

Engineering Construction Specification C04 Control of erosion and sedimentation (Construction)

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1 General

1.1 Responsibilities

1.1.1 General

Requirement: Provide temporary and permanent measures to control erosion and sedimentation to the requirements of Erosion and sedimentation control plan in *D11 Control of erosion and sedimentation (Design)* and, as documented.

1.1.2 ESCP prepared by the contractor

Implementation: To control plans documented in **PRE-CONSTRUCTION PLANNING**.

1.1.3 Erosion and sedimentation control measures by principal/consultant

Implementation: To control measures documented in **EXECUTION**.

Performance

The contractor shall plan and carry out the whole of the works to avoid erosion and sedimentation of the site, surrounding country, watercourses, waterbodies and wetlands in compliance with the requirements of appropriate commonwealth and state legislation, and council policies.

Implementation requirements:

Implement the control measures for erosion and sedimentation to comply with approved design and statutory requirements. Preclude any potential hazard to persons or property.

1.2 Cross references

1.2.1 General

Requirement: This worksection is not a self-contained specification. In addition to the requirements of this worksection, conform to the following:

- *C01 General requirements (Construction)*
- *C02 Quality management (Construction)*
- *C03 Control of traffic*
- *C04 Control of erosion and sedimentation (Design)*
- *C05 Clearing and grubbing*
- *C06 Earthworks (Road reserve)*
- *C24 Open drains*
- *C29 Landscape - road reserve and street trees*

1.3 Standards

1.3.1 General

Standards: To IECA Principles, IECA Book 5 and IECA Book 6.

Managing Urban Stormwater: Soils and Construction – Volume 1 (2004) NSW Government. Referred to as the “blue book”.

Turf installation To AS 5181.

1.4 Interpretation

1.4.1 Abbreviations

General: For the purposes of this worksection the following abbreviations apply:

- ARI: Average Recurrence Interval.

- ESCP: Erosion and sediment control plan.
- NTU: Nephelometric Turbidity Units.

1.4.2 Definitions

General: For the purposes of this worksection the following definitions apply:

- Erosion: The wearing away of land by the action of rainfall, running water, wind, moving ice or gravitational creep. Soil detachment (erosion) occurs when the erosive forces exceed the soil's resistance, causing the soil particles to move.
- NTU: A measure of water turbidity or the optical clarity of a liquid.
- Sediment: Sediment is the result of erosion, and consists of small detached soil particles. Sedimentation occurs when the transportation of detached soil particles ceases or slows and the soil particles then settle or fall out of suspension.
- Site sections: The site divided into sections based on the catchment area draining to each permanent drainage structure in the works, including the following:
 - Access and haulage tracks.
 - Borrow pits and stockpile areas.
 - Compound areas, including Contractor's facilities and concrete batching areas.
- Waterway Works Licence: This licence is required for:
 - Construction, alteration, operation, removal or decommissioning of any works on a waterway or groundwater bore.
 - Works to deviate a waterway or private dam, and covers all domestic and stock dams that are built on waterways. This approval is not required for farm dams that are not on a waterway.
- Waterway: Include the bed and banks of the following:
 - A river, creek, stream or other natural channel in which water flows (continuously or intermittently);
 - The stormwater system;
 - A lake, pond, lagoon or marsh in which water collects (continuously or intermittently).

1.5 Submissions

1.5.1 ESCP prepared by the contractor

Design documentation: Submit the following documents, if control plans are prepared or revised by the contractor:

- Erosion and Soil Sedimentation control plan (ESCP).
- Survey of embankments.
- Waterway Works Licence, if required.

Calculations: Submit calculations and references supporting the design and maintenance requirements.

1.5.2 Execution details

Section plans: Before disturbing the natural surface of a particular site section, submit an ESCP only for that site section consistent with the previously approved ESCP.

Personnel: Submit staff names and contact details for installation, monitoring, upkeep and removal.

Working in a waterways and floodplains: Submit a reinstatement plan if work in a stream is planned or the structure of a waterway will be altered including a copy of a Waterway Works Licence or Fisheries Permit if applicable. .

Drop inlet sediment control: Submit details of proposed alternative methods.

1.5.3 Reports

Work method statement: Submit detailed Environmental Work Method Statements.

1.6 Inspections

1.6.1 Notice

General: Give notice so that inspection may be made of the following:

- General: Initial installation of sediment controls.
- Stockpile sites: Stockpiles are protected by approved erosion and contamination measures in the ESCP.
- Access and exit areas: Decontamination of vehicles.
- Areas not approved for clearing: Fencing and protection of areas.
- Diversion and catch drains: Construction and lining.
- Temporary sediment control: Temporary sediment traps and batter protection.
- Removal: Removal of temporary erosion and sedimentation works.
- Cleaning: Completion of cleaning.

