

# EAST COAST GAS EXPANSION – CONSTRUCTION OF COMPRESSOR STATION MW880 AT MILNE (VIA CONDOBOLIN)

## EROSION AND SEDIMENT CONTROL PLAN

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Prepared for:



Prepared by:

ANDREW LITTLEWOOD

CPESC & Senior Soil Conservationist

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Project	East Coast Gas Expansion – Construction of Compressor Station MW880 At Milne (Via Condobolin)
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Document Author	Andrew Littlewood – Senior Soil Conservationist
Qualification	Certified Professional in Erosion and Sediment Control (CPESC No. 5988).
Experience – Years	21 years (2000 – 2021)
Current Employment	Director & Principal - Rubicon Enviro Pty Ltd (2016-2021)
Previous Employment	Senior Soil Conservationist & CPESC – TREES Pty Ltd (2008-2016)
Previous Employment	Erosion and Sediment Control Officer - Lake Macquarie City Council (2000 – 2007)
Professional Affiliations	Member of International Erosion Control Association (Australasia)

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Rubicon Enviro Pty Ltd | ACN: 616 518 211 | P O Box 7111, Redhead NSW 2290 M. 0429 953 626

E. andrew@rubiconenviro.com.au | W. www.rubiconenviro.com.au

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# East Coast Gas Expansion – Construction of Compressor Station MW880 at Milne (via Condobolin) - Primary Erosion and Sediment Control Plan

## **1 Introduction**

This Primary Erosion and Sediment Control Plan (Sub-plan) has been prepared as Attachment 'C' in accordance with the Project Soil and Water Management Plan (SWMP) prepared by EMM Consulting.

The Sub-plan has been prepared to reduce the potential for risk of environmental impacts caused by erosion and sedimentation associated with project activities.

## **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
- Blue Book Volume 2A: Installation of Services – NSW Department of Environment & Climate Change (DECC), 2007
- Blue Book Vol 2c - Unsealed roads – (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.

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### 5 Performance Criteria & SSD 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.

### 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, 4 <sup>th</sup> Edition	NSW Landcom	2004
'Blue Book' - Volume 2A Installation of Services	NSW DECCW	2008
'Blue Book' - Volume 2C - Unsealed roads	NSW DECCW	2008
Noxious and environmental weed control handbook	NSW DPI	2014
Table Drains - Erosion Control Guideline	Brisbane City Council	2001

(Note\* The project site does not contain any waterfront land and therefore the requirements of the 'Guidelines for Controlled Activities on Waterfront Land' – NSW Department of Primary Industries – Office of Water are not considered relevant for Project planning purposes)

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### **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.

#### **7.1 Construction Activities**

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

- Installation of preliminary erosion and sediment controls.
- Establishment of compounds, exclusion zones, stockpile areas, and soils treatment area/s.
- Minor earthworks, site preparation and site access/temporary access roads.
- Trenching and earthworks for service installation.
- In-situ concrete works and concrete curing.
- Operation of internal haulage and access routes.
- Stormwater construction and drainage stabilisation.
- Dewatering 'dirty' water from site areas.
- Importing, handling, stockpiling and transporting materials & resources.
- Compound operation including fuel and chemical storage, refuelling and chemical handling.
- Spills & leaks of fuels & oils from mobile and static machinery.
- Plant maintenance.
- Generation of building and construction waste.
- General putrescible waste from compound/s & works areas.
- Construction camp effluent handling, treatment and irrigation.
- Noxious weed treatment including herbicide spraying.
- Topsoil replacement, revegetation, and stabilisation.
- Landscaping.

#### **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 runoff 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.

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### **7.3 'Blue Book' receiving waters classification**

The recommended minimum design criteria for temporary erosion and sediment control measures are based upon an assessment of the sensitivity of receiving environments. Reference to Modification Report 1 (SSI-15548591) describes the surrounding environmental sensitivity and land uses. In accordance with the Modification Report and SWMP assessment (Appendix 2 of the CEMP), the attributes of the receiving waters in the vicinity of the Project have been assessed as 'standard' in accordance with Blue Book Volume 1- Sect. 6.3.4 – (f) & Volume 2A – Table 5.1. The 5-day - 80th percentile rainfall depth for Nyngan of 20.4mm has been adopted. The high confidence for this rainfall depth is confirmed by referencing the 456mm/year average annual rainfall recorded for Condobolin (SWMP Section 4.4) against the plotted trendlines in Figure 6.6 of the 'Blue Book' – Volume 1.

### **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 control construction/operation/decommissioning, soil handling and storage, water management, stabilisation, and rehabilitation/revegetation of Project areas.
- Inclusion of an erosion and sediment control component to be included in the Project induction.
- 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.
- 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 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 Primary ESCP will be supplemented with Progressive Erosion and Sediment Control Plans (PESCP's) prepared as required for the relevant work areas. 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.

