2 Legislative authority

This planning scheme policy is made under Chapter 2, Part 3 of the *Planning Act 2016.*

SC6.7.1.3 Relationship to the Townsville City Plan

This planning scheme policy is to be read in conjunction with the assessment provisions specified in the Townsville City Plan and applies to the whole of the local government planning scheme area. Flood hazard PSP specifically relates to the assessment of Flood hazard overlay code.

SC6.7.1.4 Terminology

Terms used in this planning scheme policy are defined in Schedule 1 – Definitions. A term used in the planning scheme policy which is not defined in Schedule 1 – Definitions, is to be interpreted in accordance with Part 1.3.1 Definitions.

SC6.7.2 Background information

SC6.7.2.1 Flood mapping

The flood hazard overlay maps show flood hazard derived from numerous sources and include:

(1) Detailed flood modelling studies identified in SC6.7.2.1.1 of this planning scheme policy; and

(2) Interim flood assessment overlay mapping completed by the Queensland Reconstruction Authority and amended for local constraints by Townsville City Council.

SC6.7.2.1.1 Flood modelling studies

Flood modelling studies are complex technical investigations requiring a detailed understanding of catchment hydrological processes and floodplain hydraulic controls. Computer simulations are used to quantify runoff from rainfall and evaluate flow patterns and flooding extents around floodplains. There are numerous flood modelling studies which have been completed for the Townsville local government area. Results from these flood modelling studies have been combined to provide the Flood overlay maps.

At the commencement date of the planning scheme, the flood modelling studies that have contributed to the Flood overlay maps are:

(1) Alligator and Whites Creek Flood Study (Alligatorcreek);

(2) Althaus Creek Flood Study - Baseline Flooding Assessment (AlthausCk);

(3) Townsville Flood Hazard Assessment Study (Arcadia, NellyBay and PicnicBay);

(4) Balgal Beach Infrastructure Master Planning Report (BalgalBeach);

(5) Black River Flood Study - Baseline Flooding Assessment (BlackRiver);

(6) Bluewater Creek Flood Study (Bluewater);

(7) Captains Creek Flood Study - Baseline Flooding Assessment (CaptainsCreek);

(8) Deeragun Flood Study - Baseline Flooding Assessment (Deeragun);

(9) Douglas/Annandale Flood Study - Baseline Flooding Assessment (DougAnnan);

(10) Gordon Creek Flood Study - Baseline Flooding Assessment (GordonCreek);

(11) Horseshoe Bay Flood Study - Baseline Flooding Assessment (HorseshoeBay);

(12) Little Bohle River Flood Study - Baseline Flooding Assessment (LittleBohle);

(13) Lousia Creek Flood Study - Baseline Flooding Assessment (LousiaCreek);

(14) Lower Bohle Flood Study - Baseline Flooding Assessment (LowerBohle);

(15) Townsville State Development Area - Flood Modelling (LowerStuart);

(16) Middle and Upper Bohle Flood Study - Baseline Flooding Assessment (MiddleBohle and Upper Bohle);

(17) North Ward Flood Study - Baseline Flooding Assessment (NorthWard);

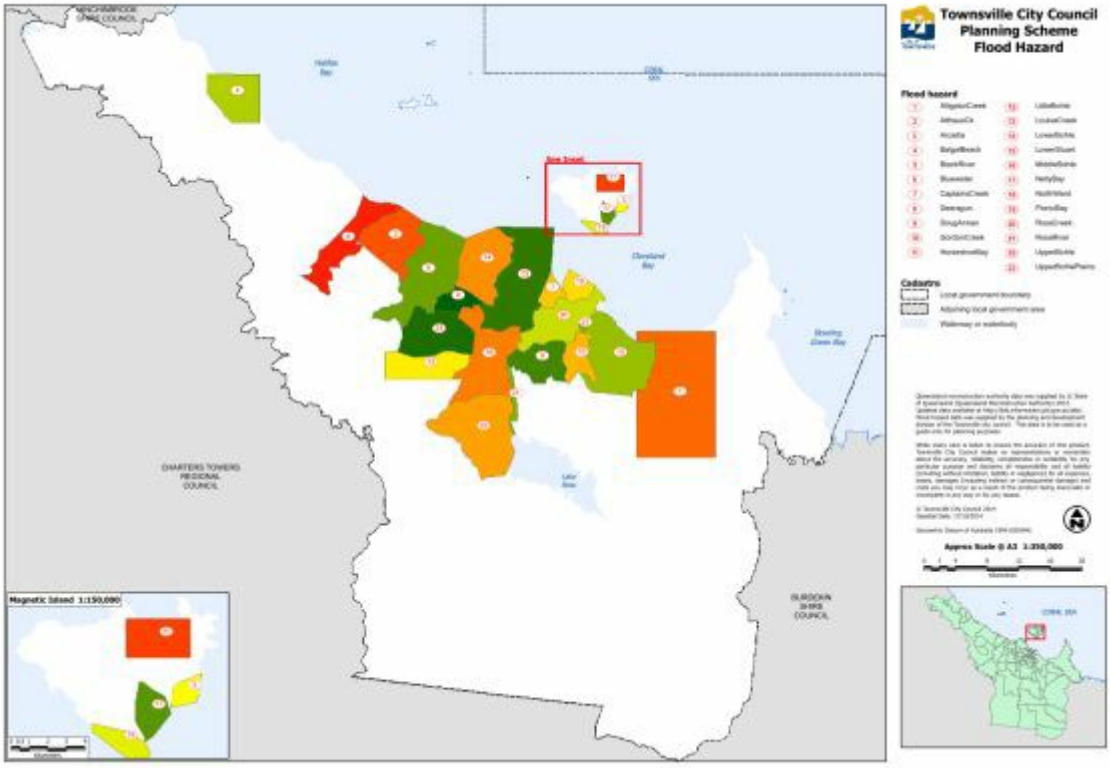
(18) Ross Creek Flood Study - Baseline Flooding Assessment (RossCreek);

(19) Ross River Flood Study - Baseline Flooding Assessment (RossRiver); and

(20) Upper Bohle Plains Flood Study - Baseline Flooding Assessment (UpperBohlePlains).

The area of applicability for each of the flood modelling studies identified in the aforementioned have been graphically presented on Figure SC6.7.1– Flood modelling study areas.

Flood modelling studies are under constant development due to the construction of infrastructure and the acquisition of new data. This information is available on Townsville City Council's website and contains digital copies of the latest and current flood modelling studies.



Click here to view PDF high resolution map.

Figure SC6.7.1 - Flood modelling study areas

SC6.7.2.2 Flood hazards

The Flood hazard overlay maps OM-06.1 and OM-06.2 have the following flood hazard ratings identified:

(1) high flood hazard;

(2) medium flood hazard;

(3) low flood hazard; and

(4) medium flood hazard – further investigation.

SC6.7.2.2.1 High and medium flood hazard

Both the high flood hazard and the medium flood hazard areas mapped on the Flood hazard overlay maps OM-06.1 and OM-06.2 are based on the 1% AEP flood. A velocity-depth criterion is used to distinguish between high flood hazard and medium flood hazard areas. High flood hazard areas are characterised by faster flowing and/or deeper floodwaters.

Figure SC6.7.2 – Flood hazard categorisation on 1% AEP flood (below) - shows the velocity depth criteria for designating the high flood hazard and the medium flood hazard areas from the 1% AEP flood. Velocity and depth information for the 1% AEP flood has been determined from flood modelling studies (refer SC6.7.2.1.1).

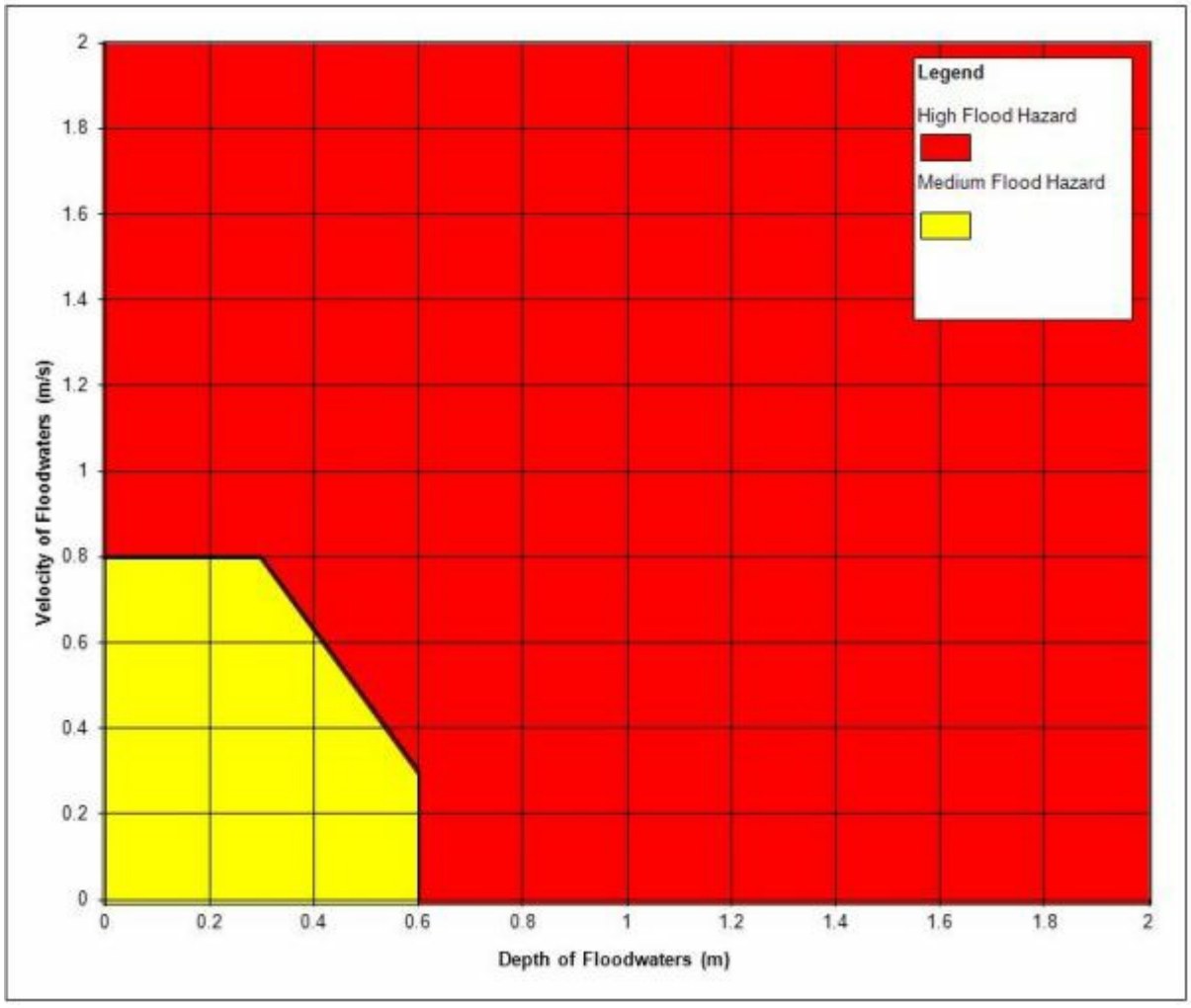


Figure SC6.7.2 - Flood hazard categorisation on 1% AEP flood

SC6.7.2.2.2 Low flood hazard

Areas of the floodplain outside the 1% AEP flood extent are still susceptible to flooding in rarer, more extreme flood events. Within the Flood hazard overlay maps OM-06.1 and OM-06.2, the low flood hazard area is identified as areas inundated by the probable maximum flood outside the combined extent of the high and medium flood hazard areas. The extent of the probable maximum flood has been determined from flood modelling studies (refer SC6.7.2.1.1).

SC6.7.2.2.3 Medium flood hazard - further investigation

Areas identified as medium flood hazard – further investigation on the Flood hazard overlay maps OM-06.1 and OM-06.2 are areas outside the extent of flood modelling studies and have been mapped by the Queensland

Reconstruction Authority. The Interim flood assessment overlay mapping produced by the Queensland Reconstruction Authority has been reviewed and amended by Townsville City Council to reflect local conditions. This information is less reliable than the other areas mapped on the flood hazard overlay maps OM-06.1and OM-06.2. Limited information is available on the flood characteristics in these areas as there is no information about flood depths, levels or velocities.

Within areas identified as medium flood hazard – further investigation, assessable development is likely to require further detailed flooding investigation, involving:

(1) development of a base-line flood study in accordance with Attachment 1 - Guidelines for preparation of flood studies and reports at a scale suitable to represent relevant floodplain process and site specific features;

(2) assessment of the potential impacts on flooding of the proposed development;

(3) identification of suitable measures to mitigate any adverse impacts on flooding; and

(4) demonstration of how the proposed development layout reduces the risk of flooding.

SC6.7.2.3 Defined flood level

Most development applications for which the Flood hazard overlay code is triggered will require details of the defined flood event (DFE). The DFE is the 1% AEP flood, which is spatially represented by the combined extent of the high flood hazard and the medium flood hazard areas mapped on the Flood hazard overlay maps OM-06.1 and OM-06.2.

For development which is accepted subject to requirements, it is most likely that existing information from flood modelling studies for the DFE will be adequate to address the acceptable outcomes of the Flood hazard overlay code. Information on the DFE derived from the flood modelling studies can be obtained from council's website.

SC6.7.3 Application requirements

This section provides information for a development application, guidance and advice for addressing assessment benchmarks.

SC6.7.3.1 Addressing assessment benchmarks

SC6.7.3.1.1

Development that is accepted subject to requirements and triggers the Flood hazard code only has to address the acceptable outcomes for performance outcomes 1 and 2 of the code.

Performance outcome 1
Development in medium and high hazard areas is designed and located to minimise susceptibility to and potential impacts of flooding.

Other than in the medium hazard - further investigation, council will be able to make available the height of the flood level for any particular location, upon request, where flood modelling studies have been undertaken (refer SC6.7.2.1.1).

In some areas, storm tide hazard areas will also co-exist with flood hazard areas. In these instances, the floor levels and other design responses will need to be sufficient to comply with both the Coastal environment overlay code, the Flood hazard overlay code and the *Building Regulation 2006*. Typically, floor levels will need to be based on the highest of either the defined flood level or the defined storm-tide level as depicted in Figure SC6.7.3.1.1.1-Floor control levels for both flooding and storm tide (below).

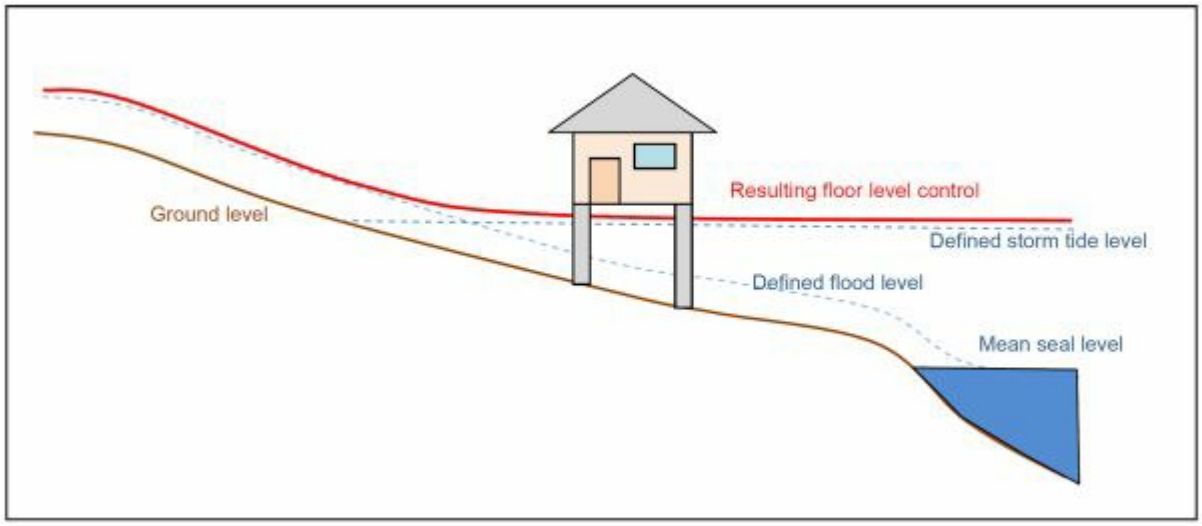


Figure SC6.7.3.1.1.1 - Floor control levels for both flooding and storm tide

Performance outcome 2
Development in high hazard areas does not significantly impede the flow of flood waters through the site or worsen flood flows external to the site.

The delineation of the high flood hazard areas on Flood hazard overlay maps OM-06.1 and OM-06.2 allows for clear identification of areas where performance outcomes 2 is applied.

Performance outcome 3
Development does not intensify use in high hazard areas, in order to avoid risks to people and property.

The delineation of the high flood hazard areas within Flood hazard overlay maps OM-06.1 and OM-06.2 allows for identification of areas where performance outcome 3 applies. Where flood flows are potentially altered by the development, a flood study will likely be required and the revised extent of the high flood hazard area will need to be mapped.

Performance outcome 4
Siting and layout of development maintains the safety of people and property in medium hazard areas.

Other than in the medium hazard – further investigation, council will be able to make available the height of the flood level for any particular location, upon request, where flood modelling studies have been undertaken (refer to SC6.7.2.1.1).

Alternatively, council's online flood mapping service can be used to obtain the height of flood levels for any particular locations.

Where flood flows are potentially altered by the development, a flood study will likely be required and the revised extent of the medium flood hazard area will need to be mapped.

Performance outcome 5

Signage is provided within high and medium flood hazard areas to alert residents and visitors to the flood hazard.

Signage will need to clearly state the nature of the flood hazard, with regards to inundation depths and flow velocities. Signage should also be able to function during a flood event and be practically visible.

Performance outcome 6

Development within high and medium flood hazard areas ensures any changes to the depth, duration, velocity of flood waters are contained within the site.

A flood modelling study, completed by a suitably qualified and experienced Registered Professional Engineer of Queensland (RPEQ), in accordance with Attachment 1 - *Guidelines for Preparation of Flood Studies and Reports*, will likely be required.

As a minimum, evaluating the impacts on floods up to the defined flood event will require a flood modelling study to evaluate the minor drainage system capacity event and the defined flood event for the catchment-wide critical duration and the site-specific critical duration. In addition, certain areas of the Townsville Local Government area will require evaluation of other frequency floods to assess adverse impacts on flooding. Attachment 2 – *Adverse Flooding Impacts Assessment – Additional Design Floods for Assessment* outlines areas where impact assessment and flood mitigation works will need to consider additional design floods to the minimum requirements.

To confirm adverse impacts on flood levels/depths, flow velocities and time of inundation are contained to the site; a pre- and post-development scenario will need to be assessed. Where possible, council requires the base-line flood modelling study that was used for deriving the flood hazard overlay to be used for evaluating development impacts. The RPEQ undertaking the impact study will need to determine if there is a need to update the base-line flood modelling with site specific survey/detail to adequately describe the hydrologic or hydraulic controls.

Performance outcome 7

Development within high and medium flood hazard does not directly, indirectly or cumulatively worsen flood characteristics outside the development site, having regard to:

(a) increased scour and erosion; or

(b) loss of flood storage; or

(c) loss of or changes to flow paths; or

(d) flow acceleration or retardation; or

(e) reduction in flood warning times.

To adequately assess the impacts of development on flooding regimes may require a hydrological and hydraulic assessment to be carried out by a suitably qualified and experienced hydrologist or engineer in accordance with Attachment 1 - *Guidelines for Preparation of Flood Studies and Reports.*

As a minimum, evaluating the impacts on floods up to the defined flood event will require a flood modelling study to evaluate the minor drainage system capacity event and the defined flood event for the catchment-wide critical duration and the site-specific critical duration. In addition, certain areas of the Townsville Local Government area will require evaluation of other frequency floods to assess adverse impacts on flooding. Attachment 2 – *Adverse Flooding Impacts Assessment – Additional Design Floods for Assessment* outlines areas where impact assessment and flood mitigation works will need to consider additional design floods to the minimum requirements.

To evaluate the potential for worsening flooding outside the development site; a pre- and postdevelopment scenario will need to be assessed. Where possible, council requires the baseline flood modelling study that was used for deriving the flood hazard overlay to be used for evaluating development impacts. The RPEQ undertaking the impact study will need to:

(a) determine if there is a need to update the base-line flood modelling with site specific survey/detail to adequately describe the hydrologic or hydraulic controls; and

(b) undertake analysis to adequately assess the potential for directly, indirectly or cumulatively impacting on flooding.

Figure SC6.7.1 – Flood modelling study areas of this PSP identifies which flood study has derived the flood hazard overlay in given areas.

Performance outcome 8

Facilities with a role in emergency management and vulnerable community services are able to function effectively during and immediately after flood events.

It is appropriate to have a higher level of flood immunity for critical community infrastructure. Table 8.2.6.3(b) within the Flood hazard overlay code outlines the required immunity for critical community infrastructure with a role in emergency management. The identified flood immunities within Table 8.2.6.3(b) should be used for setting flood levels as well as designing building services associated with the facility.

Performance outcome 9

Public safety and the environment are not adversely affected by the detrimental impacts of flooding on hazardous materials manufactured or stored in bulk.

The delineation of the low, medium and high flood hazard areas are shown the Flood hazard overlay maps OM-06.1 and OM-06.2 and allows for clear identification of areas where performance outcome 9 is applied.

Other than in the medium hazard – further investigation, council will be able to make available the height of the flood level for any particular location, upon request, where flood modelling studies have been undertaken (refer to SC6.7.2.1.1).

Alternatively, council's online flood mapping service can be used to obtain the height of flood levels for any particular locations.

