RUBICON ENVIRO PTY LTD
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CEVA LOGISTICS - WAREHOUSE 1

ASPECT INDUSTRIAL ESTATE AT

MAMRE ROAD, KEMPS CREEK

EROSION AND SEDIMENT CONTROL PLAN

August 2022 – Revision 1

Prepared for:

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Document Authorship Information

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Document	Erosion & Sediment Control Plan
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Appendices

Warehouse 1 (Lot 1) at Aspect Industrial Estate, Kemps Creek
Primary Erosion and Sediment Control Plan

1 Introduction

Rubicon Enviro Pty Ltd (Rubicon) has been engaged by Richards Crookes Constructions (RCC) to prepare a primary Erosion & Sediment Control Plan (ESCP) to support the construction of a proposed warehouse for CEVA Logistics which is known as Warehouse 1 (Lot 1) at Aspect Industrial Estate (AIE) at Mamre Road, Kemps Creek NSW 2178 (the Project).

This ESCP has been prepared in accordance with the Project SWMP and referred to as Appendix A in the SWMP. This Sub-plan has been prepared to reduce the potential for risk of environmental impacts caused by erosion and sedimentation associated with project activities. This ESCP details strategies and measures to assist with the management of soil and water impacts for the duration of demolition, earthworks and construction works at the Project Site.

This ESCP is required to support the CEMP and has been prepared to address the requirements of a Development Application - State Significant Development (SSD) 10448 and subsequent Modifications (MODs), and the Environmental Impact Statement, titled 'Aspect Industrial Estate - Environmental Impact Statement' prepared by Urbis Pty Ltd, dated November 2020.

2 Purpose

The purpose of this Sub-plan is to outline the planning, methodologies, techniques, and monitoring to minimise the potential environmental impacts of erosion and sedimentation arising from the Project construction activities.

3 Scope

The scope of the Primary ESCP will:

- Provide a strategy and framework for construction to be planned, implemented, and maintained to mitigate any adverse environmental impacts,
- Propose control measures and management procedures to be implemented during construction, to avoid or minimise potential adverse impacts to soils, surface water and groundwater,

This Primary ESCP has been prepared in accordance with the requirements of the 'Blue Book' being a collective of:

- Managing Urban Stormwater: Soils and Construction 4th Edition Volume 1 – Landcom, reprinted 2006
- Volume 2A: Installation of Services – NSW Department of Environment & Climate Change (DECC), 2007

4 Objectives

The key objectives of the Primary ESCP is to:

- Identify potential impacts to soil and water quality such as erosion and sedimentation arising from construction activities,
- Outline the soil and water management strategy for the construction phase of the development,
- Promote the adoption of sound principles and criteria for planning and implementation of erosion and sediment controls,
- Ensure the design and construction of controls is undertaken in accordance with the relevant guidelines,
- Minimise the adverse risks to soils and water by detailing mitigation measures and strategies,
- Provide an outline of a monitoring, inspection, and reporting framework for the ongoing assessment of adherence to the ESCP.

5 Performance Criteria & Development Approval Condition Compliance

The performance criteria for the ESCP are to:

- Limit potential for adverse environmental impacts on downstream waterways, riparian zones, and other identified sensitive areas,
- Minimise the risk and subsequent occurrence of erosion and sedimentation, to mitigate the impacts on project areas, sensitive areas, and downstream environments,
- Prevent the occurrence of pollution incidents causing environmental harm,
- Maintain existing downstream waterway attributes and water quality parameters,
- Manage erosion and sedimentation with sound management practices of effective planning and formation of relevant controls
- Ensure compliance with legislative & regulatory requirements, and to maintain liaison and communication with statutory authorities and/or delegates.

5.2 SSD 10448 Consent Condition Compliance - Development Approval by NSW Dept of Planning & Environment

This ESCP is required to support the CEMP and has been prepared to address the requirements of a Staged Development Application - State Significant Development (SSD) 10448, the subsequent Modification of Development Consents (MODs 1 & 2), and the Environmental Impact Statement, titled 'Aspect Industrial Estate - Environmental Impact Statement' prepared by Urbis Pty Ltd, dated November 2020.

Please refer to Section 3.2 & Table 3-2 in the SWMP for the relevant mitigation & management measures. Section 3.2 of the SWMP includes reference to required outcomes, the timing of when the commitment applies and the section of this Plan or other management system document which addresses the requirement.

6. Guidelines, Standards and Procedures

Name of Document/Publication	Author	Published
Acid Sulfate Soil Manual	ASSMAC	1998
Approved Methods for the Sampling and Analysis of Water Pollutants in NSW	NSW EPA	2004
Australian and New Zealand Guidelines for Fresh and Marine Water Quality	ANZECC and ARMCANZ	2000
Bunding & Spill Management	NSW DEC	1997
Environmental Best Management Practice Guideline for Concreting Contractors	NSW DEC	2004
Guidelines for the Management of Acid Sulphate materials: Acid Sulphate Soils, Acid Sulphate Rock and Monosulphidic Black Ooze	NSW RTA	2005
Guideline for Environmental Management - Spraying Bituminous Materials	VIC EPA	2002
Guideline for Handling Liquids	NSW DECCW	2007
Managing Urban Stormwater ('Blue Book'): Soils and Construction Volume 1, 4th Edition	NSW Landcom	2004
'Blue Book' - Volume 2A Installation of Services	NSW DECCW	2008
'Blue Book' - Volume 2D Main Roads Construction	NSW DECCW	2008
Noxious and environmental weed control handbook	NSW DPI	2014

7. Environmental Planning

Erosion and sediment control planning is based on the principle that preventing erosion where possible provides the best environmental outcomes, is more economical, and effective than controlling the capture of sediment. This is a significant goal, given the Project topography, drainage patterns and soils that have a significant proportion of sodic soils that are highly erodible.

7.1 Construction Activities

The scope and anticipated duration of the Project works present risks of environmental impacts to the environment. Key aspects of the project that could result in adverse impacts to soils and water include:

- Installation of erosion and sediment controls.
- Ancillary site preparation, establishment, and operation.
- Bulk earthworks, trenching, earthworks, and underground services service installation.
- In-situ concrete works and concrete curing.
- Stormwater construction and drainage structures.
- Dewatering ‘dirty’ water from site areas and sediment basin operations.
- Spills & leaks of fuels & oils from mobile and static machinery.
- Storage of chemicals, fuels & oils.
- Generation of building and construction waste.
- Importing, handling, stockpiling, and transporting materials & resources.
- Plant maintenance.
- General waste generation from compound/s & works areas.

7.2 Impacts

The possible impacts on soil and water from the activities described include:

- Unnecessary disturbance of existing areas outside the Project footprint,
- Erosion of soils that degrade the water quality of runoff to downstream receivers, dependant flora and fauna, and sensitive areas,
- Degraded soil or water quality from exposure to contaminated soils or ASS material, or run-off from these soils,
- Contamination of soils, and surface and groundwater from accidental spills or oil leaks
- Disturbance or degradation of groundwater aquifers,
- Litter and gross pollutants from construction activities
- Atmospheric dust pollution affecting air quality of areas surrounding the Project.

7.3 ‘Blue Book’ receiving waters classification and design criteria

The recommended minimum design criteria for temporary erosion and sediment control measures are based upon an assessment of the sensitivity of receiving environments. In accordance with the SWMP assessment, the attributes of the receiving waters in the vicinity of the Project have been assessed as ‘standard’. The design criteria adopted will be in accordance with Blue Book Volume 1- Sect. 6.3.4 – (f) & Volume 2A – Table 5.1. however, we have elected to adopt the 5-day - 85th percentile rainfall depth for Blacktown of 32.2mm.

7.4 Key Management Strategies

The following list outlines the Key Management Strategies that will be implemented to mitigate potential erosion and sediment impacts:

- Specialist expertise and advice will be sought from an accredited Project Soil Conservationist (CPESC) in regard to the broad spectrum of erosion and sediment control issues, including but not limited to site establishment, temporary access routes, off-site water diversion, on-site drainage, sediment basin construction/operation/decommissioning, soil handling and storage, water management, stabilisation, and rehabilitation/revegetation of Project areas.
- Implementation of structured erosion and sediment control training program for all relevant site personnel in the form of inductions, toolbox talks and workshops/training presentations.
- Minimising the extent and duration of construction disturbance.
- Control and diversion of off-site water flows around or across site.
- Control and diversion of on-site flows to installed sediment controls and water quality control devices.
- Conservation of topsoils for site rehabilitation and revegetation.
- Implementation of progressive erosion methods & techniques throughout various work stages.
- Construction and management of suitable sediment controls including sediment filters, traps, sumps, tanks, and basins.
- A thorough inspection and maintenance program to monitor, record and schedule actions for maintenance and upgrades of controls, rectification works, and sediment removal and handling.
- Establishing a procedure to monitor forecast weather events and implementing response plans for significant wind or rainfall events and flooding.
- Timely and progressive stabilisation of disturbed areas prior to final landscaping.
- Monitoring stabilisation measures and promoting prompt & effective revegetation and permanent stabilisation.

7.5 Preparation of Progressive Erosion and Sediment Control Plans (PESCP's)

This ESCP is supplemented with staged Progressive Erosion and Sediment Control Plans (PESCP's) prepared as required for the relevant work areas and work stages, attached as Appendix F of this ESCP. The PESCP's illustrate the strategy for erosion and sediment control and provides detail on structures and controls to be implemented in concert with construction activities. The PESCP's will outline structural and non-structural measures to:

- Intercept and divert clean water runoff around worksites
- Prevent erosion
- Limit the movement of sediment
- Remove or filter sediment from runoff
- Detain or control the discharge of runoff from site
- Promote timely rehabilitation or stabilisation of disturbed areas.

There are a number of control measure options available for selection and use. The selection of controls will be in accordance with sound management practices to achieve the desired outcomes.

The staged PESCP's will be revised as necessary to address changes in the site conditions and nature of works. The PESCP's have been formulated in conjunction with construction personnel prior to the commencement of specific onsite activities. The plans will be prepared to manage the various works or construction stages such as:

- Site establishment - Compound, access, stockpile operations, and construction facilities
- Bulk earthworks for building pads, road formation, drainage, services, etc.
- Major off-site and on-site water drainage works or structures such as diversions, drains, outfalls, and water quality control devices
- Construction activities such as paving, kerbing/guttering, stormwater drainage and outlets, etc.
- Stabilisation of disturbed areas, access and works areas, and perimeter areas
- Decommissioning of temporary erosion and sediment controls.

The formulation of Environmental Work Method Statements (EWMS) will be sub-ordinate to the requirements of the primary ESCP, supplement the PESCP's, and will outline methods and strategies for works in critical areas such as clearing & grubbing, topsoil stripping & earthworks, culvert works, drainage works, construction & operation of water quality control devices, and dewatering.

7.6 Erosion and Sediment Control Training for Site Personnel

Prior to the commencement of onsite activities, all site personnel will be instructed to observe site constraints and be made aware of environmental controls, in particular:

- Avoidance of disturbing or damaging 'No-Go' zones
- Effects of erosion and sedimentation and off-site or downstream impacts
- Environmental legislation, responsibilities, and 'due diligence'
- Correct establishment and maintenance of erosion and sediment controls
- 'End-of-day' site maintenance, emergency procedures, and spill response
- Personnel to monitor, review and improve controls as appropriate.

Key construction personnel would undertake additional environmental training including a specific training session for erosion and sediment control addressing:

- Environmental impacts
- Relevant legislation
- Principles and techniques of erosion and sediment control
- Preparation of PESCP's.

The structure and content of the Erosion and Sediment Control training would be developed in conjunction with Project management and construction personnel.

7.7 Inspection and Maintenance

A self-auditing program will be established for erosion and sediment control based on a check sheet developed for the site. A site inspection using the developed check sheet will be undertaken by relevant Project personnel:

- At least weekly
- Immediately before extended site shut down or prior to forecast rainfall exceeding 10mm
- At the conclusion of all rainfall events exceeding 10mm 20mm. and during periods of prolonged rainfall as soon as practicable).

The self-audit will include:

- Noting the condition of installed erosion and sediment controls onsite
- Detailing maintenance requirements (if any) for installed erosion and sediment controls
- Recording the volumes of sediment removed from sediment controls and sediment traps, where applicable
- Recording the location to where extracted sediments are disposed.

A Project Soil Conservationist (CPESC) will be engaged to undertake monthly site inspections and provide a written report detailing identified issues and recommendations for rectification works.

8. Erosion Control Measures and Sediment Control Methods

The formulation of the ESCP assumes that controls will generally be installed in the following progression:

- Installation of preliminary erosion and sediment controls and exclusion fencing to nominated areas of initial works and establishing exclusion zones
- Establishing any temporary roads and machinery access points in addition to those existing
- Installation of stabilised site access, site compound and facilities
- Forming temporary drains or banks to maximise diversion of off-site flows away from works area to existing drainage lines or to temporary drainage diversion structures
- Construction of on-site water diversion drains or banks to direct runoff to the installed sediment controls
- Installation of diversion drains/banks upslope and sediment controls down slope of proposed topsoil and spoil stockpile areas
- Bulk earthworks such as cut excavations, filling, trenching, and engineered formation are controlled with a suite of erosion controls such as exclusion bunding, surface stabilisation treatments, trench stops, batter berms/chutes, contour banks, check dams, etc.
- Drainage and run-off from site areas directed to adequately designed and constructed sediment controls with regular maintenance and repair as required
- Completed areas are progressively stabilised as soon as practical with emphasis on critical areas such as drainage outlets, batters, etc.
- Sediment controls are to be maintained until adequate soil surface protection levels (>70% ground cover) are achieved in the catchment.

