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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