SC6.7.4 Attachment 1 - Guidelines for preparation of flood studies and reports

Abbreviations

AEP	Annual exceedance probability
ARI	Average Recurrence Interval
ARR	Australian Rainfall and Runoff (1998)
DEM	Digital elevation model
DFE	Defined flood event
DRAINS	Urban hydrology and hydraulics software
HAT	Highest Astronomical Tide
HEC-RAS	Steady State One Dimensional Hydraulic Model
ISIS	Fully Dynamic One Dimensional Hydraulic Model
LiDAR	Light Detection and Ranging (Aerial Laser Survey)
MHWS	Mean High Water Springs
MIKE11	Fully Dynamic One Dimensional Hydraulic Model
MIKE21	Fully Dynamic Two Dimensional Hydraulic Model
MIKE FLOOD	Fully Dynamic Coupled One & Two Dimensional Hydraulic Model
MLWS	Mean Low Water Springs
QUDM	Queensland Urban Drainage Manual
RAFTS	Runoff Routing Software
RORB	Runoff Routing Software
SWMM	Fully Dynamic One Dimensional Hydraulic Model
TUFLOW	Fully Dynamic Coupled One & Two Dimensional Hydraulic Model
URBS	Runoff Routing Software
WBNM	Runoff Routing Software

SC6.7.4.1 Introduction

A flood study consists of the following parts:

(1) the hydrological determination to calculate the likely volume of water that results from the storm under consideration;

(2) the hydraulic determination to calculate the inundation levels and flow velocities that will most likely occur from the flow of water determined in the hydrological determination; and

(3) subsequent modelling to determine development impacts for the proposed development along with evaluation of works to mitigate the impacts of development.

Flood studies will be accepted based on approved inundation estimation calculation procedures and on observed historical records that can be quantified and related to an Average Recurrence Interval (ARI) by the use of the appropriate statistical flood frequency analysis procedure. It should be noted, use of historical records may allow for determination of inundation levels, however, will not be able to quantify the impacts on flooding of a development.

For analysis purposes a specific storm event is nominated as the benchmark event or standard to which council requires immunity against inundation for a development. That event is called the Defined Flood Event (DFE).

This guideline provides guidance on the appropriate use of given methods as well as some guidance on parameter values within the Townsville Local Government Area. There are numerous industry technical documents that detail the methods that should be consulted when completing flood studies including:

(1) Australian Rainfall and Runoff (AR&R); and

(2) Queensland Urban Drainage Manual (QUDM).

SC6.7.4.2 Catchment land use

Catchment land use is an important consideration for flood studies. The level of urbanisation within a catchment influences the volume of runoff and magnitude of peak discharges by:

(1) increasing the impervious fraction of the catchment which reduces the volume of infiltration and increases the total volume of runoff; and

(2) decreasing the time to peak discharge due to construction of open drains and stormwater networks which

concentrates flows and may increase the magnitude of peak discharges.

Strategies to avoid and increase in flooding as a result of any works may include:

(1) mitigation of flows at the individual development;

(2) catchment wide approach to mitigation of flows; or

(3) allowance for additional flow capacity within flow paths.

The strategy for accommodating flows will depend on existing land uses within the catchment and the environmental value of the watercourse. In preparing a flood study, **council must be consulted to identify the proposed approach to flood mitigation within the catchment.** The flood study may require assessment beyond the planning horizon in the current planning scheme, and make a determination of potential ultimate possible development or at least into the future for a period of 50 years, and even possibly 100 years.

As a general principle, drains are an opportunity to have several functions including providing flood mitigation for an area, however for the rest of the time they can be quite an effective open space for the community.

SC6.7.4.3 Hydrological determination

SC6.7.4.3.1 General

The hydrological process that is to be used for determining the design flows for the hydraulic modelling is to be cognisant of the proposed land uses. When calibration is being undertaken based on historical events, then the model being calibrated is to be based on the land use at the time of the storm event under calibration.

The choice of hydrologic method must be appropriate to the type of catchment and the required degree of accuracy. Simplified hydrologic methods such as the Rational Method should not be used whenever a full design hydrograph is required for flood mapping or to assess flood storage issues. Instead the more reliable runoff-routing techniques presented in publications such as Australian Rainfall & Runoff (ARR) should be adopted. Chapter 4 of the Queensland Urban Drainage Manual (QUDM) provides detailed guidance on the selection of an appropriate hydrologic method.

SC6.7.4.3.2 Hydrologic method

The hydrologic method adopted for the required analysis should be appropriate to the type of catchment and the design problem being assessed. Designers should be aware of the limitations, for each of the methods.

Approach	Applicability	Notes
Rational method	• Regular shaped catchment; • Homogenous catchments (generally uniform land use within the catchment); • Storage or timing issues are not relevant; • Rural catchments smaller than 25km^2; • Urban catchments smaller than 5km^2; • Time of concentration is likely to be less than 30 minutes; • **Rational method should only be used for drainage design as it is not appropriate for impact assessment at master planning stage.**	An appropriate method for calculating the time of concentration is essential to applying the rational method.
Synthetic unit hydrograph procedure	• Rural catchments; • Larger flood events where overbank flows are developed; • Rainfall can be assumed to be uniform across the catchment; • **Synthetic Unit Hydrograph Procedure has limited practical application in development assessment.**	Use of synthetic unit hydrograph procedures is not preferred and should preferably be undertaken by an experienced hydrologist with an extensive knowledge of the catchment.

Non-linear runoff-routing models (RORB, RAFTS, WBNM, URBS)	• Rural and Urban catchments (Rural only for RORB and all others should be used with caution in urban areas); • Storage or timing issues are relevant. • **Non-linear Runoff Routing Models are appropriate for drainage design or impact assessment at master planning stage, particularly for areas comprising both rural and urban land uses.**	Council uses RAFTS and requires any flood studies completed within the Townsville LGA to be completed using RAFTS. Models should be generally developed by suitably experienced practitioners, with appropriate verification / calibration of the models.
Time area runoff-routing models (DRAINS, ILSAX)	• Urban catchments with significant underground pipe network; • Storage or timing issues are relevant. • **Time Area Runoff Routing Models are appropriate for drainage design or impact assessment at master planning stage, particularly for areas only urban land uses.**	Models should be generally developed by suitably experienced practitioners, with appropriate verification / calibration of the models.
Direct rain on grid application in hydraulic model (MIKE FLOOD, TUFLOW)	• Flatter areas to prevent instabilities forming from flows down steep surfaces; • Study area needs to be small enough so that the model grid cell is not too large. • Storage or timing issues are relevant. • **Rain on Grid approach is appropriate for drainage design or impact assessment at master planning stage, and can represent areas comprising both rural and urban land uses.**	Although these methods are a component of hydraulic determination, they supplement the need for hydrologic determination and are gaining wider acceptance within the industry. Models should be generally developed by suitably experienced practitioners, with appropriate verification / calibration of the models.

Any hydrologic method using emerging technologies needs to clearly demonstrate:

(1) The approach and the principles it employs;

(2) Assumptions and limitations; and

(3) Appropriate calibration or verification.

SC6.7.4.3.3 Catchment parameters

Discussion on catchment parameters is required in particular:

(1) Overall catchment area and sub-catchment areas;

(2) (Sub-) catchment roughness and how the roughness or retardance was developed (may include a photographic record);

(3) Fraction impervious and how values have been derived including reference to what date values represent;

(4) Rainfall losses; and

(5) (Sub-) catchment slopes and how these have been derived.

All information used to define catchment parameters should be clearly referenced. A site assessment in the selection of some parameters is essential.

Catchment roughness

Catchment roughness or surface retardance accounts for the influence of vegetation and surface roughness on the generation of flows from sub-catchments. Ideally, values should be determined from calibration of the hydrological model to stream gauging. Values should be in the ranges presented below:

Catchment land use	Roughness coefficient (n*)
Urban impervious areas	0.010-0.030
Bare soil	0.010-0.050
Sparse vegetation	0.050-0.130
Heavily vegetated areas	0.080-0.200

Note that a sub-catchment may consist of numerous surface types that need to be accounted for in the specification of the catchment roughness.

Rainfall Losses
Rainfall losses account for rainfall which does not contribute to stormwater runoff because of infiltration and storage in surface depressions. Rainfall losses can vary from event to event and depend on antecedent rainfall conditions. Loss values for historical floods should be determined from calibration with loss values within the range of values as follows:

Surface type	Loss values
Pervious	Median initial loss 15 – 35 mm Median continuing loss – 2.5 mm/h Initial loss 0 – 140 mm Continuing loss 0.1 to 8 mm/h
Impervious	Initial loss 1mm Continuing Loss 0 mm/h

It should also be noted that loss values can vary between design storms of different frequencies. Guidance on appropriate loss values for different ARI storms can be obtained by matching peak discharges with peak flows determined from flood frequency assessment.

Sub-catchment slope
Sub-catchment slope can be derived from topographic maps or survey. Slopes applied should be representative of the sub-catchment and the modeller should ensure:

(1) The appropriate slope schematisation is applied when assigning values (equal area slope, vectored slope,); and

(2) Limitations of slope within the hydrological calculation method (i.e. Laurensen's method – minimum slope 0.3-0.5%, maximum slope 15%).

SC6.7.4.3.4 Rainfall intensities
Design Intensity-Frequency-Duration (IFD) Rainfall - IFD relationships shall be derived in accordance with the methodologies outlined in Australian Rainfall & Runoff, for the particular catchment under consideration. Input parameters shall be shown in the calculations submitted to council.

SC6.7.4.3.5 Partial area effects
If the Rational Method is being used, then there should always be checks to ensure that flows of greater magnitude are not apparent for partial catchment areas with faster runoff characteristics. These partial areas should be checked with the higher intensities relating to the shorter times of concentration.

Likewise, when using hydrograph techniques (such as runoff routing or Rain on Grid procedures), a range of storms of different duration for the same ARI should be checked to ensure that the worst event for the ARI is calculated and adopted. It should be noted that a range of storm durations may be required to evaluate sites that cover longer reaches of watercourses or numerous watercourses.

SC6.7.4.3.6 Calibration and verification of hydrological models
Calibration of results based on observed inundation events is desired. There are many pluviograph stations located within and adjacent to the City. Information from these is generally available from the Bureau of Meteorology or relevant Queensland Government department(s). Records from stream gauging stations will be required to match to hydrologic calculations and are generally available from the relevant Queensland Government department(s).

If observed data is not available to assist in the study, then it is suggested that the estimation of discharge flows from several methods will be considered with greater confidence in the result than the estimation of flows from one method alone.

SC6.7.4.3.7 Assessment of development impacts

When undertaking an assessment of the potential for development impacts on flooding, the development must be appropriately accounted for in the hydrological assessment including:

(1) Changes to imperviousness and expected rainfall losses;

(2) Changes to catchment layouts or extents;

(3) Changes to catchment roughness;

(4) Changes to slopes; and

(5) A re-evaluation for the potential for partial-area effects.

SC6.7.4.3.8 Preparation of reports

Reporting requirements

The method chosen should be adequately referenced and values derived should be substantiated by defining procedures used in their derivation. Where parameters are chosen or assumed, references and reasons should be supplied. The preferred method of setting out the hydrology is to describe in the text of the report the method to be used, and then to set the calculations out in a clear and concise table with sufficient data to enable quick verification of the results. The time of concentration or critical duration storm from the hydrological assessment should be clearly identified for areas relevant to the site.

Where computer methods for calculation of flows are used, the text of the report should describe the method that is utilised by the computer programme. Parameters that have been chosen should be referenced with reasons stated for any assumptions. A figure should be used to clearly demonstrate the layout of the model. Output from software should be tailored to produce concise tabular results to enable quick verification of the results. Where recognised computer programmes are utilised, council may require the electronic data files to be provided in acceptable format.

Where insufficient data is supplied then delays will occur while studies are returned to enable the additional data to be provided.

Catchment maps

Most hydrological techniques will require a catchment analysis and stream slope analysis. The catchment analysis should be presented on as large a scale map (smallest reduction ratio) as possible. The following scales for catchment sizes are recommended for use:

Scale	Catchment area
1:1000	up to 0.5 sq. kms (50 ha)
1:2000	up to 1.0 sq. kms (100ha)
1:5000	up to 1.5 sq. kms (150ha)
1:10000	up to 50 sq. kms (5000ha)
1:25000	limited to 300 sq. kms per sheet

Maps should be well presented with catchments contained upon one sheet where possible. Standard sized sheets should be used. Sub-catchments should be boldly defined and the contours should be clearly defined to enable easy verification of the catchments in relation to the contours. Where sub-catchments are not consistent with the contour information then reasons should be stated in the text and clearly labelled on the map. Good drafting standards should be maintained in the presentation of these maps.

SC6.7.4.4 Hydraulic determination

SC6.7.4.4.1 General

The hydraulic determination involves the calculation of flood levels and velocities for the flood flows from the hydrological determination. Australian Rainfall and Runoff and the Queensland Urban Drainage Manual set out

aspects of hydraulic calculations that can be utilised to determine the water levels for design discharges.

Unless the channel consists of long lengths of uniform section and uniform flow, the Mannings equation cannot be used in its simple form. This equation describes flow in a uniform channel at non-varying steady state flow conditions.

Australian Rainfall and Runoff describes methods for flood level determination in gradually varied flow conditions. The method for hydraulic determination will be dependent on the hydraulic controls of the study area. In general, it is appreciated that these methods will use computer applications.

SC6.7.4.4.2 Hydraulic method

The hydraulic method adopted for the required analysis should be appropriate to the hydraulic controls of the study area and the design problem being assessed. Designers should be aware of the limitations, for each of the methods.

Approach	Applicability	Notes
Steady state – one dimensional (HEC-RAS)	• Storage or timing issues are not relevant; and • Flows are one-dimensional, largely within a watercourse and the immediate overbank area.	Generally only suitable for small site scale hydraulic determination.
Fully dynamic – one-dimensional (MIKE11, ISIS, SWMM)	• Storage or timing issues are relevant; • Flows are one-dimensional, largely within a watercourse and the immediate overbank area.	Suitable for smaller onedimensional watercourses. Provides stability advantages over 2D models for steeper areas. Council uses MIKE11 and requires any flood studies completed within Townsville using a fully dynamic – onedimensional model, to use MIKE11.
Fully dynamic – two dimensional (MIKE21, TUFLOW)	• Storage or timing issues are relevant; • Flows are two-dimensional,	Flood maps are generally direct output from models. Council uses MIKE21 and requires any flood studies completed within Townsville using a fully dynamic – two-dimensional model, to use MIKE21.
Fully dynamic–coupled one & two dimensional (MIKE FLOOD, TUFLOW)	• Storage or timing issues are relevant; • Flows are combination of one and two- dimensional; • Large areas need to be represented in combination with fine detail	Council uses MIKE FLOOD and requires any flood studies completed within Townsville using a fully dynamic – one & two-dimensional model, to use MIKE FLOOD.

SC6.7.4.4.3 Topographic data

Topographic data used for the hydraulic determination will be dependent on hydraulic method:

(1) One-dimensional models employ cross-sections along branches to represent the study area topography; and

(2) Two-dimensional models employ digital elevation models to represent the study area topography.

The accuracy of the topographic data governs the accuracy of the hydraulic determination.
The accuracy of the topographic data should be clearly stated.

Cross-sections

Cross-sections are required at representative locations along a stream reach and at locations where changes occur in discharge, slope, shape, or roughness, and at bridges, culverts or control structures such as weirs. Where abrupt changes occur, several cross sections should be used to describe the change in shape regardless of the distance between sections. Cross-section spacing is also a function of stream size, slope and uniformity of cross section

shape. For one-dimensional models, the cross-sections should be wide enough so that the water surface is contained within the extent of the cross-sections. The accuracy of the hydraulic modelling will be dependent upon the spacing of cross-sections and the accuracy of the cross-section survey.

Digital elevation models

Digital elevation models used for two-dimensional models should use a grid spacing fine enough to resolve watercourses within the study area. As a general rule, a watercourse should be represented by a minimum of 5 grid-cells across the width of the watercourse. Coupled models can be used as an alternative to maintain the resolution within the watercourse.

The digital elevation model should be orientated to minimise disturbance of flows by the grid cell orientation. Aligning grid cells with streets (often part of the major drainage system) helps to achieve an appropriate orientation.

Digital elevation models are often captured from aerial surveying methods such as LiDAR or Photogrammetry. These methods can lose accuracy in areas of dense vegetation. It should be clearly demonstrated what steps (including ground survey) have been taken to improve the accuracy in areas potentially obscured by vegetation.

SC6.7.4.4.4 Roughness values

Based on the procedure developed by Cowan (1956), stream roughness values are a combination of influences from:

(1) Bed material;

(2) Surface irregularities;

(3) Variations in channel cross-section;

(4) Obstructions;

(5) Vegetation and flow conditions; and

(6) Meandering.

Different methods for hydraulic determination such as fully dynamic and fully dynamic twodimensional modelling will account for some of these influences within the underlying digital elevation model or solution scheme of the model.

Suggested ranges for roughness values based on the hydraulic method are provided below:

Land use	Roughness values (Manning's n)		
	1D Steady state	1D fully dynamic	2D fully dynamic
Natural watercourse	0.03-0.08	0.025-0.06	0.02-0.05
Riparian corridor	0.15-0.2	0.08-0.16	0.06-0.12
Open grassland	0.04-0.08	0.035-0.06	0.03-0.05
Low density vegetation	0.06-0.12	0.045-0.08	0.04-0.06
Medium density vegetation	0.08-0.18	0.06-0.1	0.05-0.08
High density vegetation	0.1-0.25	0.08-0.15	0.06-0.12
Roads	0.03-0.06	0.025-0.05	0.02-0.04
Open channels	0.03-0.05	0.025-0.05	0.02-0.04
Rural residential	0.06-0.1	0.05-0.08	0.04-0.07
Urban residential	0.06-0.15	0.05-0.12	0.04-0.1
Parks	0.04-0.18	0.035-0.1	0.03-0.08

Where possible, roughness values should be determined from calibration. Often, calibration will not be possible and sensitivity analysis to variations in roughness should be undertaken.

In the case of a one-dimensional model, roughness should be appropriately defined across the cross-sections based on the land use. In the case of a two-dimensional model, roughness should be appropriately defined using a grid to

represent the study area based on the land use.

SC6.7.4.4.5 Bridges and culverts
Australian Rainfall and Runoff and Queensland Urban Drainage Manual provide useful information and references for the determination of afflux levels and water profiles at bridges and other structures.

Head-losses across major drainage structures assessed within fully dynamic models should be verified by hand-calculations or assessment with a steady state model.

SC6.7.4.4.6 Tailwater conditions
Tailwater conditions for hydraulic models will be dependent on the location of the downstream extent of the model. Tailwater conditions may be one of the following:

(1) Sea levels for a coastal boundary;

(2) A gauged rating curve;

(3) Flood levels from the same ARI flood based on a previously accepted flood study; or

(4) Flood levels calculated from simplified means in the absence of other information (e.g. normal depth or critical depth).

In using flood levels calculated from simplified means, the method of calculation should be justified and sensitivity to input parameters should be evaluated. The downstream boundary should be located so that the boundary conditions do not influence results at the study site. Ensuring the boundary is sufficiently far enough downstream from the study site will reduce the impact on results at the site.

Requirements for some specific boundary conditions are discussed below.

Coastal boundaries
When calibrating hydraulic models, tailwater conditions should be based on observed sea levels for the event. Sea-levels are monitored at the Townsville port, with the information available through the Bureau of Meteorology.

To maintain the probability of the assessed flood event for design purposes, the tailwater condition adopted should not have a frequency of occurring any less than once a year. A fixed tailwater condition equal to the height of the Mean High Water Springs (MHWS) tide should be adopted. For storm events greater than 24 hours, a representative tidally varying water surface level between MHWS and Mean Low Water Springs (MLWS) can be adopted.

Backwater effects in tributaries from larger streams
Where a smaller stream discharges into a larger stream, it will be most probable that the larger stream will experience more severe flooding for storms of longer duration and hence lesser intensity for the same average recurrence interval. The tributary is to be checked for a storm of the same duration and intensity as that causing the peak flow in the larger stream.

The hydraulic assessment should assess the flooding for both the storm duration critical for the larger stream and the local tributary. Flood levels in the area will be based on the highest flood level determined from both storm durations. Peak velocities in the area will be based on the fastest velocity determined from both storm durations regardless of whether the storm duration that generates the fastest velocities produced the highest flood levels.

It is acknowledged that runoff routing models combined with fully dynamic hydraulic models will adequately account for these processes.

Estuary boundaries
Sometimes downstream boundary conditions for hydraulic models will be required in reaches of watercourses that are influenced by tides, but are not located at the coastline. In this instance, it is inappropriate to use neither a tidal water level boundary condition nor a rating curve boundary condition alone. The downstream boundary condition must account for both the tidal conditions and the ability for water levels to be elevated due to flood flows. Typically, this would involve the development of a rating curve with flows below MHWS set to zero and flows above MHWS to be calculated based on an appropriate water surface slope.

SC6.7.4.4.7 Impact of climate change

The impacts of climate change on flooding are likely to manifest from increased sea levels and changes in extreme event rainfall intensities. As part of understanding the risk associated with climate change, a sensitivity assessment should be undertaken as part of a flood study. The sensitivity should account for the latest projections in sea-level rise and increased rainfall intensities, specific to the area from leading authorities including relevant Queensland Government department(s), Australian Rainfall and Runoff, Commonwealth Scientific and Industrial Research Organisation, Bureau of Meteorology or Intergovernmental Panel on Climate Change. At the time of preparing this PSP appropriate values were:

Parameter	Value
Sea level rise to 2100	0.88m
Extreme rainfall Intensities to 2100	+15%

The DFE should be assessed in combination with the maximum sea-level rise applied to the MHWS level and the increase in rainfall intensities to evaluate the additional risk associated with climate change. The results from the climate change sensitivity should be assessed with commentary provided about:

(1) Areas where the floor level freeboard above the DFE would be exceeded;

(2) Any new flow paths that are formed; and

(3) What is the AEP of the climate change DFE relative to existing conditions.