2 Pre-construction planning

2.1 ESCP prepared by the contractor

2.1.1 General

Requirement: To the *C04 Control of erosion and sedimentation (Design)* worksection.

2.1.2 Schedules

Content requirement: Conform to the following:

- Work schedules for multiple contractors co-ordinated to avoid delays so that disturbed land does not remain unstabilised.
- Schedules for the construction of structures and the implementation of measures to control erosion and sedimentation programmed where possible to avoid seasonal intense rain storms.
- A work sequence with construction and stabilisation of culverts and surface drainage works at the earliest practical stage.

3 Execution

3.1 Site control and protection

3.1.1 Dewatering

Requirement: Make sure that dewatering operations do not result in turbid water entering natural waterways and conform to the following:

- Treat contaminated water if turbidity exceeds 30 NTU.

- Only pump water into natural waterways if it is under safe limits to the regulatory water quality standards.
- Pump water to vegetated areas of sufficient width to remove suspended soil, or to sediment control structures.
- If discharge is to a natural waterway or a drainage system discharging to a natural waterway, monitor turbidity hourly.

3.1.2 Dust control

Requirement: Install measures for minimising health risk or loss of amenity due to emission of dust to the environment and incorporate the following, if required:

- Suppression of dust by watering.
- Installation of wind fences.

3.1.3 Management of stockpiles and batters

Requirement: Manage soil stockpiles to minimise dust and sediment in run-off and conform to the following:

- Minimise the number and area of stockpiles and the time stockpiles are exposed.
- Keep topsoil and underburden stockpiles separate.
- Construct other protective measures including upstream diversion works and downstream sediment trapping devices.
- Height:< 2.5 m.
- Stockpiles and batters slopes: No steeper than 2H:1V.
- Stockpiles and batters bare for more than 28 days: Stabilise by covering with mulch, anchored fabrics or seeding with sterile grass.
- Install sediment controls around unstabilised stockpiles and batters.
- Suppress dust on stockpiles and batters, as required.
- Stockpile protection: Install the following at the end of each working day:
 - Sandbags: Placed on downslope of stockpile to prevent movement:
 - Waterproof cover: Placed over stockpile material.
 - Sandbags, filter bags or fibre sausages: Locate to divert upslope flow of stormwater into grassed areas of the site and away from stockpiled material.
- Exclude timber and rubbish from stockpiles.

3.1.4 Access and exit areas

Decontamination measure: Decontaminate vehicles entering/exiting the site using shake-down or other approved methods.

3.1.5 Working in waterways and floodplains

Requirement: Minimise stress on aquatic communities and do not increase sediment load when working in waterways. Conform to the following:

- Plan in-stream works to minimise contact time.
- Establish special practices to minimise impacts on the waterway and disturbance of the banks.
- Stabilise the banks and the in-stream structures.
- Maintain minimum flows to make sure the viability of aquatic communities and do not limit the passage of fish up and downstream.

- Construct in-stream crossing during low flows, that are stable under expected vehicle loads and flow regimes.

3.2 Erosion and sedimentation control measures

3.2.1 General

Initial installation of sediment control: Prepare and present the works for inspection.

3.2.2 Control measures

Land clearance: Minimise in areas with highly erodible soils and steep slopes liable to water and wind erosion.

Runoff: Decontaminate in conformance with safe limits of regulatory waterway standards before dispersing. Disperse clean runoff to stable areas or natural watercourses

Drainage lines: Provide drainage to convey water through the works to minimise erosion generation. Identify drainage lines and install measures to control predicted stormwater and sediment loads generated in the mini catchment.

Limiting areas or erodible material exposed at any time: Limit to areas being actively worked.

Protection of areas not approved for clearing or disturbance: Clearly mark and fence off.

Clearing and grubbing: To the *C05 Clearing and grubbing* worksection.

Control measures: Install and maintain for the duration of the contract, control measures including the following:

- Permanent drainage structures: Install before the removal of topsoil and commencement of earthworks within the catchment area of each structure.
- Permanent and temporary drainage works: Complete promptly to minimise exposure period of disturbed areas.
- Diversion and catch drains: Construct to prevent uncontaminated runoff from passing through the site and mixing with contaminated water. Construct and line catch drains before the adjacent ground is disturbed and before excavation.
- Contour and diversion drains: Install across exposed areas before, during and immediately after the clearing. Re-establish and maintain these drains during soil removal and earthworks operations.
- Cut off or intercept drains: Establish cut-off or intercept drains to redirect stormwater away from cleared areas, and sloping to stable (vegetated) areas or effective treatment installations.
- Sediment filtering or sediment traps: Install before and in conjunction with earthworks operations, to prevent contaminated water leaving the site.
- Berms: Construct along the edge of the formation leading to temporary batter flumes and short term sediment traps, to minimise loss of sediment during construction of embankments during fill placement.
- Progressive revegetation of site: To the *C29 Landscape - road reserve and street trees* worksection as each site section is complete.