The erosion and sediment control measures required for Project areas during the various construction areas will be determined by reference to the guidance and measures detailed in Appendix D – in the Blue Book Volumes 2A - 2D: – DECC 2007. Commonly employed methods and techniques that may be likely to be utilised on the Project are detailed in the following table:

Table 8

Erosion Control – Raindrop Impact	
Situation	Control measure or method
Soil surface protection - Vegetation	• Temporary vegetation (cover crop only) • Permanent vegetation – introduced (exotic) pasture species or native (endemic) species
Soil surface protection - Batter protection	• Organic rolled erosion control products (RECP's) such as jute mesh, jute mat, coir fibre blankets • Non-organic RECP's such as non-woven geotextile membrane or heavy grade plastic sheeting.
Soil surface protection - Mulching	• Hydromulch or hydraulic bonded-fibre matrix • Straw mulching with bitumen tack • Rock or gravel mulch
Soil surface protection - geobinders	• Organic tackifiers • Co-polymer emulsions • Bitumen emulsion •
Erosion control - Concentrated Water Flow	
Up-slope diversions	• Excavated channel-type bank • Back push-type bank or windrow • Catch drains
Soft armour channels	• Trapezoidal or parabolic shape design drain cross sections • Organic rolled erosion control products (RECP's) such as jute mesh, jute mat, coir fibre blankets • Non-organic RECP's such as non-woven geotextile membrane or heavy grade plastic sheeting • Organic tackifiers & co-polymer emulsions • Bitumen emulsion • Hydro mulch • Standard or reinforced turf
Hard armour channels	• Loose rock – hard quarry rock • Rock-filled wire mattresses • Grouted rock • Cast in-situ concrete • Underlays utilising heavy grade plastic lining or geotextile lining
Erosion control - Concentrated Water Flow	
Situation	Control measure or method
Check dams	• Stacked rock • Sandbags and aggregate filter bags • Geotextile covered straw bales • Coir logs

Table 8

Batter drainage	• Geotextile lined or heavy grade plastic chutes • Pipes and Half pipes • Loose-rock rip rap • Concrete (pre-cast or on-site) Rock-filled wire mattresses
Grade control structures and flumes	• Geotextile lined or heavy grade plastic chutes • Pipes and Half pipes • Concrete chutes • Loose-rock rip rap • Gully pits and field inlets • Sandbag drop structures • Rock-filled wire gabions and mattress structures
Outlet dissipation structures	• Loose-rock rip-rap apron diffusers • Rock-filled wire mattresses • Pinned geotextile aprons • Level spreaders
Revetments and retaining walls	• Rip rap • Rock-filled wire gabions and mattresses
Sediment control - Sheet Flows	
Vegetative filters	• Turf strips
Sediment barriers/filters	• Sediment fencing • Topsoil berms stabilised with vegetation or geotextile with filter outlets at intervals • Excavated and geotextile lined sediment traps • Geotextile covered rock or gravel windrows • Coir logs
Site exit points	• Shaker grids with paved or rock aprons and sediment sumps • Wheel wash equipment and designated/controlled areas
Sediment control - Concentrated Flows	
Sediment traps	• Sediment basins or excavated sumps • Detention tanks • Compacted mulch sediment trap & sump • Stacked rock with geotextile • Excavated and geotextile lined sediment traps • Straw bale or sand bag structures • Gully pit, field inlet and kerb inlet traps

9 Soil & Water Management Activities & Controls

The following table outlines the environmental management and mitigation measures proposed to be implemented, together with responsibilities and frequency of actions:

Table 9

Planning, permits & personnel		
Environmental Management Controls	**Person Responsible**	**Timing / Frequency**
1. All necessary licences, permits and approvals required by legislation will be obtained prior to works commencing.	Project Manager / Supervisor / Environmental Site Representative	Duration
2. Copies of any relevant licences, permits and approvals will be kept on site for inspection upon request or otherwise, as required.	Project Manager / Supervisor / Environmental Site Representative	Site establishment
3. All works and site activities will comply with the explicit requirements of any relevant licence, permit or approval.	Project Manager / Supervisor / Environmental Site Representative	Duration
4. Recordings and data from site inspections, testing, audits, and monitoring will be retained, with associated documentation maintained to demonstrate remedial action/s have occurred.	Project Manager / Supervisor / Environmental Site Representative	Duration
5. Erosion and sediment control planning is required prior to the commencement of works. The approved CEMP & SWMP is supplemented by concept Progressive Erosion & Sediment Control Plans (PESCP's) which have been developed in accordance with the requirements of '*Soils and Construction: Managing Urban Stormwater' 4th Edition.* - Landcom 2006.	Project Manager / Supervisor / Environmental Site Representative	Site establishment & duration
6. The CEMP & SWMP & construction PESCP's may be supplemented by site-specific Environmental Work Method Statements (EWMS's) which would be developed in response to a significant environmental issue emerging. The EWMS's would outline the relevant environmental risks and issues, mitigation of potential risks, and detail strategies for remediation and/or management.	Project Manager / Supervisor / Environmental Site Representative	Site establishment & duration
7. The induction of employees and contractors to include a component promoting environmental awareness, legislative requirements & penalties, and basic erosion and sediment control tasks	Project Manager / Supervisor / Environmental Site Representative	Site establishment & duration
8. Toolbox talks will regularly focus on specific works, associated risks, potential impacts, and mitigation measures. Specific erosion and sediment control awareness training and workshops may be undertaken by personnel with direct involvement with erosion and sediment control.	Supervisor / Environmental Site Representative	Site establishment & duration
9. Promote planning for seasonal restrictions for high-risk areas and/or activities ((i.e., late summer/autumn rainfall events for culvert works or cold winter temperatures affecting revegetation)	Project Manager / Supervisor / Environmental Site Representative	Site establishment & duration

Environmental Management Controls	Person Responsible	Timing / Frequency
Clearing, site establishment, topsoil stripping & stockpiling		
1. Exclusion areas ('No Go' zones) to be identified, delineated where practical, and personnel instructed to avoid disturbance in these areas.	Supervisor / Environmental Site Representative	Site establishment
2. Temporary fencing or barricading such as parawebbing or perimeter tape is to be utilised on the works perimeter with accompanying signage as required.	Supervisor / Environmental Site Representative	Site establishment
3. Areas of proposed works with identified noxious weed infestations to be treated with appropriate herbicide, in accordance with product directions. The weed treatment will occur in sufficient time prior to disturbance to ensure complete 'die back' prior to topsoil handling.	Supervisor / Environmental Site Representative	Site establishment
4. In areas requiring weed control, spray drift will be mitigated by conducting spraying activities in calm weather and application by hand sprayer unit where practical.	Supervisor / Environmental Site Representative	Site establishment
5. The extent of earthworks will be demarcated to the footprint necessary for the proposed works.	Supervisor / Environmental Site Representative	Site establishment & duration
6. Construct erosion resistant access routes, site access/egress points, and compound roads to be formed and stabilised as early works. Car parking areas and frequently utilised areas should be stabilised (e.g. geotextile with asphaltic millings, rock aggregate overlay, bitumen chip seal or similar) to prevent soil churning, where required. Any rock or aggregate required for vehicle access should be clean and free from soil or other contaminants.	Supervisor / Environmental Site Representative	Site establishment & duration
7. Temporary drains, banks or diversions are to be formed and stabilised to divert concentrated 'clean' flows around disturbed works areas.	Supervisor / Environmental Site Representative	Site establishment & duration
8. The installation of preliminary sediment controls such as perimeter sediment fencing, excavated sediment traps, check dams, coir log/straw bale filters, etc, will be implemented prior to disturbance within the catchment.	Supervisor / Environmental Site Representative	Site establishment
9. Stockpiles and material will not be located within the 1 in 10-year ARI floodplain and the stockpile locations are to avoid concentrated surface flows or areas subject to inundation during wet weather.	Supervisor / Environmental Site Representative	Site establishment & duration
10. The long-term soil stockpile locations are to be located 5 metres away from major drainage lines and at least 10 m from waterways. The stockpiles will not be established in areas subject to concentrated surface flows, waterlogging, or prolonged inundation during wet weather.	Supervisor / Environmental Site Representative	Site establishment & duration
11. Stockpiles should be stabilised if they are to remain in place for more than 20 days. Rolled Erosion Control Products (RECP's such as geotextile, jute mesh, coco fibre mat, etc) or soil binders can be used on smaller stockpiles, however, larger stockpiles should be formed into crowned structures to minimise erosion and be subsequently stabilised with cover crop seeding or applied geobinders. Plastic covers should only be utilised for short term cover for wind or storm protection.	Supervisor / Environmental Site Representative	Site establishment & duration

Environmental Management Controls	Person Responsible	Timing / Frequency
12. Maintain minor benches or contour berms on fill batter formations until profiling for topsoiling is imminent	Supervisor / Environmental Site Representative	Duration
13. Temporary scour protection lining for major 'dirty' drains for steep or long drains to sediment basins, sumps, traps or other controls.	Supervisor / Environmental Site Representative	Duration
14. Access to the works area, and movements on the site during construction will be limited to the defined access and project areas, where possible. Minimise vehicle movements & speed on unsealed areas and access tracks.	Supervisor / Environmental Site Representative	Duration
15. Earthworks and hauling, and vehicular movements to be limited in wet conditions.	Supervisor / Environmental Site Representative	Duration
16. Appropriate sediment tracking controls such as an aggregate/geotextile apron, shaker grid, etc will be installed at exit points from the site, where required.	Supervisor / Environmental Site Representative	Duration
17. The adjoining local road network to be regularly monitored for tracked sediments with affected areas cleaned as soon as possible in a safe manner.	Supervisor / Environmental Site Representative	Duration
18. Vehicles transporting bulk materials such as soils and fill are to correctly cover loads to prevent loss of load and/or dust generation on public roads.	Supervisor / Environmental Site Representative	Duration
19. Imported quarry product and fill materials required for construction are to be clean, and free of contaminants (i.e. weeds, waste, liquids, etc).	Supervisor / Environmental Site Representative	Duration
20. Water carts are to regularly spray access tracks, works areas, & temporary stockpiles, during dry weather conditions.	Supervisor / Environmental Site Representative	Duration
21. Bunded or controlled areas for re-fuelling, material stockpiling, (and contaminated soil treatment area if required) are to be formed prior to commencement of those works in the relevant risk areas.	Supervisor / Environmental Site Representative	Site establishment & duration
22. The progress of earthworks will minimise slope lengths and gradients where practical utilising contour berms, batter berms, diversion banks, etc.	Supervisor / Environmental Site Representative	Duration
23. Personnel to ensure visual dust monitoring is maintained during works, and dust suppression is undertaken regularly.	Supervisor / Environmental Site Representative	Duration
24. Minimise earthworks, soil handling and general disturbance during periods of strong and/or gusty winds.	Supervisor / Environmental Site Representative	Duration
25. Apply water sprays for dust suppression where works, soil handling and/or potentially contaminated soils are generating dust.	Supervisor / Environmental Site Representative	Duration

Environmental Management Controls	Person Responsible	Timing / Frequency
Drainage and water management		
1. Construct diversion drains or banks upslope of proposed works to direct off-site water flows to existing drainage or adequately stable vegetated areas.	Supervisor / Environmental Site Representative	Duration
2. Immediately line any constructed off-site water diversion with appropriate RECP's, OFM's and/or geobinders. Temporary spillways and associated structures to be suitably stabilised for the volume and turbulence of flows.	Supervisor / Environmental Site Representative	Duration
3. Sheet flows in work areas have erosion measures such as surface roughening, scribed drains and/or contour banks to reduce slope lengths. Flows from diversions to have velocities controlled and directed to sediment controls.	Supervisor / Environmental Site Representative	Duration
4. Temporary 'dirty' water drainage will be adjusted progressively to maximise flows to sediment filters and traps.	Supervisor / Environmental Site Representative	Duration
5. Permanent storm water drains and outlet structures will be stabilised as soon as possible following completion.	Supervisor / Environmental Site Representative	Duration
6. Check dams are to be constructed from geotextile/aggregate bags, sandbags, staked coir logs/straw bales or geotextile/rock formations to reduce flow velocities in unlined drains and other areas of concentrated flow (i.e., against diversion banks). Check dams are to be installed at the required intervals in drains with the frequency of the dams increasing as the grade increases	Supervisor / Environmental Site Representative	Duration
7. Trenching works on grade will be controlled with methods detailed in the 'Blue Book' – Volume 2A' - Section 6	Supervisor / Environmental Site Representative	Duration
8. Flooded excavations, ponded water, etc will be extracted as required and utilised for site purposes or treated to achieve acceptable water quality prior to discharge.	Supervisor / Environmental Site Representative	Duration
9. Flooded excavations and groundwater encountered in ASS areas or potentially contaminated areas will be tested and assessed prior to being extracted for treatment & subsequent discharge or conveyed to a licensed liquid waste facility.	Supervisor / Environmental Site Representative	Duration
10. Site water that is to be discharged directly to a flow line, drain, watercourse, etc, will be tested, treated, and recorded prior to discharge.	Supervisor / Environmental Site Representative	Duration
11. Water quality should meet the following minimum criteria prior to discharge to any waterway or drainage line: • Total suspended solids (TSS) – less than 50 mg/L • pH – 6.5 to 8.5 • oil and grease – not visible and less than 10 mg/L	Supervisor / Environmental Site Representative	Duration
12. Dewatering devices or transfer pumps will be positioned to ensure that settled sediments are not disturbed or extracted. Discharge of concentrated, treated flows to lands will occur in well vegetated areas with diffusers or level spreaders to prevent erosion. Flows transferred from in-stream works to downstream areas be released in a diffused manner.	Supervisor / Environmental Site Representative	Duration