SC6.7.4.4.8 Determination of impacts of development

Developments have potential to cause significant adverse impacts on flooding due to:

(1) Increasing the impervious fraction, reducing amount of infiltration and generating a larger volume of runoff;

(2) Providing more efficient conveyance of flows through the site so that flows are concentrated faster at the downstream end of the site producing larger peak flows; and

(3) Removing floodplain storage due to filling which reduces the natural flow attenuation of the floodplain and increases flood levels.

It will be necessary to carry out studies of the catchment in the pre-developed state (base case) and the developed state to determine increased amounts of flow and flood levels. The pre-developed state should represent the state of development within the catchment and floodplain immediately prior to time of construction of the proposed works.

Adverse impacts on flooding may preclude development unless appropriate flood mitigation measures are proposed as part of the development. As a result of developments:

(1) Flood levels should not increase beyond the accuracy of the method of hydraulic determination (generally 0.01 m) either upstream, downstream or adjacent to the site;

(2) There should be no significant change in flow patterns so that new flow paths on adjacent land are formed; and

(3) Any changes in flow velocities should be shown to have minimal impact on erosion potential.

Mitigation works such as levees or detention basins, involving embankments, need to be shown to have a safe overtopping failure. Such works should be modelled for the Probable Maximum Flood (PMF) to demonstrate safe passage of these flows without catastrophic failure of embankments.

Any mitigation measures recommended beyond the subject site will need to undergo the development assessment process including:

(1) Clear identification of the land parcels impacted;

(2) Development applications (material change of use, reconfiguration of a lot or operational works) - as required; and

(3) Identification of maintenance measures including responsibilities and funding sources.

Mitigation measures should generally be on the subject site unless prior discussions have been entered into with council and the landholder and there is an agreement for works outside of the subject site.

Hydraulic modelling of development

When representing development typically the hydraulic model is updated by:

(1) Changing the topography (cross-sections/DEM) to represent the development;

(2) Updating inflows to represent changes in hydrological response; and

(3) Updating roughness to represent the development.

Roughness values should only be changed to reflect the change in land use resulting from the development. These changes need to be clearly identified and justified. In assigning roughness values within new drainage channels or areas impacted by flooding, there should be consideration given to the way regrowth can occur within these areas. Areas below Highest Astronomical Tide (HAT) are likely to have mangrove regrowth occur. In areas further upstream, regrowth by tea-tree is likely to occur and can create a significant impediment to flows. Also, most flood events within Townsville occur towards the end of the wet season (January to March), when earlier rain has enabled grass in drains to grow with minimal ability to mow. Roughness values within drainage corridors for development assessment should be adopted towards the higher end of the range of values to account for regrowth, which may have minimal maintenance.

Freeboard for existing areas

Within some existing urban areas, design criteria have changed over time and have resulted in freeboard to existing buildings being less than is required in new development. To ensure the freeboard for existing areas is maintained, there should be no adverse impacts on flooding for all events floods up to the DFE. As a minimum, the assessment should demonstrate that there are no adverse impacts on flooding for the minor system drainage capacity AEP and the DFE.

SC6.7.4.5 General matters

SC6.7.4.5.1 Presentation of reports

As stated in the previous sections all reports and tabulations are to be printed on A4-sized sheets, and drawings presented on standard size sheets prepared using good drafting standards. The expected content of the reports is as discussed in SC6.7.4.2, SC6.7.4.3 and SC6.7.4.4 above. In summary the contents of a study report must include:

Hydrology section

(1) catchment Map - large as possible;

(2) report on procedure (brief), including hydrologic method, catchment characteristics, assumptions and discussions on results including critical duration /time of concentration as detailed in SC6.7.4.3 above; and

(3) calculations and model results - tabulated where possible and attached in appendix if significant in volume.

Hydraulics section

(1) report on procedure including hydraulic method, stream/floodplain characteristics and assumptions as detailed in SC6.7.4.4 above;

(2) model Results – Clearly presented as maps and tabulated values;

(3) stream Flood profile and bed profile of the study area;

(4) drawings/figures of topographic data used for the model (Digital Elevation Model map or plan of cross-section locations and cross- sections with X and Z coordinates included);

(5) a plan containing the proposed works showing any filling and excavation associated with development; and

(6) model results updated on the basis of including the development with the revised flood extents and impacts on flooding.

General

(1) discussion on sensitivity analysis for critical parameters (e.g. roughness, infiltration etc.);

(2) discussion on accuracy of inundation mapping and the resulting required flood line;

(3) recommendations as to methods of flood mitigation within the site;

(4) recommendations as to method of flood mitigation beyond the site together with development approvals,

construction proposal and funding proposals; and

(5) electronic data for both the hydrology and hydraulics in an agreed format (modelling platforms and GIS).

Drawings should be bound into the report where sizes are A3 or A4. Larger drawings are to be appropriately folded and inserted in a pocket in the back cover.

Recognition by the consultant, that the assignment of data to council, and use of the studies by council for its sole use, is a mandatory requirement before a study is commissioned and/or the results of any study will be accepted by council.

All studies, reports and submissions forwarded to council shall be prepared by, or at least certified by, a Registered Professional Engineer Queensland (RPEQ) who is registered in the specific area of engineering in which the study or report has been prepared e.g. an RPEQ (Structural) shall not certify a stormwater report.

SC6.7.4.5.2 Preference of computer models

It is acknowledged that where no modelling has been undertaken, then any modelling will provide a more accurate estimation of inundation levels than collated levels from observed inundation events.

Modelling studies where the results have been calibrated using observed levels and measured rainfalls will be recognised as providing a more representative result for the study area.

The hydrologic and hydraulic methods adopted should be suitable for purpose as indicated in SC6.7.4.3.2 and SC6.7.4.4.2. Townsville City Council requires that any flood studies completed within the Townsville Local Government Area uses software that is run internally which includes:

(1) Non-linear Routing – XP-RAFTS;

(2) 1D Steady State – HEC-RAS;

(3) 1D Fully Dynamic – MIKE11;

(4) 2D Fully Dynamic – MIKE21; and

(5) Coupled 1D/2D Fully Dynamic – MIKE FLOOD.

SC6.7.4.5.3 Copyright of reports, studies and drawings

Prepared directly for council

It is acknowledged that intellectual capacity has been demonstrated in the preparation of the report. However, the report is prepared and based on accepted engineering fundamentals and principles. In addition, the practices adopted are those developed by the engineering profession through initiative and ingenuity and ratified through the professions recognised body “The Institution of Engineers, Australia” currently trading as “Engineers Australia”.

All reports and studies (including drawings, tables, model files etc.) prepared for council under direct commission will become the sole copyright of council, and those reports will be used by council in a manner that will provide the optimum benefit to the community. All reports adopted by council will also be available for public and professional perusal on council’s website.

In any reference to the report, the author of the report will be acknowledged by council and should be acknowledged by any authorised third party user.

Submitted as part of a development application

Submitted as part of a Development Application and adopted as supporting the application only

When a technical report or study is submitted to council as part of a development application, this report/study, along with all components of the submission, can be made available to the public as part of the notification stage. The report can be provided to anyone seeking the report during this stage and following the approval. Use of the report for any third-party use will be at the complete risk of the third party. It should be noted that it will be only the approved report including any council requested amendments, which should be referred to in future.

Submitted as part of a Development Application and adopted by council as a benchmark report for future development or other purposes

From time to time, reports etc. submitted as part of a development application, or supporting an application, could provide a wider ‘regional’ significance and importance than just the development site for which they were prepared. Council may choose to open discussions with the developer to determine if obtaining all supporting digital and electronic data along with software input/output files would allow the option of adopting the report as a ‘base-line’ report for council. The decision as to whether a report has wider regional significance will be council’s alone.

Once these reports have been adopted by council as a ‘base-line’ report, the report assumes the status as if the report was prepared by or for council, and the copyright previously assigned by the author is released and the copyright provided to council. Council can use the report to achieve optimal outcomes for the wider community.

SC6.7.4 Attachment 2 - Adverse Flooding Impacts Assessment - Additional Design Floods for Asessment

Location	Design flood event
Ross River - Downstream *Within the immediate area around Ross River downstream of Ross River Dam and the lower Ross River Floodplain.*	0.2 % AEP
Ross River Upstream *Upstream of Ross River Dam*	0.5 % AEP

SC6.8 Mitigating bushfire hazard planning scheme policy

SC6.8.1 Introduction

Short Title -The planning scheme policy (PSP) may be cited as the Bushfire PSP.

SC6.8.1.1 Purpose

(1) The purpose of the planning scheme policy is to:

(a) support the outcomes presented in the Bushfire hazard overlay code; and

(b) provide guidance and information relating to the preparation of a Bushfire hazard assessment, and where necessary a Bushfire management plan.

SC6.8.1.2 Legislative authority

This planning scheme policy is made under Chapter 2, Part 3 of the *Planning Act 2016*.

SC6.8.1.3 Relationship to the Townsville City Plan

This planning scheme policy is to be read in conjunction with the assessment provisions specified in the Townsville City Plan, in particular, the Bushfire hazard overlay code.

SC6.8.1.4 Terminology

Terms used in this planning scheme policy are as defined in Schedule 1 – Definitions. A term used in the planning scheme policy which is not defined in Schedule 1 - Definitions is to be interpreted in accordance with Part 1.3.1 Definitions.

SC6.8.2 Planning scheme policy details

SC6.8.2.1 Bushfire hazard assessment

A Bushfire hazard assessment (and where necessary a Bushfire management plan) may be required as part of an assessable Reconfiguring a Lot or Material Change of Use development application as determined by assessment under the Bushfire hazard overlay code.

Where a Bushfire hazard assessment is required or is submitted, assessments are to be prepared and undertaken by a suitably qualified and experienced professional.

As a guide, the features sought by council to achieve a comprehensive Bushfire hazard assessment are addressed below.

The Bushfire hazard assessment should have regard to the following –

(1) Australian Standard AS3959 - 2009: Construction of buildings in bushfire prone areas.

(2) State Planning Policy and supporting guidelines.

Editor's note—A detailed guide on how to undertake this type of risk assessment is provided in QRA (2012) publication. Although this focuses on flooding the evaluation process can be applied for any natural hazard.

(1) A bushfire hazard assessment should provide:

(a) the name and qualifications or experience of the person(s) preparing the assessment;

(b) the use description;

(c) location of the extent and level of bushfire hazard in relation to the spatial extent of existing and forecasted land uses;

(d) details of the storage of any dangerous or hazardous goods to be kept on the site;

(e) details of existing vegetation, including slope and aspect characteristics of the site;

(f) details of weather conditions that influence bushfire intensity; and

(g) details of existing bushfire records and local knowledge.

(2) Risk appropriate development;

(a) mapping details of the proposed development through GIS overlays or comparison of hard copy mapping;

(b) a determination of the consequence of a bushfire hazard for each lot within the study area, and a qualitive assessment of

  (i) vulnerability;

  (ii) tolerability;

  (iii) a bushfire risk assessment to identify how development mitigation measures will work in conjunction with other risk management measures including building controls, mitigation infrastructure, early warning systems, community awareness and emergency managements to address the risk of bushfire, should it not be classed as a low hazard on the subject site; and

  (iv) recommendations.

SC6.8.2.2 Bushfire management plans

Where a bushfire management plan is required to respond to the risk, these are to be prepared and undertaken by a suitably qualified and experienced professional.

Where required, a Bushfire management plan is to include with the following:

(1) a discussion of proposed mitigation measures, the reduction of the hazard risk and the feasibility and reasonableness of these measures;

(2) identification of the key factors such as vegetation type, slope and aspect and include matters such as: likely direction of bushfire attack, environmental values that may limit mitigation options, location of evacuation routes and/or safety zones;

(3) an assessment of the specific risk factors associated with the development proposal, including matters such as the nature of activities and materials to be conducted or stored on the site, numbers and types of persons likely to be present, particular warning and/or evacuation requirements; and

(4) a plan for mitigating the bushfire risk. The plan should address all of the matters raised and recommend specific mitigation actions for the proposed development including:

  (a) road and lot layout and land use allocations;

  (b) firebreaks and buffers;

  (c) building locations or building envelopes;

  (d) landscaping treatments;

  (e) warning and evacuation procedures and routes;

  (f) firefighting requirements including infrastructure;

  (g) any other specific measures such as external sprinkler systems and alarms;

  (h) purchaser/resident education and awareness programs;

  (i) ongoing maintenance and response awareness programs; and

  (j) a description of the control measures that will be use to ensure compliance.

The level of detail required will vary with the nature of the development proposal and site, and with the type of development application.

The level of detail required to accompany a particular application should be determined in consultation with the assessment manager.

SC6.9 Natural assets planning scheme policy

SC6.9.1 Introduction

Short Title -The planning scheme policy (PSP) may be cited as the Natural assets PSP.

SC6.9.1.1 Purpose

(1) The purpose of the planning scheme policy is to:

- (a) support the use of the Natural assets overlay code;
- (b) provide background information on the derivation of the natural assets overlay maps;
- (c) outline information the council may request for a development application; and
- (d) provide guidance or advice about satisfying assessment benchmarks.

SC6.9.1.2 Legislative authority

This planning scheme policy is made under Chapter 2, Part 3 of the *Planning Act 2016*.

SC6.9.1.3 Relationship to Townsville City Plan

This planning scheme policy supports the assessment provisions specified in Townsville City Plan. Natural assets PSP specifically relates to the assessment of the Natural assets overlay code.

SC6.9.2 Natural assets

SC6.9.2.1 General guidance - environment protection

A healthy natural environment underpins the social and economic fabric of a sustainable city. Human modification of the natural environment interferes with physical and biological processes, natural cycles and energy flows. Natural systems can tolerate some amount of human modification however when the resilience level is exceeded, natural system break down and life support functions are diminished or damaged. In extreme cases damage may be irreparable as with endemic habitat loss, species extinction and desertification. Protecting the environment from human activities is a prerequisite for achieving ecological sustainability.

SC6.9.2.2 Land use and environment protection

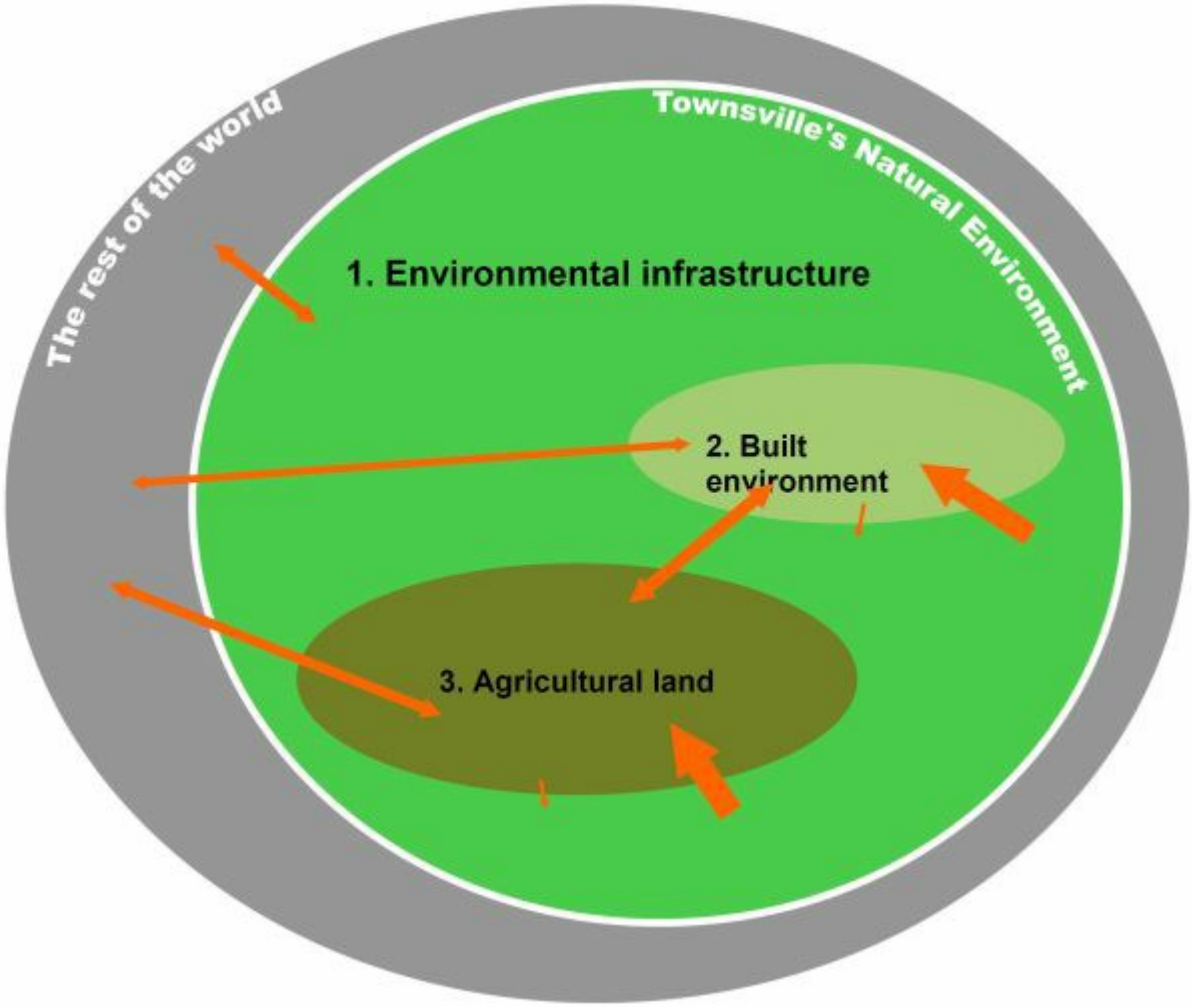
In broad terms, the three main functional land use units are:

(1) Environmental infrastructure;

(2) Built environment; and

(3) Agriculture land.

The three units are overlain on the single pillar of our existence - the natural environment, as illustrated conceptually in the diagram below.



SC6.9.2.3 Ecological planning

To seek to achieve ecological sustainability requires ecologically-based planning solutions. The underlying principle of ecological planning is the maintenance of our quality of life through the protection of our life support systems. This can best be done in a planning context through the recognition and protection of significant environmental areas.

Ecological planning takes an 'organic' approach to planning where the placement of built structures is dictated by environmental features and the need to protect and maintain natural assets and significant environmental infrastructure.

SC6.9.2.4 Environmental infrastructure

Environmental infrastructure is the basic framework or underlying foundation of the natural environment that contains the myriad of life support systems for all forms of life. Environmental infrastructure and function include:

(1) waterways/drainage systems (water drainage, water storage, seed transport, nutrient relocation, soil formation, sediment redistribution, habitat, connectivity, aquifer recharge, recreation, base flow, food source, biodiversity);

(2) wetlands (water filtering, water storage and aquifer recharge, habitat, seasonally high productivity, food source, biodiversity);

(3) riparian vegetation (shading, nutrients, ground cover; bank stabilisation, erosion prevention, water filtering, shelter/refuge, habitat, connectivity, recreation, food source, buffering, biodiversity);

(4) coastal dune systems (first line storm protection, buffering, water filtering, recreation, habitat, biodiversity);

(5) extensive forest in mid and upper catchments slopes >15% (erosion prevention, soil and slope stabilisation, soil formation, habitat, recreation, food source, aquifer recharge/intake, biodiversity, climate stabilisation);

(6) corridors and connections (wildlife movement, seed and vegetation dispersal, habitat, shade, shelter/refuge, food source, buffering, recreation, biodiversity);

(7) habitat/sustainable living space (biodiversity, connectivity, buffering, food source, recreation);

(8) native vegetation (biodiversity, habitat, wildlife movement, buffering, seed and vegetation dispersal, food source, recreation, soil health, shade, shelter/refuge, fuel, timber, erosion prevention;

(9) floodplains (habitat, biodiversity, nutrient and sediment dispersal, food source);

(10) aquifers (water storage, sub surface connectivity, hydraulic pressure); and

(11) protected areas (National Parks, Conservation Parks, Forest Reserves, Fish Habitat Areas and other socially delineated conservation areas).

Environmental infrastructure is unlikely to follow the same lines as appear on cadastral maps.

SC6.9.2.5 Ecosystem services

When planning and designing the built form we need to be aware of the intrinsic value of the surrounding environment and the ecosystem services operating in the background.

These services are provided without the need for any extra mechanical or chemical intervention and operate continually at variable rates determined by environmental conditions and climate. When we 'adjust' the environmental conditions we change the balance of ecological functions and ecosystem services at times beyond the resilience of the system to bounce back. If the change in environmental conditions is exacerbated by climate variability then a system may collapse due to the cumulative combination of natural and human impacts.

A risk management approach is adopted in ecological planning due to the uncertainties about how much of our natural assets (land, vegetation, water, soil, wildlife, soil microbes) is required to sustain an increasing human population and still maintain ecological processes at functional levels.

Determining or estimating the extent and influence of the ecological processes and ecosystem services is necessary in a planning context so that planning policies and intent can be applied to small areas (e.g. a house lot) as well as across broader landscape units such as regional ecosystems and land units.

SC6.9.2.6 Categories and components

The environmental importance ratings depicted on the Natural assets overlay map identify the likely significance of the natural environment and the likely extent of environment protection required to maintain habitat, species, vegetation communities, strategic habitat units, ecological processes, ecosystem services and hydrological function. Each of the three categories (medium, high and very high) are based on a variety of environmental and ecological components. The components associated with each category are listed in Table SC6.9.1—Environmental importance categories and components.