3.2.3 Maintenance

Maintenance of controls: Make sure each disturbed area has adequate means of containment of contaminated water. Restore and replace control measures as required.

Access areas: Provide and maintain access from within the road reserve, or from other acceptable locations, for cleaning out sedimentation control works.

3.2.4 Monitoring site performance

General: Maintain slopes, crowns and drains on all excavations and embankments, and make sure there is satisfactory drainage at all times. Do not allow water to pond on the works, unless ponding is part of an approved ESCP.

Ripped material remaining in cuttings and material placed on embankments: Seal off by adequate compaction to a smooth, tight finish.

Inspection: Inspect all erosion and sedimentation control measure as follows:

- At least daily when rain is occurring on site.
- At least weekly (even if work is not occurring on site).
- Within 24 hours prior to expected rainfall.
- Within 18 hours of a rainfall event of sufficient intensity and duration to cause on site runoff.

Rectification: Immediately rectify any defects revealed during inspection and revise ESCP, if required.

3.3 Temporary erosion and sedimentation control measures

3.3.1 General

Requirement: Install temporary erosion and sedimentation control measures to areas where the natural surface is disturbed by construction, including roads, depot and stockpile sites.

3.3.2 Temporary drainage control

Temporary drains: Control runoff from exposed areas with temporary contour drains and/or temporary diversion drains. Progressively implement and, if required, alter as the work progresses.

Contour drains: Construct across the natural slope at approximately the same elevation as follows:

- Timing: Immediately after site is cleared, intercept and divert runoff from the site to nearby stable areas at non-erosive velocities.
- Form: Channel with a ridge on the lower side.
- Grade: 1% to 1.5%.
- Spacing intervals: 20 m to 50 m, depending on the erodibility of the exposed soil, as documented.

Diversion drains: Construct diversion drains across haul roads and access tracks when there is an erosion risk, due to steepness, soil erodibility or potential for concentrating runoff flow, as follows:

- Form: Channel with a ridge on the lower side to intercept and divert runoff from the road or track to stable outlets.
- Spacing: Not greater than that required to maintain runoff at non-erosive velocities.

3.3.3 Temporary sediment control

Temporary sediment traps: Construct devices to remove sediment from sediment-laden runoff flowing from areas of 0.5 ha or more before the runoff enters the stormwater drainage systems, natural watercourses or adjacent land.

Waste barriers: Construct and maintain to prevent debris from entering natural watercourses.

Batter protection: Minimise scour of newly-formed fill batters during and after embankment construction by diverting runoff from the formation away from the batter until vegetation is established.

3.3.4 Drop inlet sediment control

General: Construct drop inlet sediment traps and inlet control banks on completion of gully pits, as documented.

Functional requirement: Construct the inlet control banks, as required, to prevent the surface flows bypassing gully pits. Make sure the sediment traps remove sediment from the surface flow before it enters the drainage system.

Sediment traps and control banks: Conform to the following:

- Construct the drop inlet sediment traps and associated inlet control banks consisting of at least two courses of sandbags, containing a 10:1 sand/cement mix, as documented.
- Key the bags at least 25 mm into the surface, dampen and make sure cement is sufficiently hydrated, and tamp lightly to achieve a mechanical interlock between adjacent bags.

3.3.5 Removal

General: Remove all measures when revegetation is established on formerly exposed areas. Remove from the site, and dispose of, all materials and components used for the temporary erosion and sedimentation control works, as documented and in conformance with regulatory authorities' requirements.

3.4 Permanent erosion and sediment control measures - Earthworks

3.4.1 Erosion and sedimentation control basins

Planned levels: Construct earthworks for permanent erosion and sedimentation control basins to the documented levels and dimensions.

Site preparation: Clear the entire storage and embankment foundation area of permanent erosion and sedimentation control basins in conformance with the *C05 Clearing and grubbing* worksection. Strip topsoil and any unsuitable material under embankments in conformance with the *C06 Earthworks (Road reserve)* worksection.

Embankments: To the *C06 Earthworks (Road reserve)* worksection.