Environmental Management Controls	Person Responsible	Timing / Frequency
13. The appearance of water quality at the discharge outlet will be regularly monitored for any increase in turbidity, and dewatering suspended until acceptable water quality levels are regained	Supervisor / Environmental Site Representative	Duration
14. Adequately designed and constructed concrete washout facilities will be constructed in a suitable location 10m away from drainage lines and 40m from waterways. Concrete wash down to occur directly into lined receptacles or formed washouts.	Supervisor / Environmental Site Representative	Duration
Sediment Controls		
1. Commonly used sediment control devices are outlined in Section 8 – Table 8, and some construction details are shown in the Standard Drawings shown at Appendix F. Alternative controls or methods may be employed in certain circumstances for practicality or efficiency purposes. Alternative controls or methods must demonstrate efficacy and be in accordance with the intent and objectives of the 'Blue Book'.	Supervisor / Environmental Site Representative	Duration
2. Substitute materials may be utilised in the construction of erosion or sediment controls where functionality is not affected.	Supervisor / Environmental Site Representative	Duration
3. Sediment fencing, non-woven geotextile, mulch berms, etc, will be installed on down slope work boundaries, down slope of stockpiles, cut/fill batters, access tracks, etc, to filter sheet flows.	Supervisor / Environmental Site Representative	Duration
4. Sediment filters will be formed from rock & shade cloth/geotextile structures, aggregate & geotextile filter bags, coir logs, etc, to control concentrated on-site water flows as required	Supervisor / Environmental Site Representative	Duration
5. Excavated sediment traps may be utilised at critical locations at the toe of the contributing catchment. They will be desilted at 40% sediment storage capacity and are to be dewatered prior to the onset of further rainfall.	Supervisor / Environmental Site Representative	Duration
6. The excavated sediment traps should be regarded as a secondary control, relying on retention of coarse sediment in upslope controls within the construction area.	Supervisor / Environmental Site Representative	Duration
7. Aggregate filter bags or sandbag inlet traps are to be deployed on roadside pit inlets or other inlets to the drainage system.	Supervisor / Environmental Site Representative	Duration
8. Gully pit inlets will be protected with filter inlet controls formed from sediment fence, filter bags, straw bales & geotextile, coir logs, etc.	Supervisor / Environmental Site Representative	Duration
9. The sediment captured by control devices is to be removed when 40% sediment storage capacity is reached. Regular desilting is also to maintain catchment and settling capacity, and to reduce re-entrainment of settled materials in subsequent rain events.	Supervisor / Environmental Site Representative	Duration

Soil Contamination		
Environmental Management Controls	**Person Responsible**	**Timing / Frequency**
1. Excavation of sub-soils to be inspected and monitored as works proceeds, to identify potential contamination. Any potentially contaminated soils to be stripped or excavated separately and transported directly to the designated stockpile, treatment area or licensed waste facility.	Supervisor / Environmental Site Representative	Duration
2. Potentially contaminated soils are to be stored within an appropriately bunded area and covered with heavy grade plastic or other impermeable covers for the duration of rainfall.	Supervisor / Environmental Site Representative	Duration
3. Potentially contaminated excavated material that are required to be removed from site are to be assessed and classified in accordance with the Protection of the Environment Operations Act 1997 and '*Waste Classification Guidelines: Parts 1 and 2* (DECC 2008)'.	Supervisor / Environmental Site Representative	Duration
4. Excavated soils and materials (that have been assessed, classified, treated, and re-assessed on site) will be re-used as fill material on site where appropriate.	Supervisor / Environmental Site Representative	Duration
5. Vehicles transporting potentially contaminated soils both on internal access tracks and public roads will correctly cover loads to mitigate dust generation or spillage.	Supervisor / Environmental Site Representative	Duration
6. The ground disturbance and machinery/vehicle movements in potentially contaminated areas will be minimised to essential works.	Supervisor / Environmental Site Representative	Duration
7. Earthworks, soil handling and general disturbance in potentially contaminated areas are to be avoided during periods of strong and/or gusty winds.	Supervisor / Environmental Site Representative	Duration
8. Water sprays are to be utilised to mitigate dust from contaminated soils in works areas, contaminated soil handling or temporary stockpile areas.	Supervisor / Environmental Site Representative	Duration
Soil & Water pollution control		
1. All waste will be handled, stored, and disposed of in accordance with the '*Waste Classification Guidelines: Parts 1 and 2* (DECC 2008)'.	Supervisor / Environmental Site Representative	Duration
2. Waste construction materials such as steel, concrete, etc will be removed to an appropriate recycling facility, to a suitable location for appropriate re-use, or to a licensed waste disposal facility.	Supervisor / Environmental Site Representative	Duration
3. All putrescible, construction, and food wastes are to be immediately captured and stored correctly, prior to removal to a licensed waste facility. Putrescibles and food wastes will be removed from site on a least a weekly basis.	Supervisor / Environmental Site Representative	Duration
4. The effluent from concrete wash down is to be captured by an excavated wash out pit lined with an impervious membrane located 10m away from drainage lines and 40m from waterways. The pit is to be protected by a diversion bund to prevent entry of site run-off that may subsequently displace alkaline water/slurry. Concrete washouts to be covered for the duration of significant or prolonged rainfall.	Supervisor / Environmental Site Representative	Duration

Environmental Management Controls	Person Responsible	Timing / Frequency
5. The water levels in concrete washout pits will be monitored and dewatered regularly. The water pH will be tested and treated where it is outside the parameters of pH 6.5-8.5. Where suitable pH is attained, the water can then be used site purposes.	Supervisor / Environmental Site Representative	Duration
6. The site machinery 'lay-up' area, re-fuelling areas and chemical storage areas are to be located at least 5 meters away from major drainage lines.	Supervisor / Environmental Site Representative	Duration
7. The re-fuelling and servicing of machinery is to be undertaken at approved premises off-site where possible. Onsite refuelling and servicing only to occur with appropriate spill control measures at hand, or where established or temporary bunded areas are available.	Supervisor / Environmental Site Representative	Duration
8. Mobile plant, machinery and vehicles are to be regularly inspected and maintained to manufacturer's specifications.	Supervisor / Environmental Site Representative	Duration
9. Appropriate spill kits are to be always kept on site and any spillage is to be immediately cleaned up. In the event of a large or hazardous spill, contact will be made with emergency and relevant authorities, where required.	Supervisor / Environmental Site Representative	Duration
10. All site personnel will be instructed about emergency spill procedures, spill kit locations and requirements. The location of spill response kits will be established close to works or operations areas.	Supervisor / Environmental Site Representative	Duration
11. Storage of liquid construction materials (chemicals, fuels, oils, etc) will be provided in appropriately bunded areas on site to prevent leaching into soils, leaking or other transfer of material into waterways.	Supervisor / Environmental Site Representative	Duration
12. Containment bunds are to be monitored regularly and captured materials removed as required to ensure bund capacity is maintained.	Supervisor / Environmental Site Representative	Duration
13. Bunded areas will satisfy requirements of the relevant Australian Standards and 'Bunding and Spill Management (DEC 1997)'	Supervisor / Environmental Site Representative	Duration
14. The requirements of the Australian Dangerous Goods Code will be observed for storage and transport of any hazardous materials. The compatibility of all chemicals, pesticides and fuels transported and stored will be assessed to avoid potential risk from reactions, explosion, etc.	Supervisor / Environmental Site Representative	Duration
15. All chemicals, pesticides and fuel will be stored and transported in approved containers. Chemicals, pesticides and fuels are to be labelled correctly and clearly, including using approved warning symbols etc.	Supervisor / Environmental Site Representative	Duration
16. A MSDS register and will be maintained and be readily accessible on site for all hazardous chemicals transported, handled, or applied.	Supervisor / Environmental Site Representative	Duration
17. An adequate record or log of all environmentally hazardous chemicals received, used and/or disposed of will be maintained.	Supervisor / Environmental Site Representative	Duration

Environmental Management Controls	Person Responsible	Timing / Frequency
18. Substitution of less hazardous materials or chemicals and modifying methods of use/storage etc. will be implemented where possible.	Supervisor / Environmental Site Representative	Duration
19. The quantities of hazardous materials and chemicals stored or used will be minimised as far as practical.	Supervisor / Environmental Site Representative	Duration
20. Sensitive areas (i.e., drainage lines) will be identified before utilising or applying chemicals. Where sensitive areas are identified, appropriate guidance and relevant restrictions will be formulated for chemical use or applications.	Supervisor / Environmental Site Representative	Duration
21. The application methods and dilution ratios specified in manufacturer's directions and/or associated MSDS will be observed by personnel.	Supervisor / Environmental Site Representative	Duration
Stabilisation		
1. Promote efficient staging planning for early stabilisation of perimeter or completed areas. (i.e., stabilisation of permanent drains, batters, Sealing & paving, and decommissioning of temporary controls)	Supervisor / Environmental Site Representative	Duration
2. Stabilisation of areas is to occur progressively in conjunction with the completion of earthworks.	Supervisor / Environmental Site Representative	Duration
3. Suitable design and construction techniques are to be selected for stabilisation of relevant areas such as drain linings, batter treatments, etc.	Supervisor / Environmental Site Representative	Duration
4. Completed earthworks areas will be backfilled and compacted in a staged manner as soon as possible. Adjacent disturbed areas will be suitably trimmed and stabilised as required.	Supervisor / Environmental Site Representative	Duration
5. Erosion and sediment controls are to be maintained until the relevant catchments are stabilised, re-vegetated, or sealed adequately to achieve soil surface protection factors as per the 'Blue Book', SWMP & ESCP requirements.	Supervisor / Environmental Site Representative	Duration
6. Any aggregate placed for vehicle access or as a work platform should be removed to a suitable location for recycling, appropriate re-use, or to a licensed waste disposal facility.	Supervisor / Environmental Site Representative	Duration
7. Cover crop seeding to occur dependent on the seasonal conditions and timing of final landscaping.	Supervisor / Environmental Site Representative	Duration

Appendix A

Site Characteristics & Revised Universal Soil Loss Equation Assessment

Site Characteristics Table & Revised Universal Soil Loss Equation (RUSLE) Data

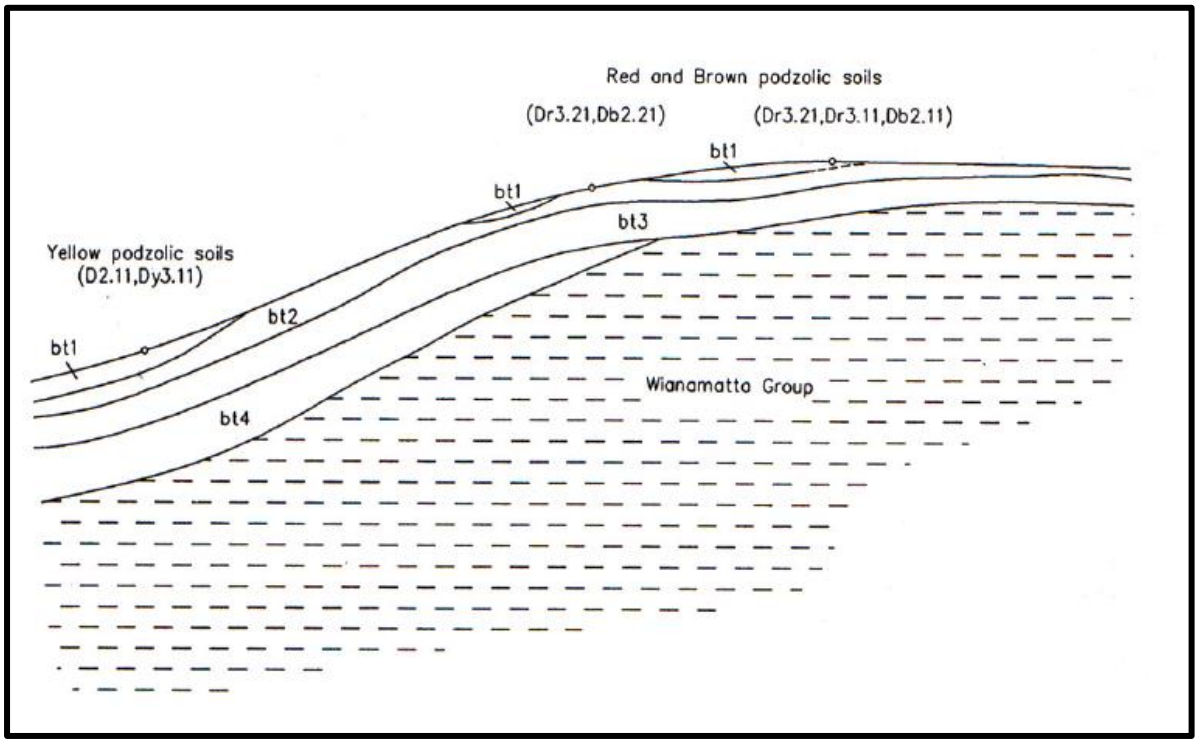
Location	Warehouse 1 (Lot 1) at Aspect Industrial Estate, Kemps Creek
Construction duration	<12 months earthworks – 85th%ile adopted (Sect. 6.3.4 – (f). Blue Book)
Erosion Hazard	Very Low (On slopes <4%) (Sect 4.4.1 & Figure 4.6 – Blue Book)
Soil Loss Class	Class 1 (Very Low on slopes <4% ranging to Moderate on slopes <10%) (Sect 4.4.2. & Table 4.2 – Blue Book)
Batter Restrictions	Yes Generally, >20m batter length @ 2H:1V ranging to >30m @ 3H:1V (Sect 4.4.2 – (a) & Figure 4.7 – Blue Book)
Seasonal erosion hazard	No (Sect 4.4.2 – (c), Figure 4.9 & Table 4.3 – Blue Book)
Soil texture group **'Blacktown' (bt) Soil Landscape:** Moderate to High Erosion Hazard landscape	bt1—Friable brownish black loam.
	bt2—Hard setting brown clay loam.
	bt3—Strongly pedal, mottled brown light clay.
	bt4—Light grey plastic mottled clay.
Soil texture group **'South Creek' (sc) Soil Landscape:** Very High to Extreme Erosion Hazard landscape	sc1—Brown apedal single-grained loam
	sc2—Dull brown clay loam
	sc3—Bright brown clay
USCS Class	Blacktown: ML (Low Plasticity Silts) to CL (Low Plasticity Clays) South Creek: CL (Low Plasticity Clays)
Soil erodibility factor – K factor	Blacktown (bt) Soil Landscape: 0.038 South Creek (sc) Soil Landscape: 0.05 (0.055 Adopted) (Appendix C – Table 19 – Penrith Soil Landscapes – Blue Book)
Sediment Type	Blacktown (bt) Soil Landscape: Type F & D South Creek (sc) Soil Landscape: Type A (Type D Adopted) (Appendix C – Table 19 – Penrith Soil Landscapes – Blue Book))
Soil hydrologic group	Blacktown (bt) Soil Landscape: Group C South Creek (sc) Soil Landscape: Group C & D (Group D Adopted) (Appendix C – Table 19 – Penrith Soil Landscapes – Blue Book))