Table SC6.9.1 — Environmental importance categories and components

Category	Environmental importance components	General description
Very High	• Endangered ecological communities − semi evergreen vine thicket* − littoral rainforest and coastal vine thicket − broad leaf tea tree* • Endangered remnant vegetation (VMA vegetation management status) − Brigalow belt north bioregion − sub-regional (<10% left OR <300ha of pre-clearing extent remains) − local government area (<10% left OR <300ha of pre-clearing extent remains) • Remnant vegetation (VMA biodiversity status - endangered (dominant)) • Endangered high value regrowth (VMA) • Non bioregional ecosystems* • GBR wetland protection areas • Main connecting corridors • Mahogany glider habitat • Southern Cassowary habitat • Land units of limited extent* − Alligator Creek delta − *Eucalyptus acmenoides* lowlands − *Eucalyptus brownii* woodlands major occurrence − *Corymbia clarksoniana* alluvial fans − *Eucalyptus platyphylla — Melaleuca viridiflora* alluvial fan complex − *Eucalyptus tereticornis* on holocene deposits − *Grevillea striata* dominant − Land zone 4 grasslands − Pleistocene dunes − Terminal wetlands − *E. platyphylla — C. clarksoniana* woodlands on old levees and prior streams	This category includes endangered species habitat and vegetation communities along with the main connecting corridors (riparian, coastal and biogeographic units), land units of limited extent and Great Barrier Reef (GBR) wetland protection areas. These areas have been allocated as very high priority as they are the last examples of this type of vegetation community and/or habitat (generally less than 10% remains) and are the most vulnerable to loss and/or extinction in the short to medium term. Any further loss of these endangered elements could result in their loss from the landscape with little chance that they will recover or could result in their loss from the landscape with little chance that they will recover or could be restored.

Table SC6.9.1 — Environmental importance categories and components

Category	Environmental importance components	General description
High	• Of concern remnant vegetation (VMA vegetation management status) − Brigalow belt north bioregion − sub-regional (<10% left OR <300ha of pre-clearing extent remains) − local (30-50% of the pre-clearing extent remains) • Remnant vegetation (VMA biodiversity status - Endangered (sub dominant)) • High value regrowth − endangered (sub dominant) − of concern (dominant) • Wetland regional ecosystems (Estuarine, Palustrine, Lacustrine and Riverine) • Black-throated Finch habitat* • Essential habitat (regional ecosystems) • Very high ecosystem diversity (SDI >75% of the maximum value for the Bioregion) • A significant habitat for 'at risk' species • Waterways (buffered as per VMA bioregion codes) • Essential regrowth habitat (VMA)* • Wet tropics corridors* • Statewide corridors (remnant)* • Magnetic Island corridors (remnant)* • Magnetic Island lowland values(remnant)* • Land units of limited extent* − Castle Hill − (Sandy Creek and Double Barrel Creek) floodplain complex − watercourses (and associated areas subject to flooding)	This category includes the next most threatened suite of habitat, species and regional ecosystems (generally less than 30% of these components remaining in the landscape) along with strategically important connecting corridors, essential regrowth habitat, wetland regional ecosystems and endemically important landscape elements. It also includes a significant portion of the network of waterways and buffers (not included in the very high category) that are critical to the maintenance of ecological functions and ecosystem services. This category includes environmental elements close to the probable 'survival edge' as 30% is considered to be at the lower limit of ecological viability and function for habitat and vegetation communities. Any further reduction of extent is likely to result in a downward spiral that could ultimately lead to species endangerment and/or the endemic loss or degradation of vegetation communities and ecological processes. To take into account the relative importance of this category, if there are two or more environmental parameters with a high rating in a given polygon then the polygon was elevated to the very high category.

Table SC6.9.1 — Environmental importance categories and components

Category	Environmental importance components	General description

Medium	• Least concern remnant vegetation (VMA vegetation management status)
	  − Brigalow belt north bioregion
	• Remnant vegetation (VMA biodiversity status — Of Concern)
	• High value regrowth
	  − of concern (sub dominant)
	  − least concern
	• GBR wetland protection trigger areas (buffers)
	• Statewide corridors (nonremnant)*
	• Magnetic Island corridors (nonremnant)*
	• Magnetic Island lowland values (regrowth)*
		This category includes the widest range of environmental values from near threatened (30% remnant vegetation remaining) to relatively stable (100% remnant vegetation remaining). This category also includes some of the less tangible environmental and ecological functions, such as catchment protection, buffers, landscape connectivity and viable- sized habitat and ecosystems.
		
		This is the category that is likely to require the highest level of investigation prior to any development, as it is the least 'certain' in terms of priority for environmental protection. It is likely to have very high and high environmental value features, which have not been identified at the mapping resolution used for the categorisation. It may also include some low value features.
		
		If there are three or more environmental parameters with a medium rating in a given polygon then the polygon has generally been elevated to the high category.

Footnote—SDI is Simpson's Diversity Index

Footnote—*Denotes amendments/additions using DEHP mapping

It should not be assumed that any area has no environmental values. Areas not included in the overlay map (depicted without an infrastructure rating) generally consist of areas that have significantly less environmental value due to the level of disturbance resulting from anthropogenic activities, including clearing of native vegetation and the construction built form. The environmental values of some of these areas could be reinstated.

Applicants and landowners should be aware that other land not included in the overlay map may contain other remnant and non-remnant vegetation or other environmental value that is subject to the requirements of other state and/or federal legislative requirement.

In addition, there are provisions in some zone codes that require applicants to respond appropriately to any localised values that may exist outside the overlay area.

SC6.9.2.7 Mapping limitations

The general mapping resolution used for the environmental importance ratings map (Overlay Map OM-08) is 1:100,000. The Queensland Government's Regional Ecosystem mapping has been used as the base map for the environmental importance rating map and, while being the best available data source for this type of environmental categorisation, it is recognised that there are inaccuracies in the base map and therefore there will be inaccuracies in the resulting product - i.e. environmental importance ratings.

To overcome some of the inaccuracies, a review of the environmental importance ratings has been undertaken for the urban, rural and rural residential areas using 2011 aerial photography (the most recent available at the time of review). Further refinement of the mapping is required, for example, to accurately locate waterways, wetlands, riparian zones and buffers as the current Queensland Government mapping is not accurate at the local/urban scale and especially for order 1 and order 2 streams.

In light of these mapping limitations, it is imperative that an environmental assessment is undertaken for areas mapped with medium, high and very high environmental importance to ensure that development applications are assessed with the benefit of the best available information.

Council will continue to improve its environmental mapping, over time, to more accurately reflect environmental importance across the entire Townsville landscape, to reduce the incidence of unsustainable land use and development, and thereby contribute to the achievement of ecological sustainability and a sustainable Townsville.

SC6.9.2.8 Supporting maps

Supporting maps have been produced to assist applicants in using the Natural assets overlay code. The data presented on each of the supporting maps has been extracted from data contained on map OM-08 and are provided to assist applicants identify environmental and ecological features within the Townsville landscape.

Supporting maps may be used to assist applicants address relevant assessment benchmarks of the natural assets code.

Maps supporting the natural assets overlay code are:

(1) Figure SC6.9.1 – Natural assets – waterways represent the Queensland Government 1:100,000 waterways mapping. Waterways have been mapped to enable identification of stream orders specifically and are designed to allow applicants to identify the relevant stream order that affects a given location.

(2) Figure SC6.9.2 – Natural assets – wetlands include Great Barrier Reef wetlands of high ecological significance (wetland protection areas), riverine wetland regional ecosystems and other wetland regional ecosystems. Ramsar wetlands and wader roosts have also been shown to identify the presence of these areas at their given location.

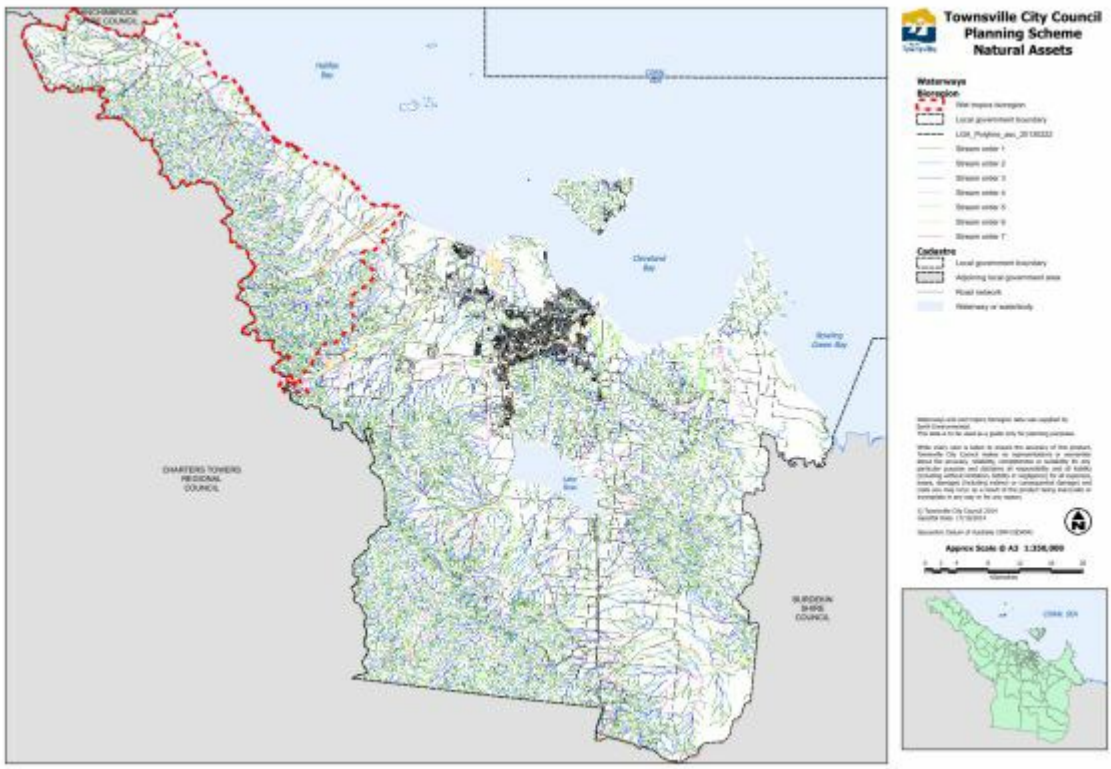
(3) Figure SC6.9.3 – Natural assets – ecological corridors include:

  (a) priority corridors from the Environment and Biodiversity Study: Final Report (Chenoweth April 2011);

  (b) state corridors from data provided by the Department of Environment and Heritage Protection (DEHP); and

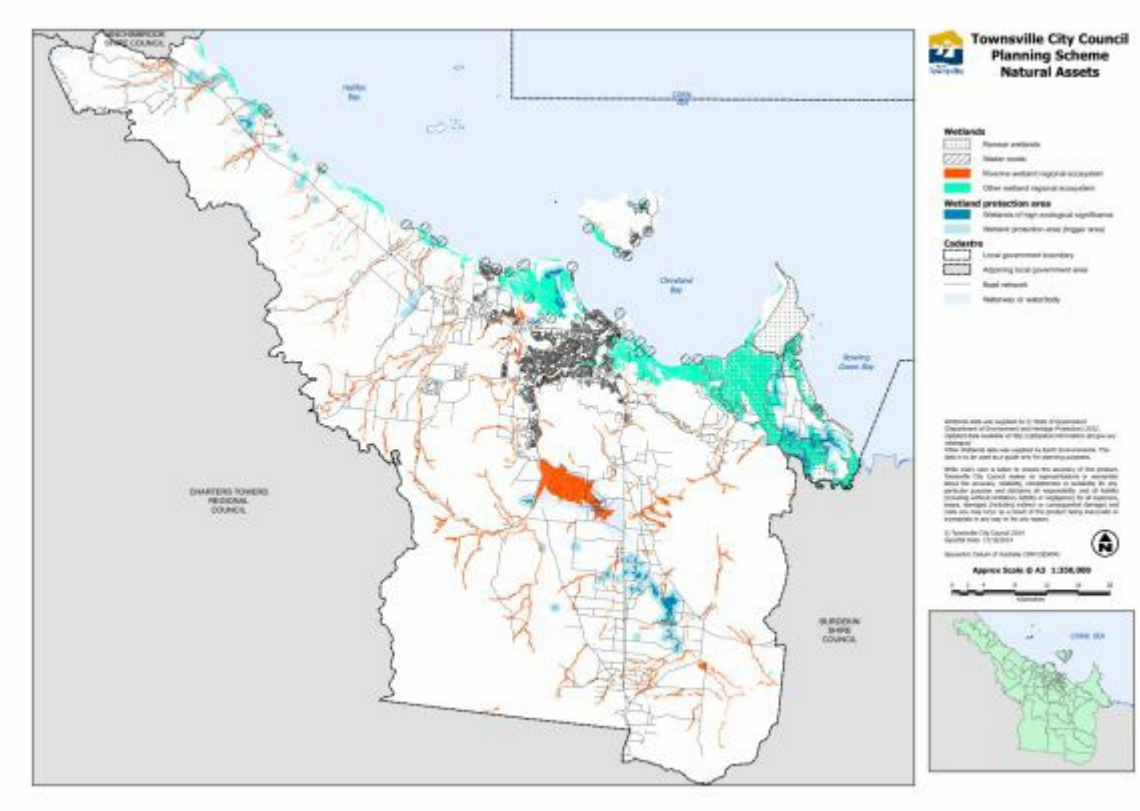
  (c) the state and priority corridors as major ecological corridors and the great eastern ranges conservation corridor. Major ecological corridors shown on the map consist of a 250m core corridor and a 50m buffer either side of the core corridor.

(4) Figure SC6.9.4 – Natural assets – core habitat includes Cassowary, Mahogany Glider and draft Black-throated Finch habitats in addition to essential habitat for other threatened species as mapped by DEHP including declared fish habitat areas.



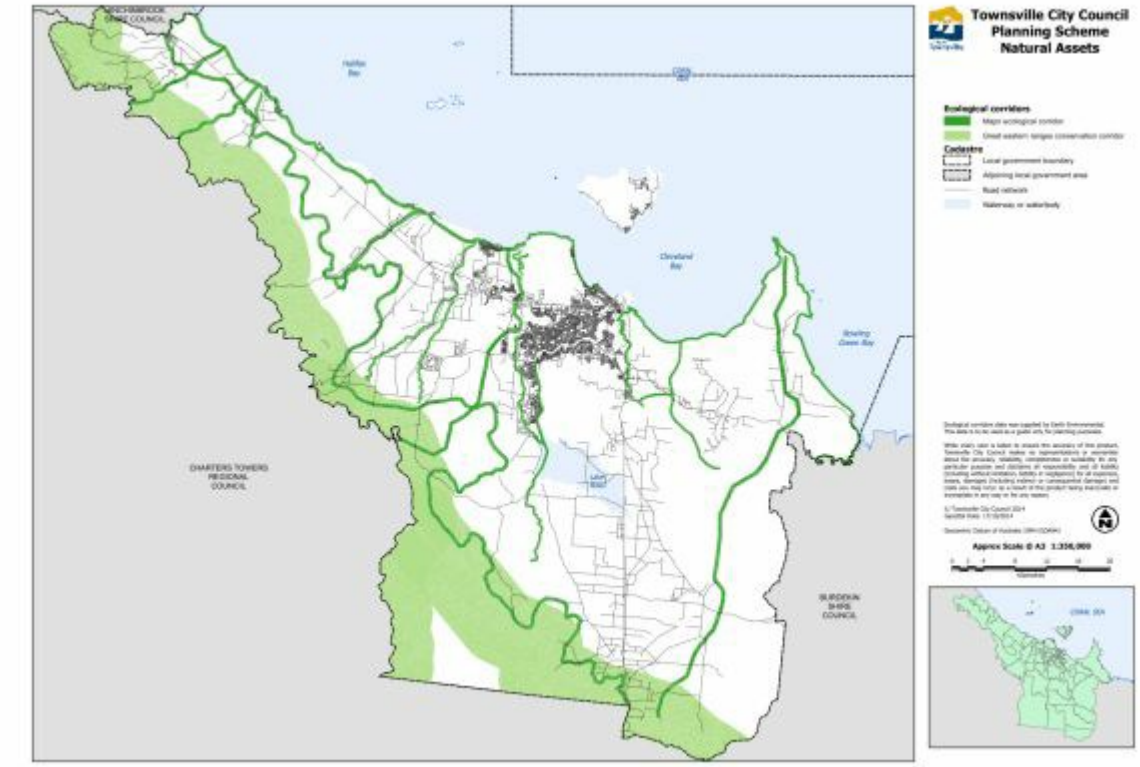
Click here to view PDF high resolution map.

Figure SC6.9.1 - Natural assets - waterways



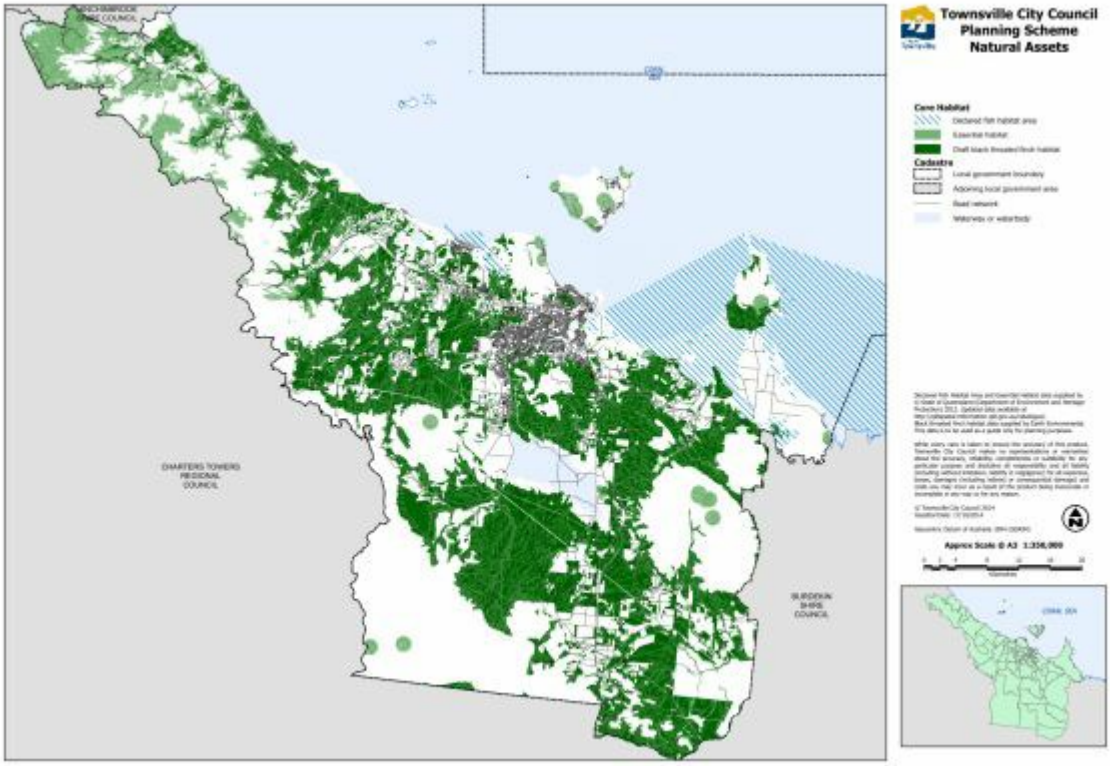
Click here to view PDF high resolution map.

Figure SC6.9.2 - Natural assets - wetlands



Click here to view PDF high resolution map.

Figure SC6.9.3 - Natural assets - ecological corridors



Click here to view PDF high resolution map.

Figure SC6.9.4 - Natural assets - core habitat

SC6.9.2.9 Environmental assessments

An environmental assessment may be required to show what impacts the development activity may have on the environment and how potential adverse impacts on the environment can be mitigated. To demonstrate compliance with the Natural assets overlay code, such an assessment may need to include a detailed ecological assessment.

The required assessments should be undertaken by a suitably qualified and experienced professional and provide a site specific investigation of the values present and their significance to ground truth the data reflected on the overlay mapping. The level of investigation required and techniques utilised should be commensurate with the scale and nature of the proposed development and the type of values present on the site. The environmental assessment should provide the appropriate level of information to assess the potential impact of a proposed development on the environment including:

(1) identification of the physical and ecological features of the site;

(2) identification of the ecological processes and ecosystem services associated with the site;

(3) identification of the physical and ecological connections between the site and the surrounding environment, including ecological processes and ecosystem services; and

(4) comparison of the environmental importance components and features identified on OM-08 to on ground findings.

The environmental assessment and reporting process also provides the development proponent with the opportunity to propose potential solutions that prevent or minimise potential environmental harm to natural assets and ecological processes associated with the proposed development. Potential solutions may include:

(1) environmental offsets;

(2) operational environmental management plans;

(3) succession plans and criteria for handover of natural assets to council;

(4) establishment of Nature Refuge areas;

(5) stormwater management plans incorporating water sensitive urban design (WSUD);

(6) resourced rehabilitation plans (in addition to or instead of environmental offsets); and

(7) innovative ideas for the progression of the development and protection of environmental values.

SC6.9.2.10 Environmental assessment report

The environmental assessment report should be set out in accordance with the framework provided below.

Physical and ecological features of the site including:

(1) Introduction providing information about:
   (a) the applicant;
   (b) tenure;
   (c) location; and
   (d) current land use and proposed land use.

(2) Site description including:
   (a) surrounding land use;
   (b) location in the water catchment;
   (c) proximity to HEV waters;
   (d) proximity to World Heritage Areas and other protected areas;
   (e) geology and soils; and
   (f) Regional ecosystems.

(3) Environmental importance components and features identified on OM-08 (Natural assets overlay).

(4) Likely ecological processes and ecosystem services associated with the site and adjoining areas.

(5) Social, physical and environmental constraints identified in other overlays including flooding, fire hazard, slope and visual amenity.