3.5 Permanent inlets, spillways and low flow outlets

3.5.1 Sedimentation control basins and sediment traps

Rock mattresses: Construct inlets and spillways using rock filled woven galvanized steel mattresses and geotextile. Install the rock filled mattresses to the *C24 Open drains*. [refer to Council's Standard Drawings].

Plastic pipe outlet: Install a 150 mm diameter plastic pipe low flow outlet in locations, as documented.

3.6 Cleaning

3.6.1 Sedimentation control structures

Progressive cleaning: Clean out, when accumulated sediment reduces the structure capacity of the control measure to 50% or less, or when sediment has built up to a point where it is less than 300 mm below the spillway crest and conform to the following:

- Removal of accumulated sediment: Use methods which will not damage the structures.
- Sediment disposal: Remove sediment to a nominated soil stockpile site or dispose in locations that sediments will not be conveyed back into the construction areas or into watercourses.
- Access: Maintain suitable access to allow cleaning out in all weather conditions.

3.6.2 Completion

Requirement: Clean, before Practical Completion of the Works.

Reinstatement: Reinstatement surfaces including areas previously occupied by stockpiles and conform to the following:

- Within areas of permanent works: As documented.
- Areas outside permanent works: Reinstatement to condition at commencement of contract.

4 Annexures

4.1 Annexure - Summary of hold and witness points

Reference No:	Clause and description	Type*	Submission/Inspection	Submission/Notice details	Process held
C04-HP01	SUBMISSIONS ESCP prepared by the contractor Design documentation	H	Erosion and sedimentation control plan (ESCP)	7 days before disturbance of natural surface	Disturbance of natural surface
C04-HP02	SUBMISSIONS ESCP prepared by the contractor Design documentation	H	Survey of embankments	7 days before disturbance of natural surface	Disturbance of natural surface
C04-HP03	SUBMISSIONS ESCP prepared by the contractor Design documentation	H	Waterway works licence Approval letter with conditions from statutory organisation controlling access to a waterway	7 days before disturbance of waterway if applicable.	Statutory approval for works in a waterway and/or floodplain.
C04-HP04	SUBMISSIONS Execution details Section plans	H	Scale diagrams showing the following: <ul style="list-style-type: none"> • Features of the site including contours and drainage paths. • Relevant construction details of all erosion and sedimentation control structures. • All permanent and temporary erosion and sedimentation control measures, including the control measure to be implemented in advance of, or in conjunction with clearing and grubbing operations 	7 days before disturbance of natural surface	Disturbance of natural surface

Reference No:	Clause and description	Type*	Submission/Inspection	Submission/Notice details	Process held
C04-HP05	SUBMISSIONS Execution details Working in waterways and floodplains	H	Reinstatement plan for works in a stream including a copy of Waterway Works Licence	7 days before works in waterways and flood plains	Work in waterways and flood plains. Reinstatement plan.
C04-HP06	INSPECTIONS Notice General	H	Initial installation of sediment controls	7 days before commencement of bulk earthworks	Commencement of bulk earthworks For development inspections book through "MyInspect"
C04-WP07	INSPECTIONS Notice Stockpile sites	W	Approved protection measures are in place	2 days	-
C04-WP08	INSPECTIONS Notice Access and exit areas	W	Decontamination of vehicles	2 days before site disturbance	-
C04-WP09	INSPECTIONS Notice Areas not approved for clearing	W	Fencing and protection of areas	3 days	-
C04-WP10	INSPECTIONS Notice Diversion and catch drains	W	Construction and lining	2 days before site disturbance	-
C04-WP11	INSPECTIONS Notice Temporary sediment control	W	Temporary sediment traps and batter protection	2 days before site disturbance	-
C04-WP12	INSPECTIONS Notice Removal	W	Removal of temporary erosion and sedimentation works	3 days	-
C04-WP13	INSPECTIONS Notice Cleaning	W	Completion of cleaning	2 days	-
	*H = Hold Point				

Reference No:	Clause description	and Type*	Submission/Inspection	Submission/Notice details	Process held
	W = Witness Point				

4.2 Annexure - Referenced documents

The following documents are incorporated into this worksection by reference:

AS 5181	2017	Use and installation of turf as an erosion, nutrient and sediment control measure
IECA Principles	2012	Principles of construction site erosion and sediment control - A training tool for the construction industry
IECA Book 5	2012	Best practice erosion and sediment control - A field guide for construction site managers
IECA Book 6	2010	Best practice erosion and sediment control - Standard drawings

Managing Urban Stormwater: Soils and Construction – Volume 1 (2004) NSW Government. Referred to as the “blue book”.