Site Characteristics Table & Revised Universal Soil Loss Equation (RUSLE) Data

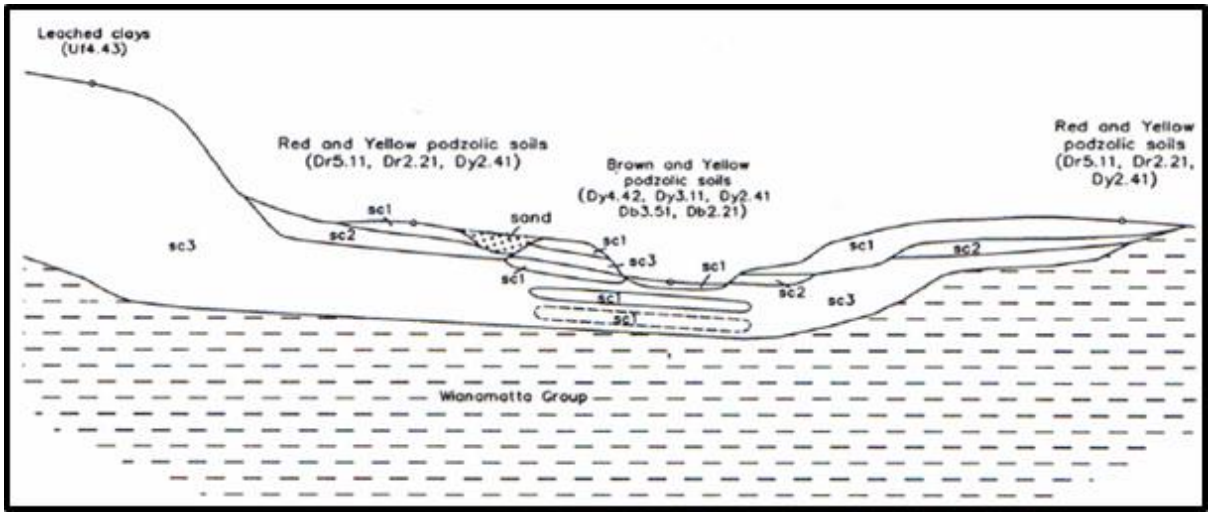
Location	Warehouse 1 (Lot 1) at Aspect Industrial Estate, Kemps Creek
85th %ile, 5-day rainfall event	32.2 mm - Blacktown (Sect 6.3.4 – Table 6.3a - Blue Book)
Rainfall Intensity - millimetres per hour	9.13mm/hour (2 Year, 6 Hour storm – BOM IFD Table)
Rainfall Erosivity – R factor	1892 (Calculated from 2-year ARI, 6 Hour storm, where S=9.13mm/hour and where $R = 164.74(1.1177)\ ^{s}S^{0.6444}$ Blue Book - Appendix A2 & B)
Volumetric runoff coefficient - Cv	0.64 (Blue Book – Appendix F: Table F2
Grade	Blacktown (bt) Soil Landscape - commonly 5% occasionally ranging to 10%) South Creek (sc) Soil Landscape - commonly <5%
Slope Length	80 metres adopted
LS Factor	Variable
Erosion control practice factor – P factor	1.3
Ground cover – C Factor	1.0
Sediment Storage Zone Volume design	2 months soil loss (Sect 6.3.4.- I (ii) - Blue Book)

Typical Soil Profile diagrams

Blacktown (bt) Soil Landscape



South Creek' (sc) Soil Landscape



Appendix B

RUSLE Catchment Assessment & Sediment Basin Calculations

SWMP Commentary, Detailed Calculations

Note: These "Detailed Calculation" spreadsheets relate only to high erosion hazard lands as identified in figure 4.6 or where the designer chooses to use the RUSLE to size sediment basins. The "Standard Calculation" spreadsheets should be used on low erosion hazard lands as identified by figure 4.6 and where the designer chooses not to run the RUSLE in calculations.

1. Site Data Sheet

Site Name: Aspect Industrial Estate

Site Location: Mamre Road, Kemps Creek

Precinct: Stage 1 - Lot 1

Description of Site: 5.75 ha finishing earthworks

Site area	Sub-catchments						Remarks
	1%/80	1%/85					
Total catchment area (ha)	5.75	5.75					
Disturbed catchment area (ha)	5.75	5.75					

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	D	D					From Appendix C
% sand (fraction 0.02 to 2.00 mm)							Soil texture should be assessed through mechanical dispersion only. Dispersing agents (e.g. Calgon) should not be used
% silt (fraction 0.002 to 0.02 mm)							
% clay (fraction finer than 0.002 mm)							
Dispersion percentage							E.g. enter 10 for dispersion of 10%
% of whole soil dispersible							See Section 6.3.3(e). Auto-calculated
Soil Texture Group	D	D					Automatic calculation from above

Rainfall data

Design rainfall depth (days)	5	5					See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	80	85					See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	24.6	32.2					See Section 6.3.4 (h)
Rainfall R-factor (if known)	1892	1892					See Appendix B
IFD: 2-year, 6-hour storm (if known)	9.13	9.13					See IFD chart for the site

RUSLE Factors

Rainfall erosivity (*R*-factor)	1892	1892					Auto-filled from above
Soil erodibility (*K*-factor)	0.055	0.055					
Slope length (m)	80	80					
Slope gradient (%)	1	1					RUSLE LS factor calculated for a high rill/interrill ratio.
Length/gradient (*LS*-factor)	0.19	0.19					
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (*C*-factor)	1	1	1	1	1	1	

Calculations

Soil loss (t/ha/yr)	26	26					
Soil Loss Class	1	1					See Section 4.4.2(b)
Soil loss (m^3/ha/yr)	20	20					
Sediment basin storage volume, m^3	20	20					See Sections 6.3.4(i) and 6.3.5 (e)

4. Volume of Sediment Basins, *Type D* and *Type F* Soils

Basin volume = settling zone volume + sediment storage zone volume

Settling Zone Volume

The settling zone volume for *Type F* and *Type D* soils is calculated to provide capacity to contain all runoff expected from up to the y-percentile rainfall event. The volume of the basin's settling zone (V) can be determined as a function of the basin's surface area and depth to allow for particles to settle and can be determined by the following equation:

$$V = 10 \times C_v \times A \times R_{x\text{-day, y-\%ile}} \ (m^3)$$

where:

10 = a unit conversion factor

C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the x-day period

$R_{x\text{-day, y-\%ile}}$ = is the x-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. (See Sections 6.3.4(d), (e), (f), (g) and (h)).

A = total catchment area (ha)

Sediment Storage Zone Volume

In the detailed calculation on Soil Loss Classes 1 to 4 lands, the sediment storage zone can be taken as 50 percent of the settling zone capacity. Alternately designers can design the zone to store the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(ii)). However, on Soil Loss Classes 5, 6 and 7 lands, the zone must contain the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(iii).

Place an "X" in the box below to show the sediment storage zone design parameters used here:

	50% of settling zone capacity,
X	2 months soil loss calculated by RUSLE

Total Basin Volume

Site	C_v	$R_{x\text{-day, y-\%ile}}$	Total catchment area (ha)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Total basin volume (m^3)
1%/80	0.64	24.6	5.75	905.28	20	925.28
1%/85	0.64	32.2	5.75	1184.96	20	1204.96

Note that designers should achieve a minimum 3:1 length:width ratio in Type D or F basins

Appendix B

Sediment Basin Management & Dewatering Procedure

1.1 Purpose

The purpose of the Sediment Basin Management & Dewatering Procedure (the Procedure) is to detail the actions to be taken in regard to site dewatering in general and specific measures for the construction and maintenance of sediment basins including steps to be taken prior to any discharge.

Adherence to the methodology outlined in procedure will ensure that works are carried out in accordance with industry standard and environmental conditions.

1.2. Scope

The Procedure applies to the following works:

- Sediment basin management and maintenance, and
- Dewatering of excavations and construction water generally, and
- Acid sulfate leachate ponds in the event that acid sulfate soils or rock is encountered.

1.3. Objectives

The objectives of this Procedure are to:

- Ensure all Project personnel are aware of the requirements of this procedure
- Detail personnel responsible for undertaking actions relating to sediment basin, construction dewatering and acid sulfate leachate management on the site:
- Providing a uniform, controlled methodology and clear criteria for water releases from the site:
- Implement industry standard methods for managing sediment basins and dewatering in accordance with best practice guidelines such as Managing Urban Stormwater Soils and Construction (Landcom 2004) and Acid Sulfate Soil Manual (ASSMAC 1998):
- Ensure water discharges from site are compliant with:
    - the NSW EPA Water Quality Criteria,
    - Managing Urban Stormwater Soils and Construction (Landcom 2004),
    - Approved Erosion and Control Plan, and
- Comply with environmental requirements of the Project, including all legal requirements and contractual obligations.

The procedure shall ensure appropriate environmental protection measures are in place relating to sediment basins, construction water management (dewatering of excavations, culverts, etc) and management of leachate collected in ponds from acid sulfate material stockpiles.

2. Sediment Basin Management & Dewatering Procedure

Environmental Management Controls	Person Responsible	Timing / Frequency
Planning		
A copy of this Sediment Basin Management and Discharge Procedure will be kept on site and be made available to all relevant project personnel	Supervisor / Environmental Site Representative	Site Establishment / Duration
All relevant project personnel will be made aware of this document during the site induction and again in Toolbox Talks and targeted training sessions.	Supervisor / Environmental Site Representative	Site Establishment / Duration
Training and Awareness		
Training, instruction and equipment familiarisation for environmental personnel undertaking water quality monitoring, equipment calibration and maintenance will be the responsibility of the Environmental Site Representative. This will be completed prior to the initial use of equipment or as new equipment arrives on site.	Environmental Site Representative	Site Establishment / Duration
Training sessions will be conducted with Supervisors, Foreman, and Environmental Work Crew and relevant personnel. The training will address • Construction of Sediment Basins • Preliminary post-rainfall inspections • Testing and recording • Treatment methods and recording • Details of the Water Discharge Permit • Dewatering requirements, methods, and recording • Maintenance requirements, methods, and recording • Storage, Handling and Application of Flocculants	Supervisor / Environmental Site Representative	Site Establishment / Duration
Any personnel that are responsible for monitoring pumps during dewatering activities, and that have not undertaken training described above, will undertake a specific toolbox talk to ensure awareness of requirements.	Supervisor / Environmental Site Representative	Site Establishment / Duration
Construction of Sediment Basins		
Refer to the relevant PESCPs for the location of the sediment basin/s.	Supervisor / Environmental Site Representative	Site Establishment / Duration
The location and design criteria (volume – length, width & depth) for the sediment basin/s will be outlined in the relevant PESCP. The following criteria will be observed: • All requirements of Landcom's - Managing Urban Stormwater: Soils and Construction Volume 1 (the Blue Book). Refer to Section 6.3.3 volume 1 of the Blue Book for detailed design of the sediment basin. • Impervious clay to be used where required in construction of the internal basin invert and embankments. • Inlet and outlet structures will be appropriately constructed to cater for the nominated rainfall event. • Markers will be present to indicate sediment storage volume and to ensure adequate capacity levels are available.	Supervisor / Environmental Site Representative	Site Establishment / Duration
Sediment basins will be constructed in a way that predominantly only site run-off is collected, and clean water is diverted around them. Earthworks will be conducted in a way so as to avoid ponding of water.	Supervisor / Environmental Site Representative	Site Establishment / Duration

Environmental Management Controls	Person Responsible	Timing / Frequency
The sediment basin/s to be constructed prior to any earthworks or topsoil stripping in the catchment being undertaken. Necessary clearing to access the basin location and associated earthworks will occur with appropriate erosion and sediment controls installed.	Supervisor / Environmental Site Representative	Site Establishment / Duration
Where applicable, the formation of operational sediment basins will be partially or fully constructed in early stages of works and managed as a temporary sediment basin to capture construction runoff.	Supervisor / Environmental Site Representative	Site Establishment / Duration
Effective diversions such as drains, and berms will be implemented to ensure that the diversion of site runoff is maximised to basins during all stages of construction.	Supervisor / Environmental Site Representative	Site Establishment / Duration
Water Quality Testing, Treatment & Criteria for Discharge		
Captured water to be discharged from sediment basins must meet the following criteria: • pH between 6.5 – 8.5 • TSS < 50mg/L and • Oil and grease - no visible trace.	Supervisor / Environmental Site Representative	Duration
<u>Correlation between TSS and Turbidity</u> A correlation between TSS and turbidity may be developed for the basin/s to allow discharge based on turbidity levels. This correlation will be submitted to the relevant Approval Authority for approval prior to implementation. If approved, a TSS sample will be taken from every tenth discharge and tested to confirm compliance with required criteria. These results will be used to check and revise the correlation. If these tests indicate an exceedance of TSS criteria, discharges on the basis of turbidity measurements will be suspended until the correlation can be re-established and approved.	Environmental Manager/ Environmental Site Representative	Duration
Potential contamination of any basin or ponded waters will be considered prior to discharge. Where the main source is from storm water, TSS and oil and grease are considered to be the likely pollutants. Where groundwater is a significant contributing source, influence from ASS/PASS, or other contaminants will be considered as potential pollutants and additional testing in the form of pH and metals may be undertaken.	Supervisor / Environmental Site Representative	Duration
Water Treatment		
The drain inverts upslope from sediment basin inlets will be pre-dosed with suitable flocculants/coagulants (Gypsum or Calcium Chloride broadcast in the drain invert and/or Anionic Polyacrylamide gel blocks suspended in cages in locations of turbulent water flow.) to pre-treat run-off before it enters the basin during rainfall	Supervisor / Environmental Site Representative	Duration
The implementation of rain-activated, passive dosing units will deploy suitable liquid flocculants/coagulants during prolonged rainfall events to promote rapid coagulation/flocculation of sediment laden water in the treatment forebay of sediment basins.	Supervisor / Environmental Site Representative	Duration
Onsite reuse of ponded stormwater or infiltrated groundwater should always be the first dewatering option considered. Onsite reuse may include application for dust suppression, earthworks compaction and vegetation establishment.	Supervisor / Environmental Site Representative	Duration
If water is to be used for construction purposes (e.g., compaction, dust control) no treatment is required. However, the water should be removed to re-secure design capacity of sediment basins within 5 days.	Supervisor / Environmental Site Representative	Duration