Physical and ecological features of the site (on ground site assessment results):

(6) The physical and ecological features of the site, based on on-ground assessment including:
   (a) soils and their geological derivation;
   (b) drainage and wetland features;
   (c) Other native vegetation and regrowth;
   (d) Regional Ecosystem type and extent;
   (e) habitat type and extent;
   (f) exotic species presence (terrestrial and aquatic – plant and animal); and
   (g) fauna sightings and signs (additional targeted survey work may be required where threatened species and ecological communities are likely to be present).

(7) Ecological processes and ecosystem services associated with the site.

(8) The physical and ecological connections between the site and the surrounding environment including ecological processes and ecosystem services.

Comparison of desktop review features with site assessment features:

(9) Comparison of the environmental importance components and features identified on OM-08 council's Natural assets overlay to on ground findings.

Suggestions for development impact avoidance or mitigation, including, but not limited to the following considerations:

(10) stormwater management including erosion prevention and sediment movement control;

(11) habitat management including weed control;

(12) maintenance of ecological processes; and

(13) maintenance or improvement of connectivity.

Environmental assessments and the preparation of management and rehabilitation plans are to be undertaken by a

person/people/organisation with the appropriate skills and experience. Where a person with less than four years' experience in field work is involved in the assessment, they should be supervised by an experienced environmental practitioner. Regardless of experience and qualifications, all work should be thoroughly reviewed as part of a quality assurance process prior to submission of studies, reports and plans to council.

SC6.9.2.11 Site-based management and rehabilitation plan

Where there is a requirement in the Natural assets overlay code, a site based management plan and/or a rehabilitation plan should be prepared to address the site specific situation. Generally, content should be in a format that identifies:

(1) the physical and biological condition of the site (from the Environmental assessment report);

(2) the issue/s being addressed and their location (from the Environmental assessment report);

(3) how and over what time scale the issue will be addressed (with input from Part 4 of the Environmental assessment report); and

(4) the commitment of resources allocated to implement the plan.

Plans need to provide enough information to show that the performance outcomes in the Natural assets overlay code will be met by the implementation of the plan. The use of maps and accompanying tables with management actions are encouraged to simplify the plan and reduce the size of documents.

SC6.9.2.12 Additional information

Additional material may be required as part of the environmental assessment depending on the environmental importance components and features identified in the Natural assets overlay. This involves proximity to areas of significant ecological or environmental value and requirements for vegetated buffers as well as the proximity to wader roosts. Additional information will be required if the proposed development is within:

(1) 200 metres of a wader roost area as indicated on Figure SC6.9.2 – Natural assets – wetlands;

(2) 200 metres of core habitat and endangered ecological communities;

(3) 200 metres of HEV waters;

(4) 200 metres of a wetland area;

(5) 100 metres of an ecological corridor;

(6) 100 metres of a declared fish habitat area; and

(7) 100 metres of a waterway.

Information derived from on ground investigations will be required to show:

(1) the actual distance from the environmental feature to the edge of the development and a comparison to the Natural assets overlay.

(2) the physical condition of the area between the environmental feature and the development including:

  (a) soils;

  (b) drainage patterns;

  (c) habitat type/s;

  (d) vegetation type and condition;

  (e) presence of exotic species;

  (f) observed fauna and signs of fauna; and

  (g) built infrastructure e.g. fences, drains and roads; and

(3) how buffer areas will maintain natural assets and ecological processes if a proposed buffer area/width is less than that specified in the Natural assets overlay code.

It is the responsibility of the development proponent to provide council with alternative solutions, when digressing from council's acceptable solutions, to ensure natural assets and ecological processes are not degraded as a consequence of the proposed development. Council may adopt the proponent's suggestions as conditions of development approvals.

SC6.9.2.13 Background information to assist environmental assessments

Council has compiled a range of environmental information to assist development proponents with the preparation of their environmental assessments. A list of the information is provided below with associated references:

(1) schedule of locally significant fauna, flora and vegetation/ecological communities along with those scheduled under legislation;

(2) landscaping guidelines expounding the use of local native species and excluding environmental weed species;

(3) local and regional movement requirements of wildlife (refine connectivity corridors based on species habitat location and known ecology);

(4) fauna survey techniques (e.g. types of trapping, call play back etc.) including the most appropriate targeted survey techniques and when these may be required for particular species;

(5) pest species (flora and fauna) specific to Townsville and appropriate management techniques; and

(6) Black Ross (Townsville) Water Quality Improvement Plan

SC6.9.2.14 Terminology

The following table provides a useful compendium of environmental terms, including terms used in this policy.

Word / Term	**Explanation**
Aquatic	Of the water, or living or growing in water.
Arboreal	Tree dwelling. Adapted to living in or among trees. Spending a significant part of the life cycle in trees or relying on arboreal habitats for shelter and/or food.
Avian	Birds. Of or pertaining to birds.
Biodiversity	The variety of all life forms: (1) *genetic diversity*—the variety of genetic information contained in individual plants, animals and other organisms. (2) *species diversity*—the variety of species. (3) *ecosystem diversity*—the variety of habitats, ecological communities and ecological processes. (from National Wildlife Corridors Plan: A framework for landscape-scale conservation 2012, pp.45-49).
Biodiversity values	As biodiversity is the variety of all forms of life biodiversity values are difficult to quantify. Biodiversity values are often based on a combination of biological and biophysical parameters including; habitat species richness and endemic anomalies. Some of these parameters have been included in the environmental importance rating map prepared for the Natural Assets Overlay.
Biophysical processes	Processes involving interaction between the biological (organic) world and the physical (inorganic) world e.g. soil formation and nutrient recycling.
Bioregion	As described in the *Vegetation Management Act 1999* (VMA).
BTF is Black-throated Finch	The Black-throated Finch BTF is an Endangered species under the *Commonwealth Environmental Protection and Biodiversity Conservation Act 2000* (EPBC Act) and Queensland's *Nature Conservation Act 1992*. BTF habitat mapping is draft and will require further investigation to determine actual core habitat. A greater level of assessment will be required for development applications in BTF habitat areas.
Buffer	The threat management space between a natural or environmental asset and the threat. Buffers can also act as ecological corridors and provide habitat for wildlife. [anything serving to neutralise the shock of opposing forces (The Macquarie Dictionary (2nd Edition) 1991, p.234)]

Buffering	The practice of providing a managed ecotone between the area of environmental significance and the threatening process/es.
Connectivity	The physical linkages serving to connect dissimilar or separated patches of habitat. The name given to the concept of landscape elements being connected. The capacity of landscapes or aquatic environments to allow ecological movement and function. The broad concept can be considered to have several main elements:*landscape connectivity*—the physical connection between areas with vegetation cover across a landscape. (1) *habitat connectivity*—the connection between patches of habitat suitable to a particular species. (2) *ecological connectivity*—the ecological processes that underpin the function of landscapes; for example, the transfer of pollen or seeds and the sequestration of soil carbon. (3) *evolutionary connectivity*—populations of species are able to interact naturally, sharing genes and adapting to changing environmental conditions. (from National Wildlife Corridors Plan: A framework for landscape-scale conservation 2012, pp.45-49).
Core area, core habitat area	An area of habitat that is of a suitable size, shape and condition for an assemblage of species or a single organism. Core habitat provides nutrients and water resources, and supports successful reproduction. (from National Wildlife Corridors Plan: A framework for landscape-scale conservation 2012, pp.45- 49).
Corridors	Corridors are passageways that facilitate the movement of organisms and serve as habitat. Corridors exist at a range of scales depending on the organism and their ecological requirements. Corridors are not confined to linear strips of vegetation or riparian zones but rather include an interconnected network of native vegetation and habitat across the landscape. Waterways and wetlands provide ecological corridors for aquatic organisms.
Degraded	In a lessor state as a result of human interaction and natural causes e.g. storms.
Ecological communities	Assemblages of species (plants, animals, bacteria and fungi) that interact with each other in a common environment and often as part of a food chain or trophic web.
Ecological functions	Functions and processes involving the interaction of organisms with each other and their environments including , nutrient cycling, pollination, animal and plant breeding.
Ecological significance	The term used to describe areas that are important for maintaining biodiversity and ecological processes.
Ecotone	The gradation or transition zone between different habitats or vegetation communities.
Ecosystem	Ecosystem is “1. a community of organisms interacting with one another and with the environment in which they live.” (The Macquarie Dictionary (2nd Edition) 1991, p.555). A complex network or interconnected system or a biological community of interacting organisms and their physical environment; for example, combinations of plant, animal and other organisms in communities and their non-living environment (soil, water, climate, and so on) interacting as a functional unit, such as forest, wetland or grassland. (from National Wildlife Corridors Plan: A framework for landscape-scale conservation 2012, pp.45-49).
Ecosystem health	A measure of the condition of ecosystems from sustainable to threatened.

Ecosystem processes	Those life processes and interactions between organisms and the environment that (generally) contribute to the overall health of the ecosystem.
Ecosystem services	The multitude of resources and processes that are supplied by natural ecosystems. Collectively, these benefits are known as ecosystem services and include products like clean drinking water and processes such as the decomposition of wastes. The term is generally applied to benefits to human beings as with the Millennium Ecosystem Assessment 2005 definition “the benefits people obtain from ecosystems”. This is a narrow, anthropogenic definition that could restrict the protection of important ecosystem services if they are not seen as beneficial to humans. The definition has been broadened in the National Wildlife Corridors Plan: A framework for landscape-scale conservation 2012 to read; “the processes or materials provided by ecosystems. Ecosystem services benefit biodiversity, humans and society through the provision of essential goods and services such as clean air, water, food, shelter, energy, nutrients, amenity values and cultural resources”. (pp.45-49)
Endemic	Refers to organisms that are native to a particular area or region. Having a limited distribution or habitat extent or confined to a specific area.
Environmental infrastructure	Environmental infrastructure is the basic framework or underlying foundation of the natural environment that contains the myriad of life support systems for all forms of life.
Hydrological function	The function of water moving through the landscape as part of a natural drainage process. Hydrological function is shaped by geological features and influences those features over time e.g. erosion. Hydrological function can be impeded by: (1) the placement of obstacles in waterways, (2) obstructing overland flow e.g. raised roads and rail lines, (3) reduced aquifer recharge.
Migratory species	Animals, especially birds and marine species, that travel significant distances (compared to remaining in a home range) to: (1) avoid climatic extremes and resource (food) depletion, (2) find sufficient resources to maintain physical health, (3) breed in more favourable conditions.
Native habitat	Habitat that is in a relatively natural state with minimal disturbance from human activities with a low incidence of exotic plant species.
Native species	Species (plant or animal) that would normally be found in the (Townsville) natural environment.
Natural areas	Those parts of the environment that have not been significantly altered from their natural state and that retain their ecological processes, biophysical functions and suite of native species.
Naturalised	Non-native species introduced to Australia that flourish and become part of the landscape.
Non-native	Not having evolved in Australia. Introduced into Australia from another country within the last 300 years.
Pest fauna and flora	Introduced species that threaten the viability and/or productivity of native ecosystems.

Refuge/refugia	An area that provides shelter, food or water for organisms when other parts of the landscape are inhospitable. For example, rocky areas can provide shelter during bushfires, while riparian areas might provide food and water during times of drought (from National Wildlife Corridors Plan: A framework for landscape-scale conservation 2012, pp.45-49).
Resilience	The ability to recover after being impacted by threatening processes.
Riparian areas	Areas of vegetation alongside watercourses, lakes and wetlands. They often contain vegetation that differs from that in the surrounding landscape, providing important habitat and ecological resources (from National Wildlife Corridors Plan: A framework for landscape-scale conservation 2012 pp.45-49).
Significant ecological communities	Those ecological communities that are limited in extent (endemic) or population, confined to specific habitats or have characteristics that result in a vulnerability to environment changes and threatening process.
Threatened species	Threatened wildlife means native wildlife that is prescribed under the *Nature Conservation Act 1992* as— (a) extinct in the wild wildlife; or (b) endangered wildlife; or (c) vulnerable wildlife.
Threatening processes	Human activities that adversely impact the environment, natural values and ecological processes and result in adverse impacts including habitat loss, native vegetation destruction and reduced populations of native and migratory species.
Wader roosts	As defined in the Environment and Biodiversity Study: Final Report (Chenoweth 2011) and represented as a 700 metre buffer trigger area around wader roosts.
Wetland mapping and classification methodology	The "A Method to Provide Baseline Mapping and Classification for Wetlands in Queensland (VERSION 1.2) published by the Environmental Protection Agency, Queensland Government and produced in conjunction with the Australian Government (Department of the Environment and Heritage) in 2005.

SC6.10 Parking rates planning scheme policy

SC6.10.1 Introduction

Short Title – The planning scheme policy (PSP) may be cited as the Parking rates PSP.

SC6.10.1.1 Purpose

The purpose of the planning scheme policy is to:

(1) define the particular rates of parking that provide the relevant acceptable outcome under the Transport impact, access and parking code in the Townsville City Plan.

SC6.10.1.2 Legislative authority

This planning scheme policy is made under Chapter 2, Part 3 of the *Planning Act 2016*.

SC6.10.1.3 Relationship to the Townsville City Plan

This planning scheme policy is to be read in conjunction with the assessment provisions specified in the Townsville City Plan, specifically the Transport impact, access and parking code.

SC6.10.1.4 Terminology

Terms used in this planning scheme policy are defined in Schedule 1 - Definitions. A term which is not defined in Schedule 1 - Definitions is to be interpreted in accordance with Part 1.3.1 - Definitions.

SC6.10.2.1 Planning scheme policy content -parking rates

(1) Parking rates are provided on site in accordance with the following uses or combination of uses.

(2) Where the number of parking spaces calculated in accordance with this table is not a whole number, then the minimum number of spaces to be provided is to be rounded upward to the closest whole number.

(3) The number of car parking spaces required for people with a disability is to be in accordance with Table D3.5 of the Building Code of Australia. There is no requirement to designate car parking spaces for people with a disability where the total number of car parking spaces required is five (5) or less.

Use	Parking rates
Adult store	One (1) space per 25m² of GFA.
Agricultural supplies store	One (1) space per 100m² of total use area, but not less than five (5) spaces.
Air services	One (1) space per 80m² of GFA.
Animal keeping	One (1) space per 10 animals for which accommodation is provided for on the premises, OR 3 spaces, whichever is the greater.
Aquaculture	One (1) space per employee (FTE).
Brothel	One (1) space for each room in the brothel AND one (1) space per two employees (FTE) on the premises at any one time.
Bulk landscape supplies	One (1) space per 100m² of total use area, but not less than five (5) spaces.
Caretaker's accommodation	One (1) space.
Car wash	Two (2) spaces, AND queuing space within the site for 4 vehicles using or awaiting use of each washing bay.
Cemetery	Thirty (30) spaces plus one (1) space per two employees (FTE) on the premises at any one time.
Child care centre	One (1) space for every 6 children, and 1 space per employee (FTE).
Club	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Community care centre	One space per 20m² of GFA
Community use	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Crematorium	Thirty (30) spaces plus one (1) space per two employees (FTE) on the premises at any one time.
Detention facility	One (1) space per 2 employees (FTE); plus a minimum of ten (10) visitor spaces.
Dual Occupancy	Two (2) spaces per dwelling unit, which may be provided in tandem, of which one (1) space is to be covered per dwelling unit.
Dwelling house	Two (2) spaces, which may be provided in tandem, of which one (1) space is to be covered.
Dwelling unit	One (1) space.
Educational establishment	Primary – one (1) space per employee (FTE) AND one (1) space per 10 students for visitor parking AND sufficient spaces for loading and unloading of passengers in addition to other requirements. Secondary – one (1) space per employee (FTE), AND one (1) space per 10 students of legal driving age, AND one (1) visitor space per 50 students, AND sufficient spaces for loading and unloading of passengers in addition to other requirements. Tertiary – point five (0.5) spaces per employee (FTE) PLUS one (1) space per 10 students (FTE), AND sufficient spaces for loading and unloading of passengers in addition to other requirements.
Emergency services	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Environment facility	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Extractive industry	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Food and drink outlet	One (1) space per 10m² of GFA available to the public (including outdoor dining); One (1) space per 50m² of GFA for food preparation; AND One (1) space per 100m² of GFA used for storage.

Function facility	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Funeral parlour	One (1) space per employee; AND One (1) space per hearse; AND One (1) space per 4 persons capable of being seated in any chapel or accommodated in a function area with a minimum of ten (10) spaces.
Garden centre	One (1) space per 100m² of total use area, but not less than five (5) spaces.
Hardware and trade supplies	One (1) space per 40m² of GFA.
Health care services	One (1) space per 20m² of GFA, OR four (4) spaces per medical practitioner, whichever is the greater; AND one (1) space for ambulance vehicle pick-up and set down.
High impact industry	One (1) space per 100m² of GFA.
Hospital	One (1) space for each 4 beds, two (2) spaces for each 3 employees, AND one (1) space for each doctor.
Hostel	One (1) space for every 2 beds provided, one (1) space for every 4 employees (FTE), and an additional one (1) covered space for a resident manager, and a dedicated car washing bay (additional to visitor and tenant parking spaces). A dedicated car washing bay is not required where there are 5 or less dwelling units provided. A dedicated car wash bay may also be integrated with visitor parking to serve both functions.
Hotel	Licensed facilities: One (1) space per 2m² of bar area; and One (1) space per 5m² of the lounge and beer garden area. One (1) space for each guest suite; AND One (1) space for each resident manager or caretaker; AND For any drive-through facility, queuing space within the site for ten (10) vehicles being served or awaiting service.
Indoor sport and recreation	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Intensive animal industry	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Intensive horticulture	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Low impact industry	One (1) per 100m² of GFA.
Major sport, recreation and entertainment facility	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Marine industry	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Market	One (1) space per stall.
Medium impact industry	One (1) space per 100m² of GFA.
Motor sport facility	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.

Multiple dwelling	In the Principal centre zone: One point five (1.5) spaces per dwelling (and one (1) dedicated car washing bay* for the entire development). In the High density residential zone: One point five (1.5) spaces per dwelling (and one (1) dedicated car washing bay* for the entire development). In the Medium density residential zone: One point five (1.5) spaces per dwelling; Point two (0.2) spaces per dwelling for visitors (and one (1) dedicated car washing bay* for the entire development). All other zones: One point seven (1.7) spaces per dwelling; Point two (0.2) spaces per dwelling for visitors (and one (1) dedicated car washing bay* for the entire development). * A dedicated car washing bay is not required where there are 5 or less dwellings provided. A dedicated car wash bay also may be integrated with visitor parking to serve both functions.
Nature-based tourism	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Nightclub entertainment facility	One (1) space per 15m² for the first 1,500m² of GFA, then one (1) space per 25m² of GFA thereafter.
Non-resident workforce accommodation	One (1) space per employee (FTE).
Office	In the Principal centre zone: One (1) space per 70m² of GFA All other zones: One (1) space per 30m² of GFA.
Outdoor sales	Point seven five (0.75) spaces per 100m² of total use area AND four (4) spaces per work bay (for vehicle service facilities)
Outdoor sport and recreation	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Permanent plantation	No parking rate required.
Place of worship	One (1) space per 10 persons capable of being seated.
Port services	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Relocatable home park	One point five (1.5) spaces per relocatable home.
Renewable energy facility	No parking rate required.
Research and technology industry	One (1) space per 80m² of GFA.
Residential care facility	Subsidised developments (nursing and convalescent homes): One (1) space per 10 beds; AND one (1) space per 2 employees and one (1) space per ambulance Self-contained units: One (1) space per 10 units (residents) and one (1) space per 10 units (visitor)

Resort complex	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Retirement facility	One (1) space per 2 self-contained or service units, plus one (1) space per 5 nursing home beds of the premises.
Rural industry	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Rural workers accommodation	One (1) space per accommodation unit.
Service industry	One (1) space per 100m² of GFA.
Service station	One (1) space per 40m² of GFA.
Shop	In the Principal centre zone: One (1) space per 30m² of total retail area* available to the public and one (1) space for each 100m² of total storage GFA. All other zones: One (1) space per 25m² of total retail area * available to the public and one (1) space for each 100m² of total storage GFA. * The total retail area available to the public excludes: (a) building services, plant and equipment; (b) access between levels; (c) ground floor public lobby; (d) a mall; and (e) the parking, loading and manoeuvring of motor vehicles;
Shopping Centre	In the Principal centre zone: One (1) space per 30m² of total retail area * available to the public and one (1) space per each 100m² of total storage GFA. All other zones: One (1) space per 25m² of total retail area * available to the public GFA and one (1) space per each 100m² of total storage GFA. * The total retail area available to the public excludes: (a) building services, plant and equipment; (b) access between levels; (c) ground floor public lobby; (d) a mall; and (e) the parking, loading and manoeuvring of motor vehicles.

Short-term accommodation	In the Principal centre zone: 0.75 spaces per self-contained unit, and 0.25 spaces per non self-contained unit, AND one (1) space for each 10m^2 of GFA available to the public and one (1) space per 50m^2 of GFA kitchen and preparation areas, and point one (0.1) spaces per unit for visitors. All other zones: One (1) space for each guest suite, one (1) space for a restaurant manager or caretaker, AND one (1) space for each 10m^2 of GFA available to the public and one (1) space per 50m^2 of GFA kitchen and preparation areas.
Showroom	One (1) space per 40m² of GFA.
Special industry	One (1) space per 100m² of GFA.
Telecommunications facility	No parking rate required.
Theatre	One (1) space per 15m² of GFA or one (1) space for each 4 seats, whichever is the greater.
Tourist attraction	Sufficient spaces to accommodate the amount of vehicle traffic likely to be generated by the particular use.
Tourist park	One (1) space per van, relocatable home and cabin site (to be located adjacent to such site), one (1) visitor space per 10 such sites, one (1) space for each 2 staff members, and one (1) space for a resident manager.
Transport depot	Sufficient spaces to accommodate the amount and type of vehicle traffic likely to be generated by the particular use.
Utility installation	Sufficient spaces to accommodate the amount and type of vehicle traffic likely to be generated by the particular use.
Veterinary services	Five (5) spaces per veterinarian.
Warehouse	One (1) space per 100m² of GFA.
Wholesale nursery	One (1) space per 100m² of total use area.
Winery	One (1) space per 25m² of GFA.
Any other development	Sufficient spaces to accommodate the amount of vehicular traffic likely to be generated by the particular use.

Schedule 7 Places of cultural heritage value

Table SC7.1.1 - Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Aitkenvale				
171510	1 RP 727464	98-100 Charlotte Street, Aitkenvale 4814		Local
176950	169 RP 703537, 170 RP 703537, 171 RP 703537	5 Sabadine Street, Aitkenvale 4814		Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Arcadia				
249270	160 EP 708	31 Hayles Avenue, Arcadia 4819	RSL	Local
249430	97 RP 706831	36 Hayles Avenue, Arcadia 4819	Dell-Orana	Local
249960	16 RP 706831	27 Marine Parade, Arcadia 4819		Local
250120	3 SP 172355	5-8 Marine Parade, Arcadia 4819	Hayles House	Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Belgian Gardens				
27750	3 RP 712293	29 Evans Street, Belgian Gardens 4810		Local
30080	1 RP 748513	142 Bundock Street, Belgian Gardens 4810		Local
30450	43 T 118114	19 Bundock Street, Belgian Gardens 4810		Local
30460	44 T 118114	21 Bundock Street, Belgian Gardens 4810		Local
33100	32 RP 729858	13 St James Drive, Belgian Gardens 4810	Bishop's Lodge	State

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Castle Hill				
24690	257 EP 513	0 Castle Hill Road, Castle Hill 4810	Castle Hill	State
24700	156 EP 2335	0 Castle Hill Road, Castle Hill 4810	Castle Hill	State
24710	264 EP 543	0 Castle Hill Road, Castle Hill 4810	Castle Hill	State
24730	409 EP 996	0 Castle Hill Road, Castle Hill 4810	Castle Hill	State
24740	788 CP 855219	0 Castle Hill Road, Castle Hill 4810	Castle Hill	State
24750	388 EP 1264	0 Castle Hill Road, Castle Hill 4810	Castle Hill	State
45170	1 USL 50891	13 Scully Street, Castle Hill 4810	Castle Hill	State
334383	157 EP 2349	Castle Hill Road, Castle Hill 4810	Castle Hill	Local

347088	11 USL 50631, 87 USL 50632,	0 Potts Street, Castle Hill 4810	Castle Hill	State
350995	2 CP 853734, 3 CP 853734, 460 CP 854058	Castle Hill Road, Castle Hill 4810	Castle Hill	State
355408	5 USL 50632, 18 USL 50632	0 William Street, Castle Hill 4810	Castle Hill	State
500749	358 SP 144120	0 Yarrawonga Drive, Castle Hill 4810	Castle Hill	State

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Cape Cleveland				
361452	1 CP 882211, 2 CP 882211, 3 CP 882211	0 Cape Cleveland Road, Cape Cleveland 4810	Cape Cleveland Light Station	State

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Townsville City				
2100	15 T 118173	16 Wickham Street, Townsville City 4810	Townsville Customs House (former)	State
2110	10 T 118248	12-14 Wickham Street, Townsville City 4810	Townsville State Government Offices	State
2140	1 RP 732344	108-124 Flinders Street, Townsville City 4810	Burns Philp & Company Ltd Building (former)	State
2170	2 RP 701607	247 Flinders Street, Townsville City 4810	Samuel Allen & Sons Building (former)	State
2180	2 RP 702069, 2 RP 701585, 1 RP 711511	87-95 Flinders Street, Townsville City 4810	Tattersalls Hotel	State
2190	1 RP 716793, 2 RP 716793	101-111 Flinders Street, Townsville City 4810	Bank of NSW, and AMIEU (QLD Branch) (former)	State
2220	2 SP 172356	129-135 Flinders Street, Townsville City 4810	Commercial Hotel (former)	Local
2240	1 RP 701590	143-149 Flinders Street, Townsville City 4810	Magnetic House	State
2250	327 SP 171614 1 AP 13623	151-157 Flinders Street, Townsville City 4810	Exchange Hotel	Local
2270	325 T 1185	167-173 Flinders Street, Townsville City 4810	Australian Joint Stock Bank (former)	State

2280	1 RP 716252, 4 RP 716252, 3 RP 701624	175-179 Flinders Street, Townsville City 4810	Queens Building	State
2290	2 RP 701623, 2 RP 716252, 3 RP 716252	181-183 Flinders Street, Townsville City 4810	Atkinson & Powell Building (former)	State
2300	1 RP 701617 1 RP 701621	185-191 Flinders Street, Townsville City 4810	North Queensland Mortgage & Investment Company, (former)	Local
2310	CP SP 162432	193-195 Flinders Street, Townsville City 4810	T. Willmetts & Sons printery and stationery warehouse (former)	State
2320	322 T 1185	197-203 Flinders Street, Townsville City 4810	Stanton House	State
2330	2 RP 729802	205-213 Flinders Street, Townsville City 4810	Commercial Banking Company of Sydney (former)	State
2350	1 RP 701615	221-223 Flinders Street, Townsville City 4810	Clayton's Apothecaries Hall (former)	State
2400	CP SP 125906	241-245 Flinders Street, Townsville City 4810	Rooney Building	State
2420	1 RP 701658	253-259 Flinders Street, Townsville City 4810	Perc Tucker Regional Gallery	State
2450	1 RP 701662, 2 RP 701662	269-275 Flinders Street, Townsville City 4810	W. H. Green Building (former)	Local
2490	3 RP 701665	287-289 Flinders Street, Townsville City 4810	Willmett's Stationery Shop (former)	Local
2500	2 RP 707340	291-293 Flinders Street, Townsville City 4810	Kodak Building (former)	Local
2510	16 RP 707412	295-303 Flinders Street, Townsville City 4810	Queensland National Bank (former)	State
2540	171 T 1181	337-343 Flinders Street, Townsville City 4810	Westpac Bank	State
2650	CP SP 141326	419-433 Flinders Street, Townsville City 4810	State Government Offices (former)	State
2790	1 RP 708141, 2 RP 701742	495-499 Flinders Street, Townsville City 4810	Newmarket Hotel	Local
3020	1 SP 229803	719-741 Flinders Street, Townsville City 4810	Lion Brewery (former)	State
3030	1 RP 739077	743-765 Flinders Street, Townsville City 4810	Mansfield Hotel	Local
3070	1 RP 701861, 320 T 11823	807-813 Flinders Street, Townsville City 4810	Sovereign Hotel	Local

3080	321 T 11823	815-821 Flinders Street, Townsville City 4810		Local
3090	5 RP 712497	823-827 Flinders Street, Townsville City 4810		Local
3100	4 RP 712781	829-833 Flinders Street, Townsville City 4810		Local
3190	103 SP 253492	502-790 Flinders Street, Townsville City 4810	Townsville Railway Station and North Yards Railway Workshops	State
542194	CP SP 253512	3 Kingsway Place, Townsville City 4810	Townsville Railway Station and North Yards Railway Workshops	State
544267	1 SP 253510	538 Flinders Street, Townsville City 4810	Townsville Railway Station and North Yards Railway Workshops	State
544268	26 SP 253492	5 Kingsway Place, Townsville City 4810	Townsville Railway Station and North Yards Railway Workshops	State
547782	2 SP 253510	534 Flinders Street, Townsville City 4810	Townsville Railway Station and North Yards Railway Workshops	State
547783	3 SP 253510	546 Flinders Street, Townsville City 4810	Townsville Railway Station and North Yards Railway Workshops	State
3220	181 T 1181, 182 T 1181	486-500 Flinders Street, Townsville City 4810	Great Northern Hotel	State
3340	31 T 11860	416-418 Flinders Street, Townsville City 4810	Australian Mutual Provident Society Building (former)	State
3360	33 T 11860	408-410 Flinders Street, Townsville City 4810	Henlein & Co. (former)	State
3480	2 RP 707272, 20 RP 707272	336-344 Flinders Street, Townsville City 4810	Commercial Banking Company of Sydney (former)	Local
3520	6 T 118212	272-278 Flinders Street, Townsville City 4810	Commonwealth Bank of Australia (former)	State
3530	1 RP 735183	252-270 Flinders Street, Townsville City 4810	Townsville Post Office (former)	State
3540	12 T 118573	232-234 Flinders Street, Townsville City 4810	Aplin Brown & Company Building (former)	State
3550	2 RP 701523, 3 RP 701523	228-230 Flinders Street, Townsville City 4810	Adelaide Steamship Co. (former)	Local

3560	4 RP 701523, 5 RP 701523	224-226 Flinders Street, Townsville City 4810	Agora House	State
3620	1 RP 747175	104-106 Flinders Street, Townsville City 4810	Queensland Building	Local
3930	1 RP 701816	11 Melton Terrace, Townsville City 4810	Melton Lodge Flats (former)	Local
3940	2 RP 701818	13 Melton Terrace, Townsville City 4810	Biralee Flats (former)	Local
3990	2 RP 701817	23 Melton Terrace, Townsville City 4810		Local
4040	2 RP 716527	35-39 Sturt Street, Townsville City 4810	Osler House	State
4080	453 EP 1600 3 RP 701686 4 RP 701686	81-99 Sturt Street, Townsville City 4810	Townsville Magistrates Court (former)	State
4400	1 RP 718874	485-493 Sturt Street, Townsville City 4810	Townsville Choral & Orchestral Society Building	State
4420	1 RP 865807	513 Sturt Street, Townsville City 4810	Potters House	State
4540	304 T 11823, 319 T 11823	654-662 Sturt Street, Townsville City 4810	Saint Theodore's Greek Orthodox Church	State
4730	1 RP 712215, 23 RP 745734	246-254 Sturt Street, Townsville City 4810	Sturt Street Shops	Local
4760	1 RP 701648, 2 RP 701648	42-50 Sturt Street, Townsville City 4810	Commonwealth Offices	State
4880	716 T 118501	31-69 Walker Street, Townsville City 4810	Townsville Magistrates Court	Local
4900	1 RP 744965, 2 RP 744965, 1 RP 701696, 2 RP 701696, 3 RP 701696, 12 T 11817, 137 T 1181, 140 T 1181	103-141 Walker Street, Townsville City 4810	Townsville City Council Administration Building	Local
4920	5 SP 263496	215 Walker Street, Townsville City 4810	Townsville Technical College (former)	State
5260	203 T 11823	412 Walker Street, Townsville City 4810		Local
5500	104 T 1181	42-50 Walker Street, Townsville City 4810	Masonic Temple	Local
5540	2 RP 718721	120 Denham Street, Townsville City 4810		Local
6820	47 T 1181, 48 T 1181	10 The Strand, Townsville City 4810	Criterion Hotel	Local
6890	290 CP 859212	14 The Strand, Townsville City 4810	Anzac Memorial Park	State
6960	1 RP 745353, 1 RP 702069, 2 RP 717290	45 Flinders Street, Townsville City 4810	Queens Hotel (former)	State
7110	1 RP 708992	30 Cleveland Terrace, Townsville City 4810	Wyora Court	Local

7120	1 RP 722451, 2 RP 701633	26 Cleveland Terrace, Townsville City 4810	Warringa	State
7130	3 RP 701633, 4 RP 701633	24 Cleveland Terrace, Townsville City 4810	Selhurst	State
7160	1 RP 702085	20 Cleveland Terrace, Townsville City 4810	The Rocks Guesthouse	State
7170	8 RP 701633	18 Cleveland Terrace, Townsville City 4810		Local
7190	1 RP 702042	14 Cleveland Terrace, Townsville City 4810		Local
7200	3 RP 702042	12 Cleveland Terrace, Townsville City 4810		Local
7210	6 T 118300	4 Cleveland Terrace, Townsville City 4810	Drystone Wall Melton Hill	State
7230	CP SP 171329	2A Cleveland Terrace, Townsville City 4810	Drystone Wall Melton Hill	State
7310	24 RP 701633	2 Herbert Street, Townsville City 4810		Local
7320	2 RP 702042	1 Herbert Street, Townsville City 4810		Local
7370	15 T 11840	22 Willmett Street, Townsville City 4810		Local
7460	1 RP 701632, 2 RP 701632, 18 RP 701633	13-15 Willmett Street, Townsville City 4810		Local
7520	1 SP 156441	6 Willmett Street, Townsville City 4810		Local
7610	71 T 11813, 72 T 11813, 73 T 11813, 74 T 11813, 2 RP 840903 2 RP 701819	36 Cleveland Terrace, Townsville City 4810	St. James Cathedral & Synod Hall	State
7730	2 RP 701653	60-66 Denham Street, Townsville City 4810	Denham Chambers	Local
7740	2 RP 701659	54-56 Denham Street, Townsville City 4810	Roberts Leu & North Building (former)	Local
8090	2 SP 123456, 3 SP 123456	266-272 Stanley Street, Townsville City 4810	Sacred Heart Cathedral	State
8100	11 RP 903759, 219 T 1181	188-210 Stanley Street, Townsville City 4810	Townsville School of Arts (former)	
8270	2 RP 709895	151-155 Stanley Street, Townsville City 4810		Local
8280	1 RP 709895	157 Stanley Street, Townsville City 4810		Local
13490	247 EP 2301	32 The Strand, Townsville City 4810	Tobruk Memorial Baths	State
353331	752 EP 2218,	66-76 Ogden Street, Townsville City 4810	Victoria Bridge (entire bridge)	State
543458	2 SP 212760, CP SP 222359	1-13 Sturt Street, Townsville City 4810	Dalgety Offices and former warehouse frontage	State
4010	CP SP 222359	84-106 Denham Street, Townsville City 4810	Denham Street Facade	

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Cluden				
215510	2 RP 748152	1-105 Racecourse Road, Cluden 4811	Grandstand, former totalisator building and main entrance gates, Cluden	State

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Douglas				
274430	40 SP 189822	150 Angus Smith Drive, Douglas 4814	Eddie Koiki Mabo Library, James Cook University	Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Garbutt				
59180	156 T 118192, 157 T 118192	62-66 Lonerganne Street, Garbutt 4814	St Theresa's War Memorial Church	Local
51910	CP SP 205746	3-5 Ramsay Street, Garbutt 4814	US 5th Air Force Operations and Signals Building (former)	Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Hermit Park				
95520	122 RP 703476, 123 RP 703476	25-27 Norris Street, Hermit Park 4810		Local
97940	36 RP 703477	56 Queens Road, Hermit Park 4812		Local
98040	7 RP 703414	42 Queens Road, Hermit Park 4812		Local
100960	81 RP 703399	17 Philp Street, Hermit Park 4812		Local
101730	173 RP 703399	17 Armstrong Street, Hermit Park 4812		Local
102430	221 RP 703399	37 Ackers Street, Hermit Park 4812		Local
105190	3 RP 710800	2 The Avenue, Hermit Park 4812		Local
105210	48 RP 703409, 49 RP 703409	6 The Avenue, Hermit Park 4812		Local
105230	50 RP 703409, 51 RP 703409, 52 RP 703409	8-10 The Avenue, Hermit Park 4812		Local
105330	30 RP 703409, 31 RP 703409, 32 RP 703409, 33 RP 703409	5-7 The Avenue, Hermit Park 4812	Weroona	Local
107640	5 RP 711405	5 Riverview Street, Hermit Park 4812	Rosslea	Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Hervey Range/Lynam				
532234	26 SP 149308	2679 Hervey Range Road, Hervey Range 4817	Range Hotel, Burial Ground and Camping Reserve	State
535200	379 EP 352	Page Road, Lynam 4817	Stock Route, Camping Reserve	Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Horseshoe Bay				
251320	6 H 7329	2-10 Heath Street, Horseshoe Bay 4819		Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Hyde Park				
116990	6 RP 703442	30 Surrey Street, Hyde Park 4812		Local
117800	4 RP 716211	22 Bayswater Terrace, Hyde Park 4812		Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Idalia				
546420	905 SP 253659	2 Kokoda Street, Idalia 4811	Ross River Meatworks Chimney	State

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Jensen				
520786	3 RP 882869	7 Veales Road, Jensen 4818		Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Kirwan				
547881	1 RP 864623	555 Ross River Road, Kirwan 4817	Retreat Hotel Site (former)	Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Mount St John				
65470	906 SP 260001	173 Webb Drive, Mt St John 4818	Y Station 16 Heavy Anti -aircraft Battery	State

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Mount Louisa				
67030	900 SP 264431	Upper crossing of the Bohle River - Dalrymple Road, Mt Louisa 4814	Bohle Hotel Site (former) (469720.7867540)	Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Mundingburra				
132270	2 RP 743712	70 Love Lane, Mundingburra 4812		Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Mysterton				
119890	2 RP 717551	21 Lawson Street, Mysterton, 4812	Rosebank	State

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Nelly Bay				
241480	73 EP 228	118-120 Sooning Street, Nelly Bay 4819		Local
242110	1 RP 714466	48 Sooning Street, Nelly Bay 4819		Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
North Ward				
10020	1 RP 710504	5 Victoria Street, North Ward 4810	Maida Vale	Local
10050	71 T 11867	11-13 Victoria Street, North Ward 4810	Kardinia	State
10070	1 RP 701912	21 Victoria Street, North Ward 4810		Local
10090	1 RP 719858	25 Victoria Street, North Ward 4810		Local
10120	1 RP 701927, 3 RP 701927	37 Victoria Street, North Ward 4810		Local
10130	3 RP 721229	39 Victoria Street, North Ward 4810		Local
10330	1 RP 739248	13 Queen Street, North Ward 4810		Local
10410	3 RP 745504	24 Queen Street, North Ward 4810		Local
12240	21 T 118288	37 Howitt Street, North Ward 4810		Local
13190	310 T 1181	70 The Strand, North Ward 4810	Anelay Flats (former)	Local
13300	2 RP 707346, 262 T 1181	55 The Strand, North Ward 4810	The Seaview Hotel	Local
13370	1 RP 710003, 30 T 1187, 31 T 1187	45 The Strand, North Ward 4810	St Patrick's Convent	State
13430	48 T 1187	27 Carter Street, North Ward 4810		Local
14490	2 RP 733821	1 Carter Street, North Ward 4810	Rockton	Local
14510	1 SP 196156	1 Fryer Street, North Ward 4810		Local

15180	87 SP 202747, 88 SP 198966	9 Cleveland Terrace, North Ward 4810		Local
15220	2 RP 702016, 37 T 11813	11 Fryer Street, North Ward 4810	Yongala Lodge	State
15240	2 RP 710003	6-14 Fryer Street, North Ward 4810	St Joseph's Church	State
501486	2 SP 257303	27 Mitchell Street, North Ward 4810	Former North Ward Defence Complex, Townsville	State
15250	3 SP 257303	46 Oxley Street, North Ward 4810	Former North Ward Defence Complex, Townsville	State
547887	4 SP 257303	38 Oxley Street, North Ward 4810	Former North Ward Defence Complex, Townsville	State
16660	141 T 1186	82 Eyre Street, North Ward 4810		Local
16870	14 T 118194	207 Denham Street, North Ward 4810		Local
16970	2 RP 707023	2 Eyre Street, North Ward 4810	Edgecliff	Local
17320	105 T 1186	117 Eyre Street, North Ward 4810		Local
17420	85 T 1186	137 Eyre Street, North Ward 4810		Local
18820	6 RP 701820	67 Cook Street, North Ward 4810		Local
19600	1 RP 716224	4 Rose Street, North Ward 4810		Local
19810	219 T 1186	37 Rose Street, North Ward 4810		Local
20340	251 SP 223215	4-6 Warburton Street, North Ward 4810	Townsville Central State School	State
21180	92 T 11884	64 Paxton Street, North Ward 4810		Local
21290	1 RP 708807	40 Paxton Street, North Ward 4810	David House	Local
21360	53 T 11884	26 Paxton Street, North Ward 4810		Local
21370	52 T 11884	24 Paxton Street, North Ward 4810		Local
21470	202 T 118159	1-13 Paxton Street, North Ward 4810	Queens Gardens	State
20330	201 SP 126605	19-43 Paxton Street, North Ward 4810	Queens Gardens	State
21480	120 EP 2264	45-85 Paxton Street, North Ward 4810	School House	State
21970	1 RP 717329	21 Queen Street, North Ward 4810		Local
21980	1 RP 716539	22 Murray Street, North Ward 4810		Local
22020	21 RP 906488	3 Victoria Street, North Ward 4810	Cummins House (former)	Local
22030	23 T 118176	9A Murray Street, North Ward 4810	Townsville Astronomical Trigonometrical Station	State
22320	138 T 11884	49 Alexandra Street, North Ward 4810		Local
22330	137 T 11884	47 Alexandra Street, North Ward 4810		Local
22370	133 T 11884	39 Alexandra Street, North Ward 4810		Local
22400	160 T 11884	33 Alexandra Street, North Ward 4810		Local
22440	1 RP 733119	27 Alexandra Street, North Ward 4810		Local

22470	153 T 11884	21 Alexandra Street, North Ward 4810		Local
22510	176 T 11884	13 Alexandra Street, North Ward 4810		Local
22610	41 T 11884	14 Alexandra Street, North Ward 4810		Local
22630	70 T 11884	14 Kennedy Street, North Ward 4810		Local
22640	69 T 11884	18 Alexandra Street, North Ward 4810		Local
22650	68 T 11884	20 Alexandra Street, North Ward 4810		Local
22670	66 T 11884	24 Alexandra Street, North Ward 4810		Local
22750	86 T 11884	36 Alexandra Street, North Ward 4810		Local
22760	85 T 11884	38 Alexandra Street, North Ward 4810		Local
23350	19 T 118157 20 T 118157	352-354 Stanley Street, North Ward 4810	Castlecrag	Local
23420	2 T 118125	338 Stanley Street, North Ward 4810		Local
23960	2 RP 701921, 3 RP 714664	5 Stuart Street, North Ward 4810		Local
351851	16 SP 236486	11-13 Clifton Street, North Ward 4810	Anton Breinl Institute (former	State
500058	1 SP 168605	336 Stanley Street, North Ward 4810	Harcourt	Local
539151	12 SP 236486	49-55 Gregory Street, North Ward 4810	Townsville General Hospital (former)	State
541615	5 SP 211556, 7 SP 211556	38-52 Howitt Street, North Ward 4810	Kissing Point Fortifications & Jezzine Barracks	State