Environmental Management Controls	Person Responsible	Timing / Frequency
All sediment basins to be inspected for capacity and water quality daily on workdays and within 24 hours (out of site hours) following cessation of a rain period.	Supervisor / Environmental Site Representative	Duration
Before any de-watering of site areas, excavations, etc, the parameters of pH, T.S.S. and oil and grease are to be tested and meet the following criteria: • pH between 6.5 – 8.5 • TSS < 50mg/L, and • Oil and grease < 10mg/L (and no visible trace). Treatment should commence as soon as practical following cessation of a rain to allow enough time for settlement of suspended solids.	Supervisor / Environmental Site Representative	Duration
Records of water quality management must be maintained, and the required records include: • The date(s) on which the sample was taken, • The time(s) at which the sample was collected, • The name of the person who collected the sample.	Supervisor / Environmental Site Representative	Duration
pH Treatment should be undertaken as follows: • Test basin water with a suitable pH meter. No action is required if the pH reading is between 6.5 and 8.5, • Lime to be added if pH below 6.5 or Hydrochloric Acid (32% Muriatic) or Sulfuric Acid to be added if pH above 8.5, • Determine volume of water to be treated in the sediment basin, • Determine the percentage of lime or acid required by taking a 10-litre sample of basin water and adding a known amount of lime or acid (initially 0.004%). If the pH is still not acceptable, vary the amount of lime or acid until within the limits, • Once the required percentage has been determined, calculate the actual amount of lime or acid to be added by multiplying the volume of water in the basin by the determined percentage, • Add the required amount of lime or acid to the basin and mix the water in the sediment basin well, • Treat for pH prior to T.S.S.	Supervisor / Environmental Site Representative	Duration
Total Suspended Solids • Test the sediment basin water initially for NTU using a turbidity tube, nephelometer (Turbidity tester) or by comparing with water samples contained in jars with representative readings up to 100mg/l. • When the comparative NTU readings indicate T.S.S. levels are <50mg/l obtain a grab sample in accordance with approved sampling methods. The water sample to be promptly analysed by a laboratory that is NATA certified in T.S.S. testing. • No further treatment action is required if T.S.S. results are <50mg/l.	Supervisor / Environmental Site Representative	Duration

Environmental Management Controls	Person Responsible	Timing / Frequency
<u>Total Suspended Solids</u> • Test the sediment basin water initially for NTU using a turbidity tube, nephelometer (Turbidity tester) or by comparing with water samples contained in jars with representative readings up to 100mg/l. • When the comparative NTU readings indicate T.S.S. levels are <50mg/l obtain a grab sample in accordance with approved sampling methods. The water sample to be promptly analysed by a laboratory that is NATA certified in T.S.S. testing. • No further treatment action is required if T.S.S. results are <50mg/l. • If basins require flocculation (e.g. T.S.S. >50mg/l), a flocculant/coagulant is to be utilised at the determined dosage initially, then treated with incremental doses should more flocculant be required. • Basins should be monitored daily after flocculation until desired TSS is achieved and to assist in determination of optimal dosage levels. Methods of application to include: • broadcast by shovels on small sumps and excavations is acceptable. This method requires spreading powdered coagulants (i.e. gypsum, calcium chloride, etc) evenly and thinly (i.e. “dusting”) over as much of the water surface as possible. • For sediment basins or areas with a large water surface area. The powdered or flake style coagulants should be pre-mixed thoroughly in a drum with clean water and sprayed over the maximum surface area of water as possible. • When spraying coagulant mixtures, the mixture should hit the water at between 10 to 20 degrees to increase surface areas exposure to the water column. • Alternative water treatment utilising liquid flocculants/coagulants will require the assessed dosage to be pre-mixed and discharged into the basin. Following dosing, the basin water is to be gently re-circulated for a suitable period (2-4 hours) to allow chemical reaction time, and to keep precipitated flocculant/coagulant in suspension a sufficient time to collect the maximum quantity of fine suspended particles into floc clusters. • The process outlined may need to be repeated if acceptable water quality is not achieved initially. **<u>Oil and Grease</u>** • Examine surface of water for evidence (e.g. sheen, discoloration). • No action if no visual contamination. • Oil absorbent material to be spread if there is contamination (e.g. cell-u-sorb). Leave basins to compensate for 24 to 48 hours.	Supervisor / Environmental Site Representative	Duration

Environmental Management Controls	Person Responsible	Timing / Frequency
After retesting, and once the above field tests indicate, the water quality is acceptable, pumping or siphoning can commence with the water extraction inlet protected to prevent extraction of sediment.	Supervisor / Environmental Site Representative	Duration
Discharging Water		
Where possible ponded water and sediment basin water will be reused on site for compaction, dust suppression, and irrigation.	Supervisor / Environmental Site Representative	Duration
The whole process of water quality management in sediment basins will be completed within 5 days of cessation of a rain period.	Supervisor / Environmental Site Representative	Duration
Water may be discharged from site where the tested water quality meets NSW EPA criteria and the Site Representative gives approval. The discharge outlet will be constructed to prevent erosion and scour.	Supervisor / Environmental Site Representative	Duration
The Supervisor is to ensure that treated water has been re-tested for pH and turbidity (NTU) in-situ immediately prior to discharge.	Supervisor / Environmental Site Representative	Duration
The preferred method for dewatering a sediment basin is by the use of a static siphon system with sufficient flow capacity to discharge the volume of supernatant water within a reasonable timeframe (i.e. 12 to 24 hours). The siphon inlet is to be positioned so that settled sediments are not extracted during dewatering. The siphon system is to be installed above the sediment basin embankment and not within the basin spillway.	Supervisor / Environmental Site Representative	Duration
Where sediment basins are to be dewatered by pump, suitable inlet protection devices (i.e. float & housing or extraction tube) will be provided to prevent the extraction of settled sediments within the basin. The flows from the pump outlet and basin are to be constantly monitored during discharge.	Supervisor / Environmental Site Representative	Duration
Only personnel who have undertaken the relevant training and been approved by the Supervisor may operate pumps and discharge sediment basins. During dewatering pumps must be monitored at all times to ensure that settled sediment is not disturbed or extracted, and that water is discharged in a diffused manner to prevent erosion.	Supervisor / Environmental Site Representative	Duration
A Sediment Basin Management Register will be maintained for each basin that details discharge volumes, dates, water treatment. The Sediment Basin Management Register will be updated when treated water is discharged from the basin.	Supervisor / Environmental Site Representative	Duration
Maintenance		
Maintenance of the sediment basins will be ongoing for the duration of the Project and will comprise the following: • The sediment storage capacity limit will be defined through the installation of a marker inside the basin. Sediment will be removed from the basin in accordance with the maintenance schedule, or when the accumulated sediment exceeds 60% of the sediment storage zone. • Sediment removed from basins may be reused on site by incorporating into spoil. • All sediment that will not be reused on site will be disposed of in locations that it will not be conveyed back into the construction areas or watercourses. • Maintenance inspections will be undertaken and the results incorporated into the Weekly Environmental Inspection Checklist.	Supervisor / Environmental Site Representative	Duration

Environmental Management Controls	Person Responsible	Timing / Frequency
The stormwater capacity of sediment basins will be reinstated within 5 days of the cessation of a rainfall event that causes runoff to occur	Supervisor / Environmental Site Representative	Duration
Assessment and use of Coagulants & Flocculants		
Coagulation is the neutralisation and/or destabilisation of electrical charge on suspended soil colloids, whereas flocculation utilises bridging type interactions involving polyelectrolyte chains adsorbing to multiple colloid particles and aggregates through electrostatic charge interactions. The following procedure will be implemented to determine the suitability and effectiveness of the various water treatment products. • The product will be sourced from a reputable and traceable supplier together with MSDS and any other supporting documentation. • Controlled 'jar testing' will be undertaken using site sourced water from the sediment basin. The jar testing will establish the site-specific dosing rates for any given products. • Initial dosing will be undertaken incrementally up to the site specific/determined dosing rate in the event that the basin water responds to a lower dose in the 'real world' application. • Settling rates in the basin will be assessed to determine the efficiency of each product. • On site water sampling and testing will progressively assess the water's pH and turbidity in NTU's prior to lab testing. • NATA certified lab testing for TSS, NTU & pH will be completed prior to any dry weather/controlled discharge to downstream waterways.	Supervisor / Environmental Site Representative	Duration
The range and type of suitable flocculants/coagulants (including typical dosing rates described as product required to water volume) that may be utilised include: • Calcium Sulphate (Gypsum - powder) – 300ppm (30kg/100m3) • Anionic Polyacrylamide (gel blocks) – 200ppm (20kg/100m3) • Calcium Chloride (solid - flakes), – 200ppm (20kg/100m3) • Aluminium Chlorohydrate (liquid) – 40ppm (4L/100m3) • PAC23 (poly aluminium chloride 23% - solution) - 50ppm (12.5L/100m3) • Aluminium Sulphate (crystals) – 200ppm (20kg/100m3)	Supervisor / Environmental Site Representative	Duration
Storage and Handling of Flocculants		
Environmental Management Controls	**Person Responsible**	**Timing / Frequency**
Gypsum and agricultural lime will be stored on site as either bagged or bulk product. Storage of bulk gypsum and agricultural lime will be covered, within erosion and sediment controls in a position where run on water will not erode the stockpiles.	Supervisor / Environmental Site Representative	Duration
All treatment chemicals particularly acids and basics will be stored in appropriately bunded and covered locations that are locked to prevent unauthorised access.	Supervisor / Environmental Site Representative	Duration
All chemicals on site will be stored with MSDSs for ease of reference in the event of a spill or irritation/injury to handlers.	Supervisor / Environmental Site Representative	Duration
Requirements of the Material Safety Data Sheets (MSDSs) will be met to ensure compatible storage with other chemicals to ensure safety.	Supervisor / Environmental Site Representative	Duration

Monitoring and Record Keeping		
Environmental Management Controls	**Person Responsible**	**Timing / Frequency**
All sediment basins will be inspected on a weekly basis as a minimum, with any defects or maintenance requirements reported immediately. Sediment basins will be inspected immediately after rainfall events to assess: • Water Storage capacity and water quality treatment requirements prior to discharge • Following treatment and discharge from the sediment basin the sediment storage capacity and requirement for clean out will be assessed.	Supervisor / Environmental Site Representative	Duration
Records to be kept of the rainfall events, inspections undertaken, field tests undertaken, dosage rates and when basin water is released etc.	Supervisor / Environmental Site Representative	Duration
The results of all inspections, including inspection reports will be retained in the site environmental inspection register	Supervisor / Environmental Site Representative	Duration
All discharges will be recorded on a discharge permit which will include: • Volume to be discharged • Treatment details (e.g. Coagulant/ flocculant used, dosage, duration and treatment date) • Water quality monitoring results (including date and time of testing) • Discharge water quality results • Date and time of discharge	Supervisor / Environmental Site Representative	Duration
Pumped discharge of any water off site will be monitored regularly to ensure that tested water quality meets all applicable criteria.	Supervisor / Environmental Site Representative	Duration
Decommissioning Construction Sediment Basins		
Construction sediment basins will remain in place until all upstream areas have been stabilised to achieve a 'C' Factor of 0.05 which equates to 70% groundcover as per Blue Book 7.1	Supervisor / Environmental Site Representative	Duration
All operational sediment basins will be desilted and reformed as per design requirements prior to completion of major works within the catchment.	Supervisor / Environmental Site Representative	Duration
Construction Sediment basins will be removed by restoring the ground disturbed by the construction of the basin similar to pre-existing conditions. This will be achieved by: • Removing all redundant basin equipment such as basin markers, siphons, spillway linings, etc. • Spreading and compacting the embankment material in the basin area • Disturbed ground will be compacted to at least the relative density of the material in the ground adjacent to it.	Supervisor / Environmental Site Representative	Duration

3. Procedure Review

The procedure will be regularly reviewed as part of the CEMP audit requirements. This document will be updated when needed in response to audit findings or changes to site conditions. The Environmental Site Representative will modify the procedure where improvements are identified.

Appendix D

Site Dewatering Record

Site Dewatering Record

Date Inspected		Basin/discharge point ID:	
Date of last rainfall event:		Amount of rainfall received:	
Estimated basin level in %?		Approximate volume of water in basin prior to treatment:	
Initial turbidity reading of the basin in NTU's		Initial pH of the basin? (range of 6.5 -8.5 required)	
The initial amount of acid/lime used if pH correction is required.		Date & time of acid/lime dosing	/ / am/pm
Subsequent amount of acid/lime used if pH correction is required.		Date & time of acid/lime dosing	/ / am/pm

Type of flocculant or coagulant product used (and typical dosing volume)	Yes	No	Flocculant or coagulant product used	Date & time of flocculant or coagulant dosing
Calcium Sulphate (Gypsum - powder) 300ppm (30kg/100m3)				/ / am/pm
Anionic Polyacrylamide (gel blocks) 200ppm (20kg/100m3)				/ / am/pm
Calcium Chloride (solid - flakes) 200ppm (20kg/100m3)				/ / am/pm
Aluminium Chlorohydrate (liquid) 40ppm (4L/100m3)				/ / am/pm
PAC23 (poly aluminium chloride 23% - solution) 50ppm (12.5L/100m3)				/ / am/pm
Aluminium Sulphate (crystals) 200ppm (20kg/100m3)				/ / am/pm

Turbidity reading of the basin in NTU's		Laboratory TSS Result: (if applicable)	
Time and Date of dewatering (i.e. siphon valve opened for discharge or commencement of pump operation)			/ / am/pm
Supervisor responsible for discharge:	Name:		
Date:	Signed:		
Comments? (E.g. next rainfall predicted – slight, moderate, severe?) Was rainfall received during treatment period affecting basin (start a new sheet)			

Appendix E

Wet weather contingency procedure

Wet weather contingency procedure

1.1 Purpose

The purpose of the Wet Weather Contingency Procedure (the Procedure) is to detail the actions to be taken by construction personnel in response to an imminent severe rainfall event as forecast by the Australian Government - Bureau of Meteorology (BOM). The procedure provides guidance for monitoring BOM rainfall & storm event forecasts and other resources, to assist with Project preparations to minimise adverse site impacts where practical.

Adherence to the methodology outlined in procedure will ensure that works for wet weather contingency planning & implementation will be carried out in accordance with contract specifications and to maximise adherence to environmental obligations.

The purpose of the Wet Weather Contingency Procedure is to:

- Identify rainfall events which may cause significant precipitation over the site areas which would result in flash flooding and/or exacerbate erosion and sediment impacts,
- Include monitoring procedures of the Bureau of Meteorology (BOM) weather forecasts to predict severe rainfall events,
- Ensure emergency procedures are developed for the management of work areas, facilities and materials in a severe rainfall event that has the potential to impact areas of the Site,
- Ensure hazardous chemical & fuel/oil storage and stockpile areas are positioned in locations to limit the potential for adverse impacts from major runoff flows and/or flash flooding,
- Outline control measures for the protection of water quality in the event of a flood over the site,
- Ensure progressive stabilising methods for areas that may be potentially affected by flash flooding and/or significant scouring & erosion are implemented.

1.2. Scope

The Procedure applies to the following:

- Weather forecast monitoring and works planning,
- Implementation, monitoring and maintenance of erosion and sediment controls,
- Stockpile and hazardous materials storage,
- Sediment basin management, dewatering and maintenance.

1.3. Objectives

The objectives of this Procedure are to:

- Ensure all Project personnel are aware of the requirements of this procedure,
- Detail personnel responsible for undertaking actions relating to works planning, erosion and sediment control management, sediment basin management & construction dewatering on the site,
- Comply with environmental requirements of the Project, including all legal requirements and contractual obligations.

2. Wet Weather Contingency & Management

Environmental Management Controls	Person Responsible	Timing / Frequency
Planning		
A copy of this Wet Weather Contingency Procedure will be kept on site and be made available to all relevant project personnel	Supervisor / Environmental Site Representative	Site Establishment / Duration
All relevant project personnel will be made aware of this document during the site induction and again in Toolbox Talks and targeted training sessions.	Supervisor / Environmental Site Representative	Site Establishment / Duration
Training and Awareness		
Training & instruction of site personnel will be the responsibility of the Environment Manager/ Environmental Site Representative.	Environmental Site Representative	Site Establishment / Duration
Training sessions will be conducted with Supervisors, Foreman, Environmental Work Crew, and relevant personnel. The training will address • Weather forecast monitoring procedures and interpretation of forecasting by BOM and other sources • Site erosion and sediment control status and high-risk areas • Roles and responsibilities for wet weather preparation • Temporary measure selection for augmentation or additional ERSED measures • Pre & post-rainfall inspections and recording • Dewatering requirements, methods and recording • Identification of stabilisation and rectification works required.	Supervisor / Environmental Site Representative	Site Establishment / Duration
Identification of significant rainfall events		
The daily BOM forecasts for the local area are issued each morning and late afternoon. The forecasts will be monitored daily, at the start of the shift and prior to shut down. The BOM three-day forecast outlook will be reviewed daily.	Supervisor / Environmental Site Representative	Duration
BOM forecasts indicating a high likelihood of storm fronts or rainfall events of >10mm with an occurrence probability of more than 50% will be regarded as a potential rainfall event.	Supervisor / Environmental Site Representative	Duration
In periods of forecast storm weather or likely rainfall events, the tracking and intensity of approaching weather fronts is to be monitored regularly (where possible) to anticipate the time of the onset of wet weather.	Supervisor / Environmental Site Representative	Duration
Wet Weather Management Procedures		
Where a potential rainfall event is deemed likely in the BOM three-day outlook, Project personnel are to review the scope and progress of existing and imminent site works to determine high risk areas and prioritise works to stabilise the nominated areas. High risk works include culvert works, scour protection installation, permanent drainage installation, trenching on grade, and sediment basin construction or maintenance.	Project Manager / Senior Engineer / Supervisors / Environmental Site Representative	Duration

Environmental Management Controls	Person Responsible	Timing / Frequency
Wet Weather Management Procedures		
The high-risk work areas that are identified will be managed by: • Completion and temporary/permanent stabilisation of the high-risk work areas where time & resource constraints allow, prior to the onset of the potential rainfall event. • Re-allocating resources from low-risk activities to assist with completion of high risk works prior to the onset of a rainfall event. • Implementation of erosion controls in high-risk areas to minimise sediment control requirements. Erosion controls will be employed such as: o temporary geotextile linings or soil binders will be installed around culverts, scour protection works and drain junctions, o sandbag check dams, rock baffles, trench stops, etc will be utilised in open trenching on grade, temporary diversion drains, or concentrated flow paths over unstabilised areas.	Project Manager / Senior Engineer / Supervisors / Environmental Site Representative	Duration
The site sediment controls, and sediment basins are to be inspected and any necessary rectification works undertaken such as: • Sediment basins are to be managed in accordance with Sediment Basin Management Procedure to regain the maximum runoff capacity parameters, where possible, • Sediment traps and filters to be desilted where more than 40% storage capacity is exceeded, • Spillways and discharge points from sediment traps to be inspected and reinstated as required. • Sediment fences, mulch bunds, earth berms to be inspected and repairs or reinstatement implemented as required.	Supervisor / Environmental Site Representative	Duration
The chemical, fuel, and other hazardous material storage areas to be inspected to ensure their location is protected from the ingress of rainfall or concentrated overland flows. Bund controls to be inspected and accumulated liquids or other residues removed to a controlled waste location on site or for offsite disposal at licensed premises.	Supervisor / Environmental Site Representative	Duration
Following the onset of a significant storm event or rainfall event, the site controls to be inspected as soon as site conditions and safety requirements allow. The inspection to focus on high-risk areas to review the function and status of the installed erosion and sediment controls.	Supervisor / Environmental Site Representative	Duration
Post-Rainfall/Storm Procedure		
The Post Rainfall Inspection will be conducted in accordance with the PESCP. The identified high-risk areas will be prioritised for any rectification or maintenance works, followed by areas with lower risk.	Supervisor / Environmental Site Representative	Duration
Records detailing the necessary works to reinstate the controls will be conducted in accordance with the PESCP.	Supervisor / Environmental Site Representative	Duration
Sediment basins are to be managed in accordance with Sediment Basin Management Procedure. Flocculation of the sediment basins may occur soon after the cessation of a rainfall event to improve the water quality parameters in circumstances where further significant rainfall is anticipated.	Supervisor / Environmental Site Representative	Duration

Environmental Management Controls	Person Responsible	Timing / Frequency
High risk work areas that are inundated will be prioritised for dewatering by: • Dewatering to a sediment basin where sufficient capacity is available, • Flocculated in-situ and discharged at a licensed discharge point when EPA water quality parameters are attained, • Dewatered by water cart and utilised for construction purposes.	Supervisor / Environmental Site Representative	Duration
Repair and reinstatement of erosion and sediment controls to be implemented as site conditions allow, proceeding from high-risk areas to lower risk areas on site.	Supervisor / Environmental Site Representative	Duration

3. Procedure Review

The procedure will be regularly reviewed as part of the CEMP audit requirements. This document will be updated when needed in response to audit findings or changes to site conditions. The Project Environmental Representative in consultation with the Client will modify the procedure where improvements are identified.

Appendix F

Progressive Erosion and Sediment Control Plan

NOTES - Administration & General

1. This progressive plan is to be read in conjunction with the SWMP, CEMP, relevant specifications, and procedures.
2. Works programming to maximise the mitigation of erosion by the early implementation of permanent drainage measures, temporary and permanent soil surface stabilisation measures, and minimising the area and duration of soil disturbance.
3. Bureau of Meteorology weather forecasting to be monitored daily for the local 7-Day weather outlook. Site management measures to be planned for imminent storm/rainfall/flood/wind events include, but are not limited to:
   - avoiding additional soil disturbance immediately prior to an event,
   - provision of additional erosion and sediment controls in critical locations,
   - installing, repairing, and/or adjusting 'clean' (off site water) and 'dirty' (on site) water drainage measures,
   - desilting and re-instating sediment controls as required,
   - implementing stockpile protection measures,
   - stabilising and sealing disturbed soil surfaces,
   - minimising dry soil handling in windy conditions,
   - evacuating or protecting erodible materials in lower lying area.
4. The plan is to be revised as necessary (i.e., progression of works, altered site conditions or weather). **The controls depicted are subject to staging and the controls may be progressively implemented or removed according to progression of works. The symbols depicting controls are not to scale and are only indicative of the general location and type of control selected.**
5. All erosion and sediment controls generally to be constructed in accordance with `Blue Book' specifications and standard drawings & RMS Specifications being
   - MANAGING URBAN STORM WATER: SOILS AND CONSTRUCTION - 4th EDITION, LANDCOM, MARCH 2004
   - MANAGING URBAN STORM WATER: SOILS AND CONSTRUCTION – VOLUME 2D MAIN ROAD CONSTRUCTION, DEC, 2008
6. Substitute materials may be utilised in the construction of erosion or sediment controls where functionality is not affected, i.e. compacted mulch bunds in place of sediment fences, stabilised earth Berms in place of excavated drains near underground services or timber pegs in place of star pickets where electrical or gas.
7. Personnel constructing controls to have demonstrated competence and experience. Specific awareness training and workshops to be undertaken by personnel with direct involvement with erosion and sediment control. Toolbox talks to regularly focus on erosion and sediment control for specific works, associated risks, potential impacts, and mitigation measures.
8. All existing vegetated or undisturbed areas outside of the works area to be regarded as "No Go" zones and to be delineated with fencing, tape or other markers, as required. All site personnel to be instructed to avoid "No Go" zones or damaging installed controls.

Erosion Control

9. Prior to commencement of significant works, install surface drains, sediment traps, sumps & filters, and other surface runoff control measures to control runoff onto, across, and from the works zones to prevent the loss of sediment from the site.
10. Construction zones in constrained areas to be managed in smaller, defined sub-catchments to reduce slope lengths and minimise sediment loads to boundary controls.
11. Stripped topsoil to be stripped and stockpiled generally as per SD 4-1. Any viable stripped topsoil to be stored in stockpiles, preferably less than two metres in height.
12. Short term on-site stockpiles to be located away from drains and flow lines and be controlled with sediment fence or storm covers.
13. Any significant (long & steep) cut/fill batters should be progressively overlaid with Rolled Erosion Control Products (RECP's such as jute mesh, coir fibre mesh, etc), mulching, Organic Fibre Mulches (OFM's) or geobinders to reduce erosion and rilling, prior to permanent stabilisation with cover crops, mulching, or other long-term surface protection
14. Vehicles transporting bulk materials on public roads are to correctly cover loads to prevent loss of load and/or dust generation.
15. Temporary controls in addition to those shown may be required at strategic locations as required by the progression of works or weather conditions

Water Management (Cont'd)

16. Maximise the interception and diversion of 'clean' (off site water) away from works areas. The 'clean' flows to be conveyed in stabilised drainage lines to suitable discharge points. The flows to be discharged to off-site areas at non-erosive velocities with adequate diffusers, level spreaders, etc. Ensure drainage paths and controls are adjusted as required to maximise the separation of 'clean' (off site) and 'dirty' (on site) water flows through/off site.
17. Flows paths with high velocity flows over unstabilised areas to be controlled with
    - applied soil surface stabilisers i.e., geotextile lining, applied soil binders, coarse rock lining, etc
    - suitably constructed check dams placed at intervals to maximise flow suppression and settling of coarse sediment.
18. Where possible, provide sandbag or other bunding controls at on-site collection points & pit inlets to prevent flows bypassing controls to downslope areas.
19. Protect all existing and constructed inlets to pits & culverts from sediment ingress.
20. Where practical, maintain and/or improve existing stabilised drains to assist in the diversion of 'clean' (off site) flows.
21. Flooded excavations, ponded water, etc. to be extracted where required and utilised for site purposes or treated to achieve acceptable water quality prior to discharge.

Sediment Control

22. The installation of preliminary sediment controls such as perimeter sediment fencing, excavated sediment traps, check dams, coir log filters, etc, will be implemented prior to soil disturbance within the catchment.
23. Accumulated water in sediment traps/sumps cannot be pumped, discharged, or released from site without completing a dewatering checklist or approval by an authorised Site Manager.
24. Appropriate sediment tracking controls such as an aggregate/geotextile apron, shaker grid, etc. will be installed at exit points from the site. Personnel to monitor roadways & tracked sediments to be removed as required.
25. Personnel to ensure visual dust monitoring is maintained during works, and dust suppression is undertaken regularly. Dust control to be regularly conducted with water carts and soil stockpiles to suitably covered. Additional dust suppression measures to be utilised to minimise dust pollution during periods of high winds.
26. Temporary 'dirty' water drainage will be adjusted progressively to maximise flows to sediment control devices.

Contamination

29. Excavation of sub-soils to be inspected and monitored as works proceeds, to identify potential contamination. Any potentially contaminated soils to be stripped or excavated separately and transported directly to the designated stockpile, treatment area or licensed waste facility.
30. Potentially contaminated soils are to be stored within an appropriately bunded area and covered with heavy grade plastic or other impermeable covers for the duration of rainfall.
31. Ground disturbance and machinery/vehicle movements in potentially contaminated areas will be minimised to essential works.

Monitoring & Reporting and Inspection & Maintenance

32. Inspections of erosion and sediment controls will occur following rainfall events >10mm (daily on workdays or as soon as practical during site shutdown periods), with any necessary repairs implemented as soon as possible.
33. Relevant checklists and records to be maintained noting details such as rainfall received, repairs to controls and amounts of sediments cleaned from controls.
34. Sediment traps, sumps and filters are to be desilted when 60% of storage capacity is reached.
35. All site personnel to report any spill, leaks, or other failure to relevant response staff as soon as possible.