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Oak Valley				
360408	58 RP 737741	12 Chisholm Trail, Oak Valley 4811	Tobacco Kiln	State

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Pallarenda				
34790	633 EP 1908	The Esplanade, Pallarenda, 4810	Cape Pallarenda Quarantine Station (former)	State

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Paluma				
512763	203 P 8363	66 Mt Spec Road, Paluma 4816	Ivy Cottage	Local
527786	2 RP 728420	13 Lennox Crescent, Paluma 4816	WW2 igloo	Local
530972	2 P 83613	3 Lookout Road, Paluma 4816	Misthaven Units	Local
528857	15 P 8366, 17 P 8366, 18 P 8366	25 Lennox Crescent, Paluma 4816	WW2 igloo	Local
530970	2 P 8363	63 Mount Spec Road	Tennis Court	Local
530971	1 P 8363	61 Mount Spec Road, Paluma 4817	Tennis Court	Local
534148	401 P 8363	24 Mount Spec Road, Paluma 4816	Cavilcade guesthouse (former)	Local
534150	308 P 8363	52 Mt Spec Road, Paluma 4816	RAAF No 6 MRU (former)	Local
534155	95 AP 15524	9 Mt Spec Road, Paluma 4816	WW2 Yank Hut	Local
534160	13 RP 750121	17-19 Lennox Crescent, Paluma 4816	WW2 igloo	Local
		Mount Spec Road	Mount Spec Road and Little Crystal Creek Bridge	State

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Picnic Bay				
240900	201 CP 850698	11-15 Granite Street, Picnic Bay 4819	Magnetic Island Craft Shop	State
			Picnic Bay Jetty	State
240680	105 P 9381 116 P 9381 117 P 9381	15 Barbarra Street, Picnic Bay 4819		Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Railway Estate				
84650	25 RP 703382	71 Robertson Street, Railway Estate 4810		Local
86850	17 RP 703371	48 Tenth Avenue, Railway Estate 4810		Local
87010	33 RP 703373	80 Tenth Avenue, Railway Estate 4810		Local
88600	2 RP 703361 117 RP 703355, 118 RP 703355	5 Ninth Avenue, Railway Estate 4810		Local
88860	51 SP 126582	60 Railway Avenue, Railway Estate 4810	Byer's Store (former)	Local

89350	626 EP 1920	29-47 Railway Avenue, Railway Estate 4810	Railway Estate State School	Local
90780	22 SP 156437	128 Boundary Street, Railway Estate 4810		Local
90950	7 RP 703356	162 Boundary Street, Railway Estate 4810		Local
91440	2 RP 860274	99-101 Boundary Street, Railway Estate 4810	Ross Island Hotel	Local
92410	101 RP 703359	41 Second Street, Railway Estate 4810		Local
92460	165 SP 116238	19 Second Street, Railway Estate 4810		Local
92530	72 RP 703359, 182 RP 703359, 183 RP 703359	5 Second Street, Railway Estate 4810		Local
92660	1 RP 846351	26 Second Street, Railway Estate 4810		Local
92820	289 RP 703355, 290 RP 703355, 291 RP 703355, 292 RP 703355, 293 RP 703355, 294 RP 703355, 295 RP 703355, 296 RP 703355	40 Tenth Avenue, Railway Estate 4810		Local
92860	10 SP 227326, 20 SP 227326	29 Third Street, Railway Estate 4810		Local
92990	143 RP 703359	3 Third Street, Railway Estate 4810		Local
93620	57 RP 703364	17 Anderson Street, Railway Estate 4810		Local
93990	84 RP 703364	7 Fifth Street, Railway Estate 4810		Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Rasmussen				
510460	1 RP 743522	1087 Riverway Drive, Rasmussen 4815	Gollogly's House (former)	Local
511429	20 RP 853743	1199 Riverway Drive, Rasmussen 4815	Kennedy Hotel Site (former)	Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Roseneath				
237850	491 E 12463	521-549 Stuart Drive, Roseneath 4811	St Brigid's Church	State

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Rupertswood				
512997	4 RP 736178	17 Bolinda Court, Rupertswood 4817	Alice Hotel Site (former)	Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
South Townsville				
75660	23 RP 703389	35 Sixth Avenue, South Townsville 4810		Local
76270	4 SP 120464	42 Nelson Street, South Townsville 4810		Local
76280	50 T 118105	40 Nelson Street, South Townsville 4810		Local
76320	1 RP 712482	32 Nelson Street, South Townsville 4810		Local
76370	169 T 118105	20 Nelson Street, South Townsville 4810		Local
76520	2 RP 745103	15 Nelson Street, South Townsville 4810		Local
76530	99 T 118105	17 Nelson Street, South Townsville 4810		Local
76610	71 T 118105, 72 T 118105, 73 T 118105, 74 T 118105, 75 T 118105	32 Hubert Street, South Townsville 4810	St Patrick's Church	Local
76810	42 RP 703389, 43 RP 703389	18 Fifth Avenue, South Townsville 4810		Local
77120	19 RP 745719, 20 RP 745719	40 Bell Street, South Townsville 4810		Local
77330	159 T 118105	3 Bell Street, South Townsville 4810		Local
77340	158 T 118105	5 Bell Street, South Townsville 4810		Local
77350	157 T 118105	7 Bell Street, South Townsville 4810		Local
77360	156 T 118105	9 Bell Street, South Townsville 4810		Local
77460	36 T 118105	29 Bell Street, South Townsville 4810		Local
77500	33 T 118105	35 Bell Street, South Townsville 4810		Local
77770	1 T 11868	78 Tully Street, South Townsville 4810	South Townsville State School	Local
77940	101 T 11887, 102 T 11887	20 Macrossan Street, South Townsville 4810	Commonwealth Hotel	Local
77950	1 RP 708320	39 Allen Street, South Townsville 4810		Local

77990	275 T 11868, 276 T 11868, 277 T 11868	30 Macrossan Street, South Townsville 4810	St John's Anglican Church Precinct	State
78600	37 CP 868168, 195 CP 868168	18-38 Tully Street, South Townsville 4810	Victoria Park	Local
79240	23 RP 745911	57 Perkins Street, South Townsville 4810		Local
79460	2 RP 745100	103 Perkins Street, South Townsville 4810		Local
79520	21 T 118638	115-147 Perkins Street, South Townsville 4810	Warehouse	Local
79820	1 RP 701973, 2 RP 701973	54 Davidson Street, South Townsville 4810		Local
79830	7 RP 701972, 9 RP 701972	56 Davidson Street, South Townsville 4810		Local
79840	6 RP 701972	58 Davidson Street, South Townsville 4810		Local
79850	3 RP 701972	60 Davidson Street, South Townsville 4810		Local
80960	322 T 118105, 323 T 118105	29-31 McIlwraith Street, South Townsville 4810	Republic Hotel	Local
81100	1 RP 701930	3 Palmer Street, South Townsville 4810		Local
81140	28 RP 745913, 35 T 11868, 52 T 11868	11 Palmer Street, South Townsville 4810	The Australian Hotel	Local
81150	36 T 11868	13 Palmer Street, South Townsville 4810		Local
81160	37 T 11868	15 Palmer Street, South Townsville 4810	Queensland Teachers Union Building	Local
81210	1 RP 701933, 43 T 11868	31 Palmer Street, South Townsville 4810	Shamrock Hotel	Local
81360	CP SP 225259	84 McIlwraith Street, South Townsville 4810	Metropole Hotel	Local
81380	709 SP 135285	42-68 Palmer Street, South Townsville 4810	Townsville Maritime Museum	Local
81520	2 RP 701959	24 Archer Street, South Townsville 4810		Local
81840	3 RP 701968, 5 RP 701968	14 Allen Street, South Townsville 4810		Local
82110	1 RP 706700, 2 RP 706700	65 Morey Street, South Townsville 4810	Overseas Telecommunications Centre (former)	Local
82640	41 RP 703374, 42 RP 703374, 43 RP 703374	264-268 Boundary Street, South Townsville 4810	Victoria Park Hotel	State
502604	2 RP 715005	262 Boundary Street, South Townsville 4810	Victoria Park Hotel (former Scown butchery)	Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Stuart				
254620	56 EP 1573, 57 SP 152800	4900 Prison Reserve Area, Stuart 4811	Stewart's Creek Gaol (former)	State

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
West End				
38200	12 RP 745387	28 Greenslade Street, West End 4810		Local
38290	2 RP 701539	10 Greenslade Street, West End 4810		Local
38470	8 RP 745387	33 Greenslade Street, West End 4810		Local
38480	1 RP 701544	35 Greenslade Street, West End 4810		Local
38600	28 T 118117	2 Castling Street, West End 4810	Jean Devanny home (former)	Local
38630	191 EP 1742	5 Castling Street, West End 4810	Currajong	State
39380	1 RP 732245	22-26 Echlin Street, West End 4810	Plaza Cinema (former)	Local
39710	11 RP 701603	14 Cowley Street, West End 4810		Local
39980	2 RP 709750 3 RP 709750	96-134 Leigh Street, West End 4810	St Peter's Church	Local
40050	158 RP 701649, 159 RP 701649	26 Leigh Street, West End 4810		Local
40100	148 RP 701649, 149 RP 701649	16 Leigh Street, West End 4810		Local
40240	29 RP 701601	11 Leigh Street, West End 4810		Local
40510	122 RP 701649, 123 RP 701649	30 Estate Street, West End 4810		Local
41480	52 RP 701649	11 Edwards Street, West End 4810		Local
41490	51 RP 701649	9 Edwards Street, West End 4810		Local
41510	47 RP 701649 48 RP 701649	5 Edwards Street, West End 4810		Local
42120	1 SP 188739	40 Percy Street, West End 4810		Local
42890	224 RP 713516	21-25 Green Street, West End 4810	RAAF Operations Building Site (former)	State
43050	1 RP 712313	32 William Street, West End 4810		Local
43070	2 RP 712908	36 William Street, West End 4810	Mona Vale	Local
43900	169 EP 2263, 170 EP 2263	1-5 Stagpole Street, West End 4810		Local
44080	2 RP 725278	47 Stagpole Street, West End 4810		Local
44310	254 T 11869	95 Stagpole Street, West End 4810	Wolverton	State
44750	1 RP 701781	77 Harold Street, West End 4810		Local

44760	3 RP 701778, 4 RP 701778	113 Harold Street, West End 4810		Local
45650	1 RP 701722, 2 RP 701722, 3 RP 701722	10 Ralston Street, West End 4810		Local
46260	2 RP 711432	144 Francis Street, West End 4810		Local
46300	2 RP 701606, 5 RP 701603	128 Francis Street, West End 4810		Local
46630	5 T 118365	33 Church Street, West End 4810	West End Cemetery	State
47010	6 RP 745498	145 Francis Street, West End 4810		Local
47900	134 RP 701591, 135 RP 701591, 136 RP 701591	1 North Street, West End 4810		Local
50060	446 CP 886001	72-104 Ingham Road, West End 4810	Townsville Showground	State
50210	46 T 118117, 47 T 118117, 48 T 118117, 202 T 118101, 203 T 118101, 204 T 118101	28-34 Ingham Road, West End 4810	St Mary's Church and former Convent	Local
50340	707 SP 253232	14 Wilson Street, West End 4810	Townsville District Education Centre and Memorial Gates	State
50420	4 T 118351	63-69 Ingham Road, West End 4810	West End Park	Local
50440	2 RP 709434	71 Ingham Road, West End 4810	Church	Local
50510	18 RP 701558, 19 RP 701558	89 Ingham Road, West End 4810	West End Hotel	State
50960	19 RP 745707	86 Livingstone Street, West End 4810		Local
51130	15 T 118141	73 Livingstone Street, West End 4810		Local
51260	67 T 118107	30 Shaw Street, West End 4810		Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
West Point				
252340	456 NPW 398	0 West Point Road, West Point, 4819	Fort Complex Magnetic Island	State

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Woodstock				
360653	24 EP 352	42 Woodstock Avenue, Woodstock 4816	Woodstock CWA Hall	Local
360850	2 EP 1107	13 Manton Cemetery Road, Woodstock 4816	Manton Cemetery	Local

501444	500 E 12466	132 Bidwilli Road, Woodstock 4816	Lansdown Station Homestead Site (former) and Unmarked Grave	Local

Table SC7.1.1—Places of cultural heritage value (Part)

Property number	Lot on plan address	Street address	Place name	Listing
Wulguru				
508574	1 SP 233941	343-345 Stuart Drive, Wulguru 4811	Operations and Signals Bunker (former)	State

Appendix 1 Index and glossary of abbreviations and acronyms

Table AP1.1 - Abbreviations and acronyms

Abbreviation/Acronym	Description
AEP	Annual exceedance probability
AHD	Australian height datum
ANEF	Australian Noise Exposure Forecast
ANZSIC	Australia and New Zealand Standard Industrial Classification
ARI	Average recurrence interval
BCA	Building Code of Australia
CASA	Civil Aviation Safety Authority
CBD	Central business district
DARC	Defence (Areas Control) Regulation
DSS	Desired standard of service
DME	Distance measuring equipment
ESD	Ecologically sustainable development
GBR	Great Barrier Reef
HAT	Highest astronomical tide
HES	High ecological significance
HF	High frequency
JCU	James Cook University
LGIP	Local government infrastructure plan
MCU	Material change of use as defined in the Act
NDB	Non-directional beacon
PFTI	Plans for trunk infrastructure
PIA	Priority infrastructure area
PDA	Priority development area
PIP	Priority infrastructure plan
PSP	Planning scheme policy
QDC	Queensland Development Code
QWQG	Queensland Water Quality Guidelines
RAAF	Royal Australian Air Force
ROL	Reconfiguring a lot as defined in the Act
RL	Reduced level
RSTEL	Recommended storm tide event level
SPP	State planning policy
the Act	*Planning Act 2016*
the Regulation	Planning Regulation 2017
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VOR	VHF omni-directional radio range
VMA	*Vegetation Management Act 1999*
WQO	Water quality objective

Appendix 2 Table of amendments

AP2.1–Table of amendments

Date of adoption and effective date	Planning scheme version number	Amendment type	Summary of amendments
13 October 2014 (adoption) and 27 October 2014 (effective)	2014/01	Administrative and Minor	The purpose and general effect of the administrative amendments are to correct errors in explanatory matter, formatting and presentation, spelling and grammar, inconsistent numbering and cross-references. The purpose and general effect of the minor amendments are to: • Remove and amend gross floor area triggers for the uses Food and drink outlet and Community use in Part 5 Tables of assessment, Part 5.5.2 Medium density residential zone and Part 5.5.1 Mixed use zone to better reflect the purpose of the zone; • Amend mapping (Schedule 2 and Schedule 3) to reflect recently created lots and the new use intention; and • Reflect the declaration of the Townsville City Waterfront Priority Development Area.
28 July 2015 (adoption) and 28 August 2015 (effective)	2015/01	Administrative and Minor	The purpose and general effect of the administrative amendments are to correct formatting and presentation, spelling and grammar and mapping errors. The purpose and general effect of the minor amendments are to correct and update minor technical matters with respect to: • local government administrative matters in Part 1; • the levels of assessment tables associated with the Character residential zone, Mixed use zone, Bushfire hazard overlay and Flood hazard overlay in Part 5; • the Low density residential zone and Rural zone codes in Part 6; • the Coastal protection – Coastal hazard areas overlay, Development constraints - Flood hazard overlay and Development constraints - Landslide hazard overlay mapping in Schedule 2; and • the Development manual planning scheme policy in Schedule 6 (SC6.4.4.4 Attachment A).
15 December 2015 (adoption) and 29 January 2016 (effective)	2015/02	Administrative and Minor	The purpose and general effect of the administrative amendments are to correct formatting and presentation, spelling, grammar and mapping errors. The purpose and general effect of the minor amendments are to correct and update minor technical matters with respect to: • Table of assessable building works in Part 1.6; • Amend zoning and precinct maps to reflect existing development approvals in Schedule 2; • Inclusion of mandatory transport and noise corridor maps in Schedule 2; and • Outline requirement for footpath treatments to be approved prior to construction in Schedule 6; • Updated wording and mapping of existing Oonoonba PDA and inclusion of Waterfront PDA under Part 10.

27 September 2016 (adoption) and 12 December 2016 (effective)	2016/01	Administrative and Minor	The purpose and general effect of the administrative amendments are to correct formatting and presentation, spelling, grammar and mapping errors. The purpose and general effect of the minor amendments are to correct and update minor technical matters with respect to: • Local government administrative matters in Part 1 relating to information regarding declared locality and building form for amenity and aesthetic referral agency assessment; • Refinement of the Coastal protection overlay code in Part 8 Table 8.2.3.3(a) relating to the design of buildings; • Refinement of the Cultural heritage overlay code in Part 8 Table 8.2.4.3 relating to elements in the road reserve; • Refinement of the Advertising devices code in Part 9, Table 9.4.1.3(a) relating to clarification of zoning and luminance values at night; • Amend zoning and precinct maps to reflect existing development approvals in Schedule 2; and • Updating the legend of Overlay Map OM-01.4 Australian noise exposure forecast (ANEF) in Schedule 2.
25 October 2016 (adoption) and 12 December 2016 (effective)	2016/01	Major	The purpose and general effect of the major amendment to SC6.4 Development manual PSP is to make improvements to the policy to reflect modern standards and practices. The more notable changes are listed below: • SC6.4.3.2 - Standards relating to building over or adjacent to services; • SC6.4.3.3 - Revised extents of the Footpath treatment policy to strategically align with the Townsville City Plan; • SC6.4.3.8 - Clarification of stormwater management plan requirements; • SC6.4.3.14 - Improvements to the Traffic impact assessment guidelines; • SC6.4.3.20 - Introduction of use of LED public street lights; • SC6.4.3.21 - Revised and improved water design standards; • SC6.4.4.2 - Revised and improved pavement design standards; • SC6.4.4.4 - Revised and improved stormwater design standards; and • General formatting and administrative corrections throughout the policy.
25 October 2016 (adoption) and 12 December 2016 (effective)	2016/01	Major	The purpose and general effect of the major amendment to SC6.10 Parking rates PSP is to correct the anomaly that exists between the definition of a Community care centre and the nominated parking rate for such a use under the Townsville City Plan. The parking rate associated with a Community care centre has been amended to: • One (1) space per 20m2 of GFA.
24 January 2017 (adoption) and 6 March 2017 (effective)	2017/01	Minor	The purpose and general effect of the minor amendment is to update minor technical matters with respect to: Updating of the Australian Noise Exposure Forecast (ANEF) contours on Overlay Map OM-01.4 in Schedule 2.

28 April 2017 (adoption) and 2 May 2017 (effective)	2017/02	Administrative and Minor	The purpose and general effect of the administrative amendments are to correct formatting and presentation and mapping errors. The purpose and general effect of the minor amendments to the planning scheme are as follows: • Update Map SFM-004 to reflect an additional future extractive resource area in Schedule 2. • Update Overlay Map OM-08 to rectify a mapping error in Schedule 2. • Update of Overlay Map OM-10.1 to reflect the most up-to-date noise corridor information in Schedule 2.
27 June 2017 (adoption) and 3 July 2017 (effective)	2017/03	Alignment amendment under section 293 of the *Planning Act 2016*	The purpose and general effect of the alignment amendment is to amend the Townsville City Plan for alignment with the *Planning Act 2016* as by the Minister's rules under section 293 of the *Planning Act 2016*.
25 July 2017 (adoption) and 31 July 2017 (effective)	2017/04	LGIP amendment	The purpose and general effect of the LGIP amendment is to convert the Priority infrastructure plan to a Local government infrastructure plan.
25 July 2017 (adoption) and 31 July 2017 (effective)	2017/04	Administrative	The purpose and general effect of the administrative amendment is to change outdated terms in the planning scheme following adoption of the Local government infrastructure plan.
17 April 2018 (adoption) and 30 April 2018 (effective)	2018/01	Major	The purpose and general effect of the major amendment is to amend the relevant zoning and overlay maps associated with the land parcel at 134 Racecourse Road, Cluden (Part of Lot 21 SP261125). The amendments are: • Schedule 2 – Zoning Map ZM-041 – Part of Lot 21 SP261125 at 134 Racecourse Road, Cluden has been removed from the Open space zone and included in the Low impact industry zone. • Schedule 2 - Overlay Map OM-03.1 and Overlay Map OM-03.2 Coastal hazard areas – storm tide inundation areas and erosion prone areas from sea level rise - Part of Lot 21 SP261125 at 134 Racecourse Road, Cluden has been removed from High hazard and included in the Medium hazard. • Schedule 2 - Overlay Map OM-03.3 Coastal hazard areas – erosion prone areas - Part of Lot 21 SP261125 at 134 Racecourse Road, Cluden has been removed from the Erosion prone area. • Schedule 2 – Overlay Map OM-06.1 and Overlay Map OM-06.2 Flood hazard and Overlay Map - Part of Lot 21 SP261125 at 134 Racecourse Road, Cluden has been removed from the High flood hazard area and included in the Low flood hazard area.

22 March 2018 (adoption) and 30 April 2018 (effective)	2018/01	Administrative and Minor	The purpose and general effect of the administrative amendments are to correct formatting, presentation mapping errors. The purpose and general effect of the minor amendments are to correct and update minor technical matters with respect to: • Part 9 - Refinement of the Landscape code in Table 9.4.3.3 relating to irrigation systems; • Schedule 2 - Updating of Coastal hazard overlay maps OM-03.1, OM-03.2 and OM-03.3 regarding the inclusion of an identified coastline; and • Schedule 2 - Updating of Cultural heritage overlay maps OM-04.1, OM-04.2, OM-04.3 and OM-04.4 regarding State heritage sites.