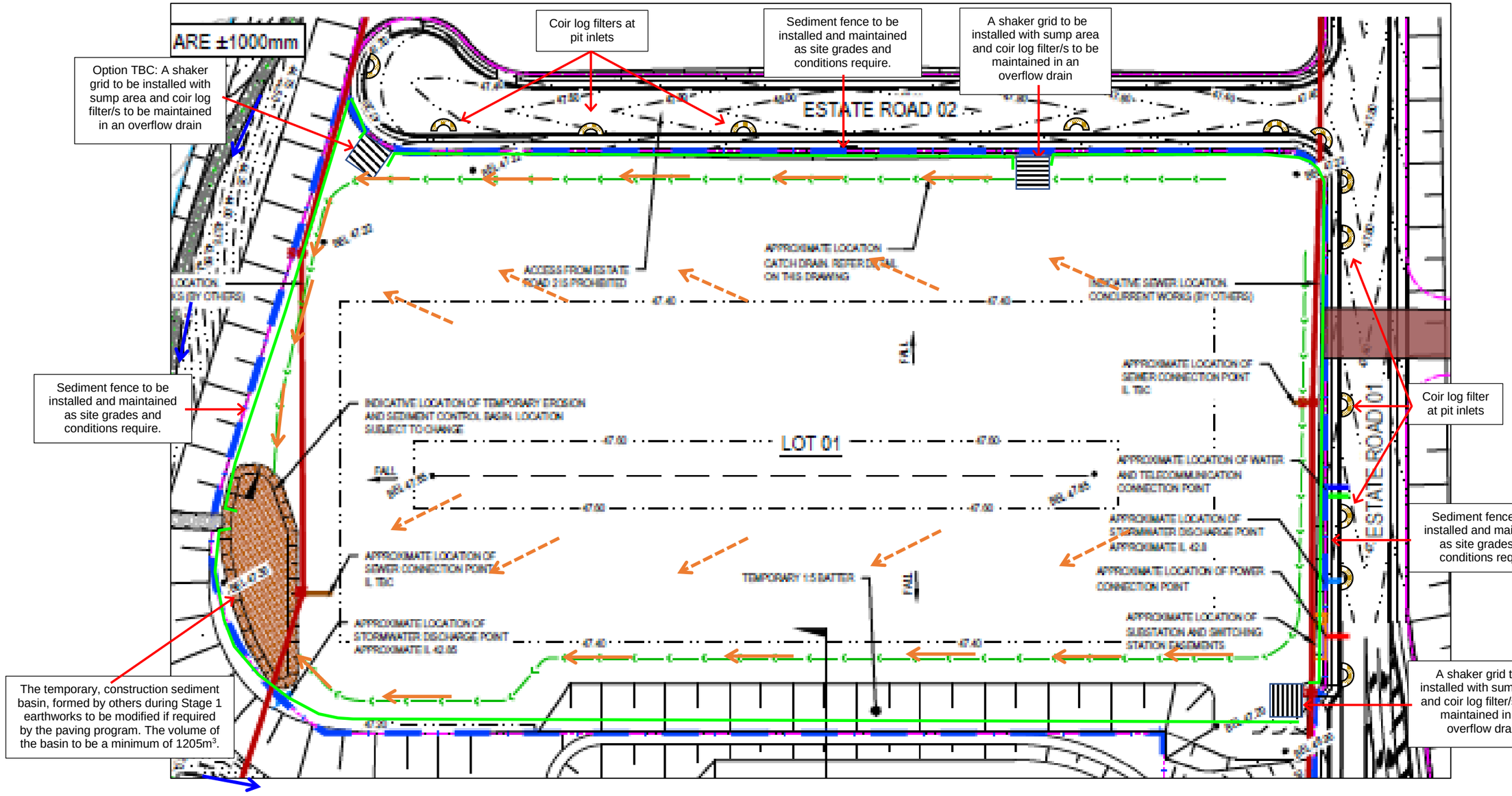
Stabilisation

36. Erosion and sediment controls are to be maintained until the relevant catchments are stabilised, re-vegetated, or sealed adequately to achieve soil surface protection factors as per the 'Blue Book' and SWMP requirements.
37. Completed earthworks areas will be backfilled and compacted in a staged manner as soon as possible. Adjacent disturbed areas will be suitably trimmed and stabilised as required.
38. Stabilisation of areas is to occur progressively in conjunction with the completion of earthworks.
39. Areas subject to heavy compaction and disturbance from vehicle movements and machinery to be scarified to a depth >100mm prior to topsoiling and seeding.

Version	Drawn by	Date	Signed	Reviewed by	Date
01	A. Littlewood	15/08/2022			

Stage 1 – Site establishment and preparatory earthworks

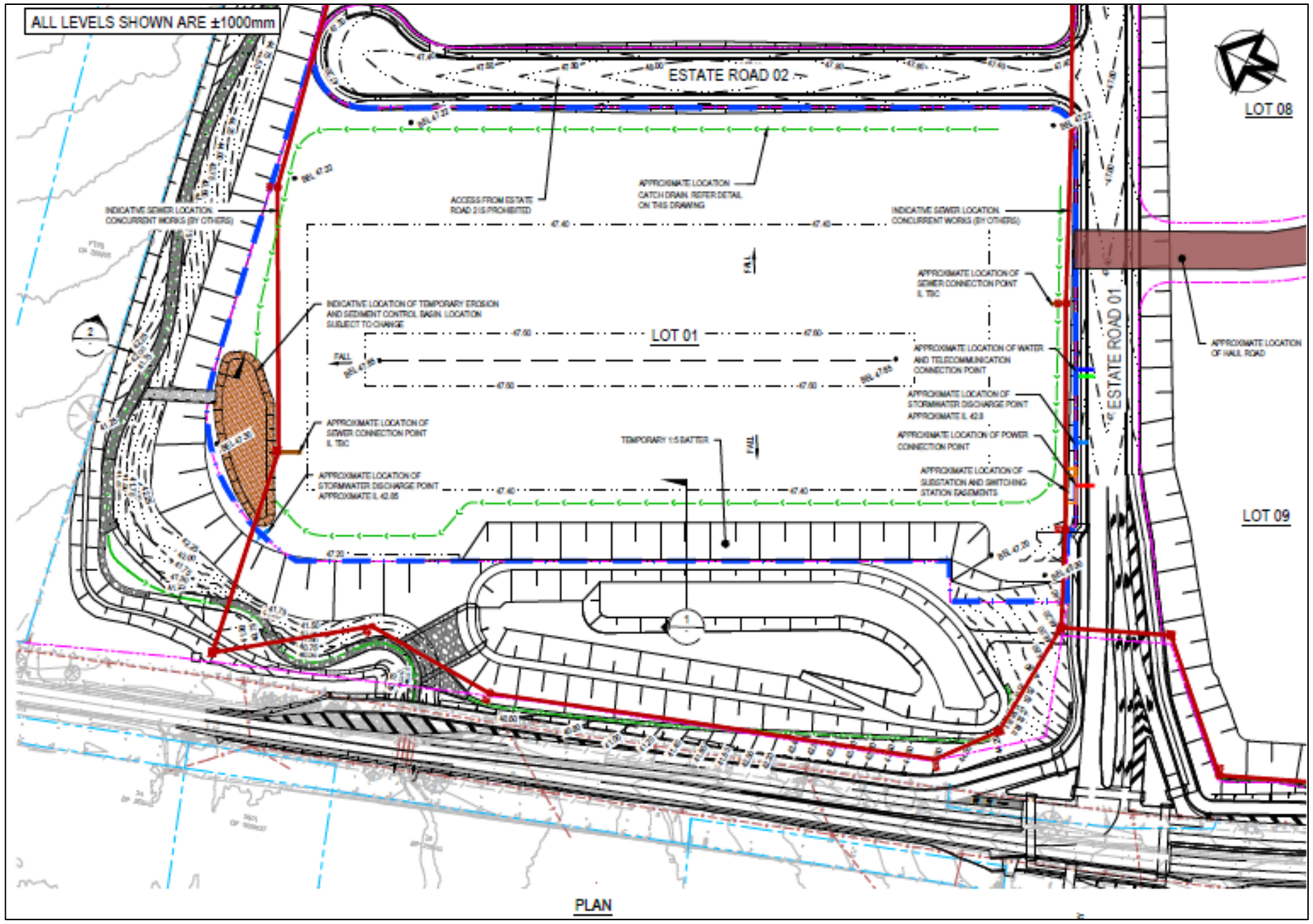
(The drawing reproduced below is Drawing 18-596-C1860 extracted from AT&L's Lot 1 Principal Works Plan - issued 29/06/2022.)



Legend											
Off Site Water – Sheet Flows		Piped Drainage		Stabilised Topsoil Berm (geo/jute/seed)		Sediment basin / large sump		Sediment Fence Geotextile Apron		Geotextile pit filter	
Off Site Water – Concentrated Flow/Drain		Off-site & onsite water cross-over		Geo-lined drain		Filter bag sediment trap		Mulch bund		Vegetated filter	
On Site Water - Concentrated Flow/Drain		'Off site' water exclusion bank		Rock lined drain		Compacted Mulch / Rock & Geotextile / topsoil sediment trap		Coir Log / Straw bale filter		Stabilised site access / Shaker / Wheel wash	
On Site Water – Sheet Flows		Level Spreader / Diffuser/ Geo spillway		Coarse rock / sandbag check dam		Excavated sediment trap with spill weir		Filter bag or sediment fence inlet filter		Stabilised Haul Road/Access Track/ Piling pad/Piped crossing	

Stage 2 – Construction & Paving

(To be developed)

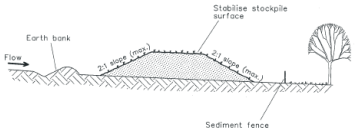


PLAN

Legend											
Off Site Water – Sheet Flows		Piped Drainage		Stabilised Topsoil Berm (geo/jute/seed)		Sediment basin / large sump		Sediment Fence Geotextile Apron		Geotextile pit filter	
Off Site Water – Concentrated Flow/Drain		Off-site & onsite water cross-over		Geo-lined drain		Filter bag sediment trap		Mulch bund		Vegetated filter	
On Site Water - Concentrated Flow/Drain		‘Off site’ water exclusion bank		Rock lined drain		Compacted Mulch / Rock & Geotextile / topsoil sediment trap		Coir Log / Straw bale filter		Stabilised site access / Shaker / Wheel wash	
On Site Water – Sheet Flows		Level Spreader / Diffuser/ Geo spillway		Coarse rock / sandbag check dam		Excavated sediment trap with spill weir		Filter bag or sediment fence inlet filter		Stabilised Haul Road/Access Track/ Piling pad/Piped crossing	

Appendix F
Standard drawings

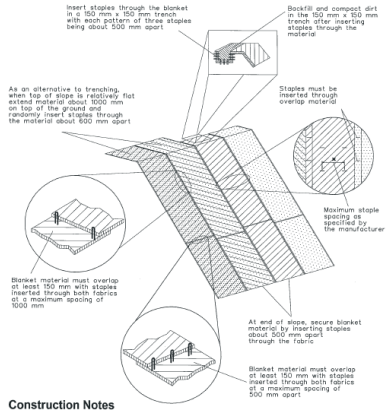
Standard Drawings



Construction Notes

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

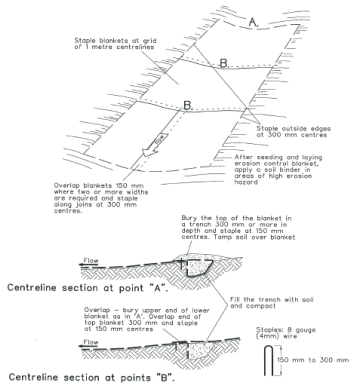
STOCKPILES **SD 4-1**



Construction Notes

1. Remove any rocks, clods, sticks or grass from the ground surface before laying the matting.
2. Spread topsoil to at least 75 mm depth.
3. Where appropriate, complete fertilising and seeding on a properly prepared seedbed (Standard Drawing 7-1) before laying the matting.
4. Ensure the fabric can be continuously in contact with the soil by grading the surface carefully first.
5. Lay the matting in "shingle-fashion" with the ends of each upstream roll overlapping the next roll downslope.
6. Ensure sufficient staples are used to maintain a good contact between the soil and the matting.

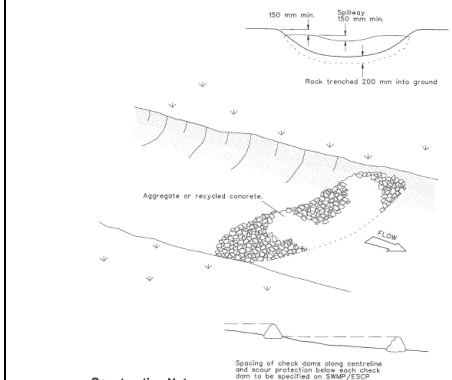
RECP : SHEET FLOW **SD 5-2**



Construction Notes

1. Remove any rocks, clods, sticks or grass from the surface before laying matting
2. Ensure that topsoil is at least 75 mm deep.
3. Complete fertilising and seeding before laying the matting.
4. Ensure fabric will be continuously in contact with the soil by grading the surface carefully first.
5. Lay the fabric in "shingle-fashion", with the end of each upstream roll overlapping those downstream. Ensure each roll is anchored properly at its upslope end (Standard Drawing 5-7b).
6. Ensure that the full width of flow in the channel is covered by the matting up to the design storm event, usually in the 10-year ARI time of concentration storm event.
7. Divert water from the structure until vegetation is stabilised properly.

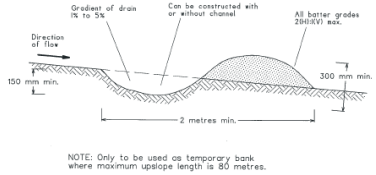
RECP : CONCENTRATED FLOW **SD 5-7**



Construction Notes

1. Check dams can be built with various materials, including rocks, logs, sandbags and straw bales. The maintenance program should ensure their integrity is retained, especially where constructed with straw bales. In the case of bales, this might require their replacement each two to four months.
2. Trench the check dam 200 mm into the ground across its whole width. Where rock is used, fill the trenches to at least 100 mm above the ground surface to reduce the risk of undercutting.
3. Normally, their maximum height should not exceed 600 mm above the gully floor. The centre should act as a spillway, being at least 150 mm lower than the outer edges.
4. Space the dams so the toe of the upstream dam is level with the spillway of the next downstream dam.

ROCK CHECK DAM **SD 5-4**

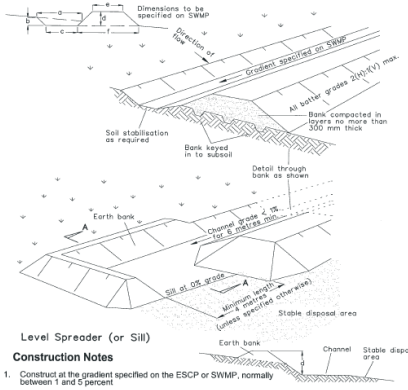


NOTE: Only to be used as temporary bank where maximum upslope length is 80 metres.