22 March 2018 (adoption) and 30 April 2018 (effective)	2018/01	Amendment	The purpose and general effect of the amendment is to make improvements to Schedule 6, SC6.4 Development manual planning scheme policy to reflect modern standards and practices. The key amendments include: • SC6.4.3.6.6 Crime prevention through environmental design (CPTED) notes that landscaping design should be considerate of CPTED principles; • SC6.4.3.6.9 Public open space provides greater clarity around levels of public open space embellishment to achieve balance between the needs and wishes of the community and the development industry and more sustainable maintenance outcomes; • SC6.4.3.6.10 Recreation Parks provides further detail to improve identification and classification of the open space and park hierarchy; • SC6.4.3.6.11 Sporting Parks provides further detail to improve identification and classification of the open space and park hierarchy; • SC6.4.3.6.12 Other public open space provides further detail to improve identification and classification of the open space and park hierarchy; • SC6.4.3.6.13 Open space embellishments provides greater clarity around levels of public open space embellishment to achieve a balance between the needs and wishes of the community and development industry and sustainable maintenance outcomes; • Table SC6.4.3.6.1 Public open space embellishment framework provides increased clarity about the level of embellishments required for open space areas within the park and open space hierarchy; • SC6.4.3.6.24 Dog off-leash facilities has been added to guide the development of dog off-leash facilities to meet community expectations and needs; • Sub-section SC6.4.3.6.34 – Irrigation design and system requirements provides greater clarity around irrigation construction handover standards; • SC6.4.3.6 Table A – Preferred plant species list includes a small number of new species reflective of industry supply and research; • SC6.4.4 Design specification and standard drawings include changed engineering standards; • SC6.4.5 Construction Management includes changed engineering standards; and • SC6.4.6 Construction Management includes changed engineering standards.

22 January 2019 (adoption) and 4 March 2019 (effective)	2019/01	Major	The purpose and general effect of the major amendment is to include an addition precinct, to be known as the Burdell precinct, within the Emerging community zone in the North Shore master-planned community at Burdell. The key amendments include: • Part 5 Tables of Assessment: Table 5.6.1 – Reconfiguring a lot has been amended to make reconfigurations in the Burdell precinct code assessable; • Part 6 Zones: 6.7.1 Emerging community zone: Section 6.7.1.2 Purpose has been amended to include overall outcomes for the Burdell precinct and Table 6.7.1.3 – Self-assessable and assessable development has been amended to include criteria for assessable development in the Burdell precinct; • Part 9 Development codes: Table 9.3.4.3(c) – Minimum lot size dimensions has been amended to include reference to the Burdell precinct in the Emerging community zone; and • Schedule 2 Mapping: Zoning Map-ZM-026 and Precinct Map-PM-028 have been amended to include the Burdell precinct within the Emerging community zone.
23 July 2019 (adoption) and 12 August 2019 (effective)	2019/02	Major	The purpose and general effect of the major amendment is to change the zoning of a number of land parcels within the local government area. The amendments are: • Schedule 2 - SC2.3 Zoning maps - Map ZM-023: Land located at 86 Thuringowa Drive, Thuringowa has been removed from the Open space zone and included in the Mixed use zone; • Schedule 2 - SC2.3 Zoning maps - Map ZM-033: Land located at 386 – 406 Ross River Road, Cranbrook has been removed from the Low density residential zone and included in the Community facilities zone; • Schedule 2 - SC2.3 Zoning maps - Map ZM-033: Land located at 243 Ross River Road, Aitkenvale has been removed from the Sport and recreation zone and included in the Mixed use zone; • Schedule 2 - SC2.3 Zoning maps - Map ZM-033: Land located at 154 – 182 Ross River Road, Mundingburra has been removed from the Low density residential zone and included in the Community facilities zone; and • Schedule 2 - SC2.3 Zoning maps - Map ZM-033: Land located at 2 Martinez Avenue, West End has been removed from the Medium density residential zone and included in the Mixed use zone.
26 November 2019 (adoption) and 16 December 2019 (effective)	2019/03	Amendment	The purpose and general effect of the amendment is to make improvements to Schedule 6, SC6.4 Development manual planning scheme policy to reflect modern standards and practices. The key amendments include: • SC6.4.2.2.1 Prelodgement advice guidelines – (1)(b) change of terminology. • SC6.4.2.2.2 Design requisites and quality assurance guidelines – (1)(a) clarification of included engineering works quality assurance personnel shall cover as an RPEQ. • SC6.4.2.2.2 Design requisites and quality assurance guidelines – (1) inclusion of item (d) to stipulate what a quality assurance personnel shall be for an erosion and sediment control plan. • SC6.4.2.2.3 Documentation guidelines – items (4), (5), and (6) collated into tabular format for ease of use. • SC6.4.3 Design standards – Administrative updates – References to Part 9.4.3 Landscape code have been corrected

			to 9.3.3 Landscape code. • SC6.4.4.4.5 Inter-allotment drainage – (2) amended “must” to “should” to allow for a new item (3), which provides for more flexible design options. • SC6.4.4.4.5 Inter-allotment drainage – inserted item at (3) to clarify requirements for inter-allotment drainage for more than 5 lots, which must be contained within an easement in favour of council, to ensure council infrastructure is easily accessible for maintenance. • SC6.4.4.4.5 Inter-allotment drainage – inserted item at (4) to stipulate that commercial and industrial developments should connect directly to the council stormwater network rather than via inter-allotment drainage, to ensure that adequate drainage infrastructure is provided that is fit for purpose. • SC6.4.4.4.5 Inter-allotment drainage – (10) removal of prescriptive requirement to allow flexibility in construction material of inter-allotment drainage pits to be fit for purpose. • SC6.4.4.4.5 Inter-allotment drainage – (11) corrected and clarified requirements for minimum longitudinal gradient of open channels and pipes to align with industry practice and standards. • SC6.4.4.4.8 Drainage easements and drainage reserves – (1)(b) removed reference to Table SC6.4.4.4.3 and correct a parameter “≤” to “>”. • SC6.4.4.5.1 Earthworks (design) Introduction – (1) and (2) corrected formatting. • SC6.4.4.5.3 Special treatment of particular areas – (1) added a guiding comment. • SC6.4.5 Construction management – (4) (c) - amended specification MRTS30 to reflect the standard name “Asphalt Pavements”. • SC6.4.5.2.1 General standards and guidelines – (3) minor typographic change. • SC6.4.5.2.1 General standards and guidelines – (11) added line requiring as constructed plans for an erosion and sediment control plan (ESCP) to be submitted to council prior to requesting the On-Maintenance inspection, as there has been inconsistency in provision of plans to council. • SC6.4.5.2.1 General standards and guidelines – (21) Insurance and indemnity updated minimum cover in line with Australian insurance guidelines. • SC6.6.6.13 Asphaltic concrete – (6)(c) amended specification MRTS30 to reflect the standard name “Asphalt Pavements”. • SC6.4.7.2.11 Bonds and fees advice – (1)(a) corrected terminology and clarified basis of fee.
28 January 2020 (adoption) and 02 March 2020 (effective)	2020/01	Interim LGIP amendment	The purpose and general effect of the Interim LGIP amendment is to amend growth assumptions associated with the local government area.
26 May 2020 (adoption) and 22 June 2020 (effective)	2020/02	Major	The purpose and general effect of the major amendment is to change the zoning of Lansdown Station, Calcium, from Rural zone to High impact industry zone and Sport and recreation zone and create the Lansdown high impact industry precinct and the Lansdown motor sport facility precinct, as well as amend associated overlays and mapping. The key amendments include: • Part 1 About the planning scheme: Reflection of the additional Lansdown high impact industry and Lansdown motor sport

			facility precincts. • Part 3 Strategic framework. Removal of all references that indentify the Lansdown Station site as being an “industrial investigation area” and referring to the site as the Lansdown industrial precinct. • Part 5 Categories of development and assessment. Reflection of the Lansdown motor sport facility precinct and making a Motor sport facility development located in the Lansdown motor sport facility precinct Assessable development – Code assessment. • Part 5 Categories of development and assessment. Identifying Emergency services, Medium impact industry, Research and technology industry and Warehouse as Assessable development – code assessable in the High impact industry zone. • Part 6 Zones – Sport and recreation zone code. Inclusion of additional outcomes associated with the Lansdown motor sport facility precinct and additional assessment criteria relating to development not detracting from the future useability of the site as a motor sport facility, future development minimising impacts (including noise) on sensitive land uses, development being supported by adequate infrastructure, development maintaining the natural environmental values and ensuring that future development not does not cause nuisance to nearby sensitive uses. • Part 6 Zones – High impact industry zone code. Inclusion of additional outcomes associated with the Lansdown high impact industry precinct and additional asessment criteria relating to future development being supported by adequate infrastructure, existing environmental areas being protected and mantained, provision of adequate landscaping, noise quality standards,vibration standards and protection of water quality. • Part 8 Overlays – Water resource catchment overlay code. Inclusion of an additional Performance Outcome to ensure that future development protects water quality of both surface and groundwater. • Part 9 Development codes – Healthy waters code. The Editor’s note in PO1 of the code has been amended to ensure both environmental values and water quality are protected and maintained. • Schedule 2 Mapping – SC2.2 Strategic framework map SFM-001 has been amended to reflect the Lansdown Station site as an “Urban area”. • Schedule 2 Mapping – SC2.2 Strategic framework map SFM-004 has been amended to reflect the Lansdown Station site as a “Key productive precinct – industrial”. • Schedule 2 Mapping – SC2.3 Zoning maps - ZM-055 and ZM-058 has been amended with land being removed from the Rural zone and included in the High impact industry zone and the Sport and recreation zone. • Schedule 2 Mapping – SC2.3 Zoning maps - Precinct map PM-023 has been amended to reflect the Lansdown high impact industry precinct and the Lansdown motor sport facility precinct. • Schedule 2 Mapping – SC2.5 Overlay maps - OM-04.4 Cultural heritage has been amended to include additional sites containing local heritage signficance including the Manton Cemetery and an unmarked grave, as well as the site of the original Lansdown Station homestead.

			• Schedule 2 Mapping – SC2.5 Overlay maps - OM-06 Flood hazard has been amended to reflect the findings of the flood study associated with the Lansdown Station site. • Schedule 2 Mapping – SC2.5 Overlay maps - OM-08 Natural assets environmental importance has been amended to reflect the findings of the environmental study associated with the Lansdown Station site. Schedule 7 Places of cultural heritage value has been updated to include additional sites that contain local heritage significance including the Manton Cemetery and an unmarked grave and the site of the original Lansdown Station residence.
24 November 2020 (adoption) and 21 December 2020 (effective)	2020/03	PSP Amendment	The purpose and general effect of the amendment is to make improvements to Schedule 6, SC6.4 Development manual planning scheme policy to reflect modern standards and practices. The key amendments include: SC6.4.2 Development application guidelines • SC6.4.2.2.6 Conduit Assessment – Extra detail added to ensure that assessment is programmed at the correct timing in the construction phase and relevant to the On/ Off Maintenance dates, and clarification of when CCTV conduit inspections may be required. SC6.4.3 Design standards • SC6.4.3.2 Building over or adjacent to services – To ensure adequate access at all times. • SC6.4.3.3 Footpath treatment policy – Treatments reviewed for suitability of long term replication and SC6.4.3.3.7 Footpath treatment location maps updated. • SC6.4.3.4 Outdoor dining design – Improved clarity of terminology and update of notations. • SC6.4.3.5.1 Introduction (3) (a)(b) – administrative amendment – incorrect references to other sections of policy. • SC6.4.3.6 Landscape policy – Detail added to specific type and product to be used. • SC6.4.3.8 Stormwater management plans for development – Clarify a “suitably qualified and experienced professional”. • SC6.4.3.14 Traffic impact assessment guidelines – Clarify appropriate levels of service. • SC6.4.3.17 Driveways – Prescribed distances in residential areas changed. • SC6.4.3.20 Public lighting and utility services – Updated in accordance with current standards. • SC6.4.3.21 Townsville Water planning and design guidelines – The Cairns Townsville Mackay Water Alliance Design and Construction Code (CTM Code) is to replace much of this section (where applicable). The CTM Code provides a consolidated set of technical standards for water supply and sewerage infrastructure intended for use across all of North Queensland to ensure greater alignment with the national urban water industry and the WSAA National Codes. • SC6.4.3.21 Water and sewerage planning and design guidelines – Network modelling timeframes updated to specify that the reporting years shall coincide with census collection years. • SC6.4.3.23 Water and sewer network modelling guidelines – The CTM Code is to replace parts of this section (where applicable). • SC6.4.3.23 Water and sewer network modelling guidelines – Network modelling timeframes updated to specify that the

reporting years shall coincide with census collection years.

- SC6.4.3.23 Water and sewer network modelling guidelines – change to the way appropriately qualified users are able to access council's network models, minor changes to general requirements for network models, updates to terminology and references, modification to the network model needs analysis, assessment and consultation process flowchart, and inclusion of a map of available sewer network model areas . Subsequent updates to attachments and forms to reflect changes in access to network models and consultation process.

SC6.4.4 Design specification and standard drawings

- SC6.4.4.1 Geometric road design – SC6.4.4.1.2 Consultation and planning – Remove reference to inclusion of pavement and lighting details in item (2e).
- SC6.4.4.5.3 Special treatment of particular areas amended for consistency of wording.
- SC6.4.4.5.8 As-constructed drawings – Subsection deleted and referred to SC6.4.7 for consistency and readability.
- Table SC6.4.4.8.4 Townsville City Council standard drawings for sewerage and Table SC6.4.4.8.6 Townsville City Council standard drawings for water – standard drawings removed where contained in the CTM Code.
- Add Table SC6.4.4.8.7 Townsville City Council standard drawings for Landscape and Open Space – these will influence SC6.4.6.26 Landscape Construction Standards.

SC6.4.5 Construction management

- SC6.4.5.3 Quality management system – SC6.4.5.3 (5)(a) Quality assurance system - Amended to provide 48 hours' notice for inspections and 5 business days' notice for On/Off maintenance and Final inspections.

SC6.4.6 Construction Standards

- SC6.4.6.26 Landscaping – Outdated and incomplete section reviewed and aligned to internal and external works standards.

SC6.4.7 Acceptance of completed works

- SC6.4.7.1.2 Release of plan of survey requirements – SC6.4.7.1.2 (2) As-constructed street lighting plans required.
- SC6.4.7.2.11 Bonds and fees advice – addition of missing requirements.
- SC6.4.7.2.12 On maintenance inspection and final inspection and compliance check – 1(d) Removal of wording referencing an on-maintenance certificate that has not been issued.
- SC6.4.7.2.13 Off Maintenance – The developer must correct any defects.

22 June 2022 (adoption) and 08 August 2022 (effective)	2022/01	Major	The purpose and general effect of the major amendment is to make changes to development codes and mapping to ensure that the City of Townsville Planning Scheme remains up-to-date and reflects modern standards and practices. The key amendments include: • Part 6 Zones: Vehicle movements associated with Home based business activities have been changed to ensure that the term "Trip" identified in the relevant zone codes aligns with the "Trip" definition included in the Traffic impact assessments section of the Development manual planning scheme policy. • Part 5 Tables of assessment and Part 6 Zones: Part 5 Tables of assessment have been changed to nominate Secondary dwellings as Accepted development subject to requirements in the residential zone codes. Additional assessment benchmarks have also been included to ensure that Secondary dwelling developments remain subordinate to an existing dwelling located on a site. • Part 6 Zones: Additional Accepted development benchmarks have been included within a number of zones with respect to the Caretaker's accommodation use to ensure that a Caretaker's accommodation use remains secondary to the primary use of the site. • Part 9 Development codes: Changes to the Advertising devices code includes a full review of the code and the inclusion of additional criteria relating to advertising devices that include illuminated or digital faces and those devices located on vehicular trailers. • Schedule 2 Mapping: Zoning Map ZM-003 has been amended to include 125m² of land located within Loop Road, Paluma in the Environmental management and conservation zone to better reflect the use of the land. • Schedule 2 Mapping: Zoning Map ZM-026 has been amended to remove the zoning designation from land that has now been included as part of the Townsville Ring Road. • Schedule 2 Mapping: Zoning Map ZM-028 has been amended to include land previously designated as road reserve but which has now been amalgamated into an adjoining land parcel at Gilbert Crescent, North Ward. • Schedule 2 Mapping: Zoning Map ZM-037 has been amended to remove land (1.4km long and 0.50m wide) from the Rural residential zone to the Open space zone to better reflect the use of the land.
23 November 2022 (adoption) and 30 January 2023 (effective)	2022/02	Administrative	The purpose and general effect of the administrative amendment is to update references to SC6.4 Development manual planning scheme policy in relevant parts of the Townsville City Plan.

23 November 2022 (adoption) and 30 January 2023 (effective)	2022/02	PSP Amendment	The purpose and general effect of the amendment is to amend Schedule 6, SC6.4 Development manual planning scheme policy, in order to: • make the policy more user friendly to improve efficiency; • improve application review times and therefore reduce assessment timeframes; • improve safety in the design and delivery of cost-effective, sustainable infrastructure which is suited to the dry tropics climate; • improve consistency in the level of service that Council can financially sustain; and • maintain up-to-date standards and processes to ensure that the policy remains relevant and accurate. The amendment to the policy includes the following changes: • A reorganised policy under twenty-four discrete disciplines, with all relevant information combined under each discipline heading. • Specific new sections, including “Active Transport Infrastructure” and “Geotechnical Investigations”. • A revised Landscape and open space section, including references to plant species suitable for Townsville’s dry tropic climate; development application requirements; and ensuring planted road centre medians are of sufficient width to minimize/eliminate maintence requirements for costly traffic control. • Specific additional requirements, including updated Erosion and Sediment Control requirements; clarification of requirements for the design and manufacture certification of Fibre Reinforced Plastic (FRP) pump stations designed and manufactured outside Queensland; and a requirement for geotechnical investigations to be undertaken at the commencement of design of urban residential development to ensure stormwater infrastructure is provided with adequate cover to avoid damage during construction. • Updates to reflect latest standards, as well as general formatting and administrative updates throughout the policy.
4 September 2024 (adoption) and 4 November 2024 (effective)	2024/01	PSP Amendment	The purpose and general effect of the amendment is to: • Improve efficiency and user-friendliness; • Improve safety in the design and delivery of cost-effective, sustainable infrastructure that is suited to the dry tropics’ climate; • Improve the consistency in the level of service that Council can financially sustain; and • Maintain up-to-date standards and processes to ensure the policy remains relevant, accurate and consistent with stakeholder expectations. The amendment includes general formatting and administrative updates throughout the policy, as well as the following specific major changes: <u>SC6.4.3 Standard Drawings</u> • Removed the “Revision No”- column from Table SC6.4.3.1 to ensure the most recent drawings are referred to. • New standard drawings are now available relevant to SC6.4.12 Landscaping and open space. • Revised drawings available relevant to SC6.4.5. <u>SC6.4.5 Road Network Infrastructure</u> • Minor changes to SC6.4.5.1. (3) to enhance readability and clarity on the road hierarchy aspects as well as clarification on the

			preferred spacing of intersections, median breaks, and speed limits throughout this section. • SC6.4.5.2 –minor additions i.e., editor's note relating to DTMR's TIA guideline document. • Provision of additional information under SC6.4.5.2 (3). • Updated Desired Standards of Service (DSS) for links and intersection/access operations under 6.4.5.2 (4) (e) and (f) – DSS aligns with LGIP definitions. • Updated Attachment C in SC6.4.5 – Road hierarchy Typical Cross Section Characteristics to align with amendments to SD-001 (Local Streets) & SD-002 (Major Collector Roads) standard drawings. <u>SC6.4.6 Road Works and Traffic Control</u> • SC6.4.6.1(3)(p) Bicycle Lanes – New section detailing design requirements for bicycle lanes aligning with SC6.4.4 Active Transport Infrastructure Policy. • SC6.4.6.1(3)(q) Parking – Amendment to section to align with SC6.4.5 Road Network Infrastructure and Standard Drawings SD-001, SD-002, SD-003, SD-004, SD-005. • SC6.4.6.2(15) Preferred surfacing design configuration – most of this section has been deleted and replaced by more relevant design criteria. • SC6.4.6.4 Roadworks construction – most of the content has been removed and replaced with requirements for Inspection and Test Plans with construction in accordance with nominated Standard Drawings and / or a Contract works specification document. • SC6.4.6.5 – SC6.4.6.18 have been removed in its totality. The construction specifications have been removed and replaced with a requirement to submit an Inspection and Test Plan for the works prior to commencing any construction. <u>SC6.4.12 Landscaping and Open Space Policy</u> • Removing some content within the policy and convert it into separate documents that provide as attachments on the relevant webpage accessible through hyperlinks. • The introduction of a revised species list that provides additional criteria like soil type, planting area, and height & spread growth reflective of the locality, with an emphasis on species that do not have excessive water requirements and available via a hyperlink to a hosting webpage. • The addition of standard drawings available on Council's Drawings and Specifications webpage which aligns with the construction standards within the policy and references to other sections in the planning scheme. • References to outdated master plans are removed. <u>SC6.4.20 Outdoor Dining Policy</u> • Amending the heading from Outdoor Dining to Footpath treatment and Outdoor dining aiming to make the policy more user friendly and easier to allocate the footpath treatment policy. • SC6.4.20.2 – the heading has been changed to: Outdoor dining design for permanent outdoor dining structures. • Several sections pertaining to the scope, terminology, risk management considerations and design guidelines have been removed from SC6.4.20.2. This information is now available on Councils website as part of Council's Outdoor dining policy. • The focus of this policy has changed to the design of permanent outdoor dining structures with an emphasis on the protection of pedestrians in a shared footpath environment.