Construction Notes

1. Build with gradients between 1 percent and 5 percent.
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V shaped.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction.

EARTH BANK (LOW FLOW) **SD 5-5**

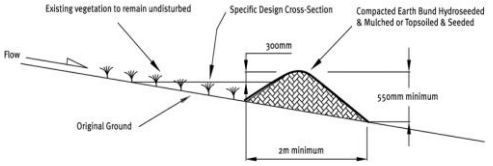


Construction Notes

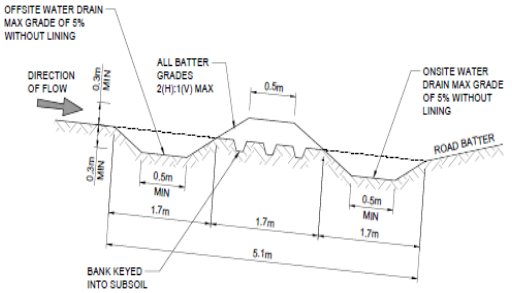
1. Construct at the gradient specified on the ESCP or SWMP, normally between 1 and 5 percent
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V-shaped, at the dimensions shown on the SWMP.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction following Table 5.2 in Landcom (2004).
7. Where discharging to erodible lands, ensure they outlet through a properly constructed level spreader.
8. Construct the level spreader at the gradient specified on the ESCP or SWMP, normally less than 1 percent or level.
9. Where possible, ensure they discharge waters onto either stabilised or undisturbed disposal sites within the same subcatchment area from which the water originated. Approval might be required to discharge into other subcatchments.

EARTH BANK (HIGH FLOWS) **SD 5-6**

Stabilised topsoil diversion bank



Cross Section

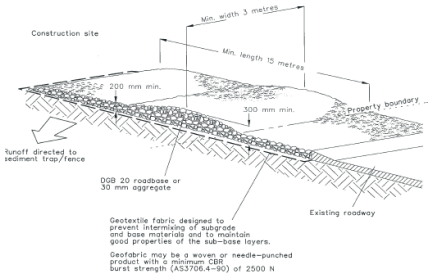


EARTH BANK (ONSITE & OFFSITE COMBINED)
N.T.S.

GENERAL CONSTRUCTION NOTES

1. CONSTRUCT WITH GRADIENT OF 1% TO 5%.
2. AVOID REMOVING TREES AND SHRUBS IF POSSIBLE - WORK AROUND THEM
3. DRAINS TO BE CIRCULAR, PARABOLIC OR TRAPEZOIDAL CROSS SECTION NOT V-SHAPED.
4. EARTH BANK TO BE ADEQUATELY COMPACTED IN ORDER TO PREVENT FAILURE.
5. PERMANENT OR TEMPORARY STABILISATION OF THE EARTH BANK TO BE COMPLETED WITHIN 10 DAYS OF CONSTRUCTION.
6. ALL OUTLETS FROM DISTURBED LANDS ARE TO BE FED INTO A SEDIMENT BASIN OR SIMILAR.
7. DISCHARGE RUNOFF COLLECTION FROM UNDISTURBED LANDS ONTO EITHER A STABILISED OR AN UNDISTURBED DISPOSAL SITE WITHIN THE SAME SUBCATCHMENT AREA FROM WHICH THE WATER ORIGINATED.
8. COMPACT BANK WITH A SUITABLE IMPLEMENT IN SITUATIONS WHERE THEY ARE REQUIRED TO FUNCTION FOR MORE THAN FIVE DAYS.
9. EARTH BANK TO BE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT WILL IMPEDE NORMAL FLOW.

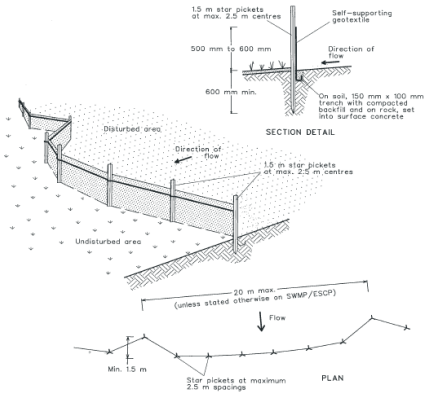
Standard Drawings



Construction Notes

1. Strip the topsoil, level the site and compact the subgrade.
2. Cover the area with needle-punched geotextile.
3. Construct a 200-mm thick pad over the geotextile using road base or 30-mm aggregate.
4. Ensure the structure is at least 15 metres long or to building alignment and at least 3 metres wide.
5. Where a sediment fence joins onto the stabilised access, construct a hump in the stabilised access to divert water to the sediment fence

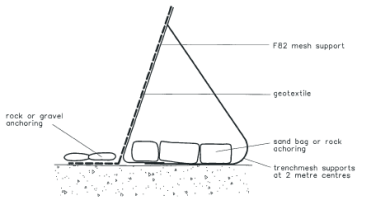
STABILISED SITE ACCESS **SD 6-14**



Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

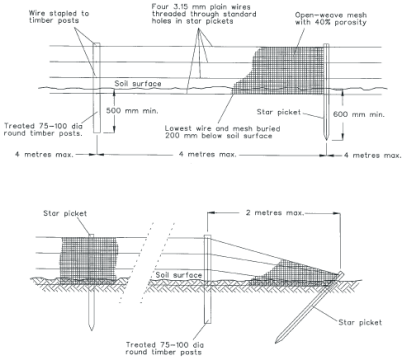
SEDIMENT FENCE **SD 6-8**



Construction Notes

1. Install this type of sediment fence when use of support posts is not desirable or not possible. Such conditions might apply, for example, where approval is granted from the appropriate authorities to place these fences in highly sensitive estuarine areas.
2. Use bent trench mesh to support the F82 welded mesh facing as shown on the drawing above. Attach the geotextile to the welded mesh facing using UV resistant cable ties.
3. Stabilise the whole structure with sandbag or rock anchoring over the trench mesh and the leading edge of the geotextile. The anchoring should be sufficiently large to ensure stability of the structure in the design storm event, usually the 10 year event.

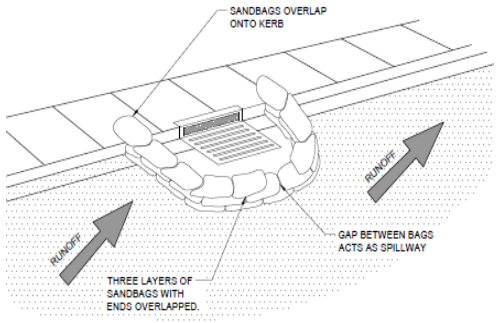
ALTERNATIVE SEDIMENT FENCE **SD 6-9**



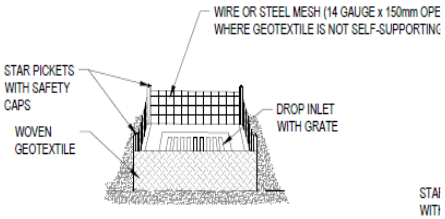
Construction Notes

1. Install the fence to the height specified in the ESCP/SWMP.
2. Cut a channel 200 mm deep along the fence line.
3. Place wire and light resistant, open-weave polymer mesh with 40 percent porosity on the prevailing wind side of fence.
4. Fasten the mesh to all wires using ring fasteners at 100 mm to 150 mm intervals on top wire and 300 mm intervals on other wires.
5. Use one 75-mm to100-mm diameter treated round timber post every 20 metres.
6. Where star pickets are used, ensure they are fitted with safety caps.

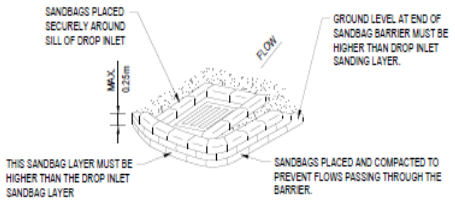
CONTROL OF WIND EROSION **SD 6-15**



SANDBAG SEDIMENT TRAP FOR KERB INLET
N.T.S.

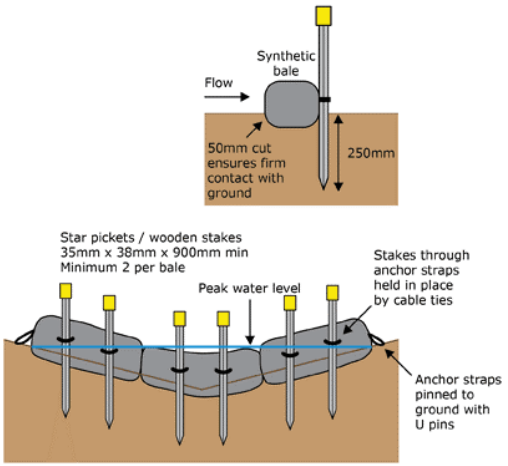


GEOTEXTILE INLET FILTER (SD 6-12) - PERSPECTIVE
NTS

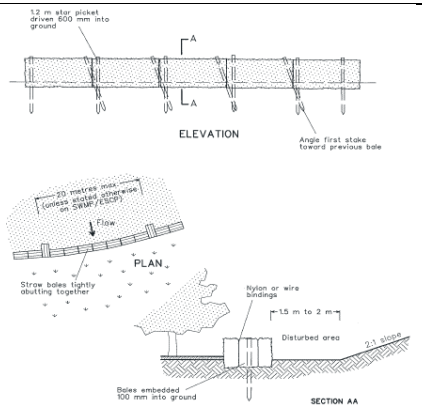


SEDIMENT BARRIER (SD 5-4) DETAIL

Coir Log Filter



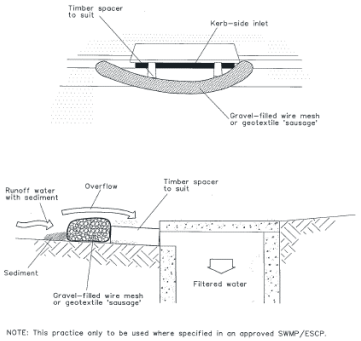
Standard Drawings



Construction Notes

1. Construct the straw bale filter as close as possible to being parallel to the contours of the site.
2. Place bales lengthwise in a row with ends tightly abutting. Use straw to fill any gaps between bales. Straws are to be placed parallel to ground.
3. Ensure that the maximum height of the filter is one bale.
4. Embed each bale in the ground 75 mm to 100 mm and anchor with two 1.2 metre star pickets or stakes. Angle the first star picket or stake in each bale towards the previously laid bale. Drive them 600 mm into the ground and, if possible, flush with the top of the bales. Where star pickets are used and they protrude above the bales, ensure they are fitted with safety caps.
5. Where a straw bale filter is constructed downslope from a disturbed batter, ensure the bales are placed 1 to 2 metres downslope from the toe.
6. Establish a maintenance program that ensures the integrity of the bales is retained - they could require replacement each two to four months.

STRAW BALE FILTER **SD 6-7**

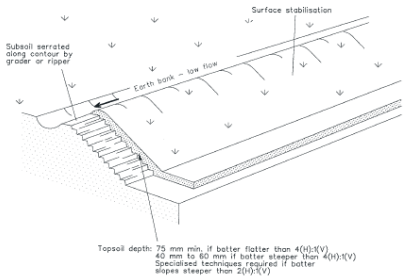


NOTE: This practice only to be used where specified in an approved SWMP/ESCP.

Construction Notes

1. Install filters to kerb inlets only at sag points.
2. Fabricate a sleeve made from geotextile or wire mesh longer than the length of the inlet pit and fill it with 25 mm to 50 mm gravel.
3. Form an elliptical cross-section about 150 mm high x 400 mm wide.
4. Place the filter at the opening leaving at least a 100-mm space between it and the kerb inlet. Maintain the opening with spacer blocks.
5. Form a seal with the kerb to prevent sediment bypassing the filter.
6. Sandbags filled with gravel can substitute for the mesh or geotextile providing they are placed so that they firmly abut each other and sediment-laden waters cannot pass between.

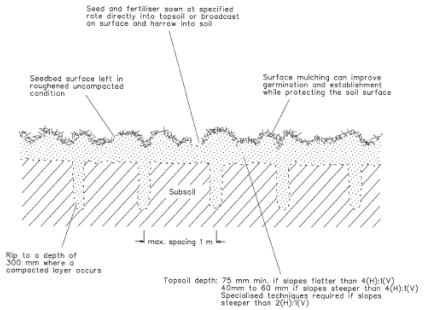
MESH AND GRAVEL INLET FILTER **SD 6-11**



Construction Notes

1. Scarify the ground surface along the line of the contour to a depth of 50 mm to 100 mm to break up any hardsetting surfaces and to provide a good bond between the respread material and subsoil.
2. Add soil ameliorants as required by the ESCP or SWMP.
3. Rip to a depth of 300 mm if compacted layers occur.
4. Where possible, replace topsoil to a depth of 40 to 60 mm on lands where the slope exceeds 4(H):1(V) and to at least 75 mm on lower gradients.

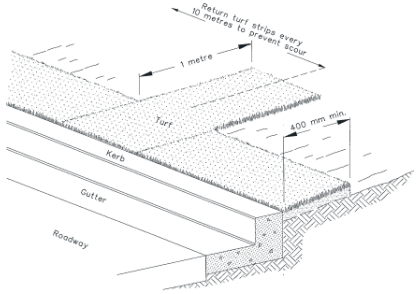
REPLACING TOPSOIL **SD 4-2**



Construction Notes

1. Loosen compacted soil before sowing any seed. If necessary, rip the soil to a depth of 300 mm. Avoid rotary hoe cultivation.
2. Work the ground only as much as necessary to achieve the desired tilth and prepare a good seedbed.
3. Avoid cultivation in very wet or very dry conditions.
4. Cultivate on or close to the contour where possible, not up and down the slope.

SEEDBED PREPARATION **SD 7-1**



Construction Notes

1. Install a 400-mm minimum wide roll of turf on the footpath next to the kerb and at the same level as the top of the kerb.
2. Lay 1.4 metre long turf strips normal to the kerb every 10 metres.
3. Rehabilitate disturbed soil behind the

KERBSIDE TURF STRIP **SD 6-13**