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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 PESCP's will be revised as necessary to address changes in the site conditions and nature of works. The PESCP's will be 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:

- Compound, access, stockpile operations, and construction facilities
- Bulk earthworks for road formation, drainage, services, etc.
- Major off-site and on-site water drainage works or structures such as diversions, drains and treatment/sediment basins
- 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.

### **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.

### **7.7 Inspection and Maintenance**

A self-auditing program will be established by the Contractor 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
- At the conclusion of all rainfall events exceeding 10mm 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.



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### **8. Erosion Control Measures and Sediment Control Methods**

The formulation of the ESCP is based on the assumption 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 watercourses, 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 the 'Blue Book' - Volume 2A: 'Installation of Services' – NSW Department of Environment & Climate Change (DECC), 2007. Commonly employed methods and techniques that may be utilised on the Project are detailed in the following table;

**Table 8**

<b>Erosion Control – Raindrop Impact</b>	
<b>Situation</b>	<b>Control measure or method</b>
Soil surface protection - Vegetation	<ul style="list-style-type: none"><li>• Temporary vegetation (cover crop only)</li><li>• Permanent vegetation – introduced (exotic) pasture species or native (endemic) species</li></ul>
Soil surface protection - Batter protection	<ul style="list-style-type: none"><li>• Organic rolled erosion control products (RECP's) such as jute mesh, jute mat, coir fibre blankets</li><li>• Non-organic RECP's such as non-woven geotextile membrane or heavy grade plastic sheeting.</li></ul>
Soil surface protection - Mulching	<ul style="list-style-type: none"><li>• Hydromulch or hydraulic bonded-fibre matrix</li><li>• Straw mulching with bitumen tack</li><li>• Rock or gravel mulch</li></ul>
Soil surface protection - geobinders	<ul style="list-style-type: none"><li>• Organic tackifiers</li><li>• Co-polymer emulsions</li><li>• Bitumen emulsion</li></ul>

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**Table 8**

<b>Erosion control - Concentrated Water Flow</b>	
<b>Situation</b>	<b>Control measure or method</b>
Up-slope diversions	<ul style="list-style-type: none"> <li>• Excavated channel-type bank</li> <li>• Back push-type bank or windrow</li> <li>• Catch drains</li> </ul>
Soft armour channels	<ul style="list-style-type: none"> <li>• Trapezoidal or parabolic shape design drain cross sections</li> <li>• Organic rolled erosion control products (RECP's) such as jute mesh, jute mat, coir fibre blankets</li> <li>• Non-organic RECP's such as non-woven geotextile membrane or heavy grade plastic sheeting</li> <li>• Organic tackifiers &amp; co-polymer emulsions</li> <li>• Bitumen emulsion</li> <li>• Hydro mulch</li> <li>• Standard or reinforced turf</li> </ul>
Hard armour channels	<ul style="list-style-type: none"> <li>• Loose rock – hard quarry rock</li> <li>• Rock-filled wire mattresses</li> <li>• Grouted rock</li> <li>• Cast in-situ concrete</li> <li>• Underlays utilising heavy grade plastic lining or geotextile lining</li> </ul>
Check dams	<ul style="list-style-type: none"> <li>• Stacked rock</li> <li>• Sandbags and aggregate filter bags</li> <li>• Geotextile covered straw bales</li> <li>• Coir logs</li> </ul>
Batter drainage	<ul style="list-style-type: none"> <li>• Geotextile lined or heavy grade plastic chutes</li> <li>• Pipes and Half pipes</li> <li>• Loose-rock rip rap</li> <li>• Concrete (pre-cast or on-site)</li> <li>• Rock-filled wire mattresses</li> </ul>
Grade control structures and flumes	<ul style="list-style-type: none"> <li>• Geotextile lined or heavy grade plastic chutes</li> <li>• Pipes and Half pipes</li> <li>• Concrete chutes</li> <li>• Loose-rock rip rap</li> <li>• Gully pits and field inlets</li> <li>• Sandbag drop structures</li> <li>• </li> </ul>
Outlet dissipation structures	<ul style="list-style-type: none"> <li>• Loose-rock rip-rap apron diffusers</li> <li>• Rock-filled wire mattresses</li> <li>• Pinned geotextile aprons</li> <li>• Level spreaders</li> </ul>

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**Table 8**

Sediment control - Sheet Flows	
Situation	Control measure or method
Vegetative filters	<ul style="list-style-type: none"> <li>• Turf strips</li> </ul>
Sediment barriers/filters	<ul style="list-style-type: none"> <li>• Sediment fencing</li> <li>• Topsoil berms stabilised with vegetation or geotextile with filter outlets at intervals</li> <li>• Excavated and geotextile lined sediment traps</li> <li>• Geotextile/ shade cloth covered rock or gravel windrows</li> <li>• Coir logs</li> </ul>
Site exit points	<ul style="list-style-type: none"> <li>• Shaker grids with paved or rock aprons and sediment sumps</li> <li>• Wheel wash equipment and designated/controlled areas</li> </ul>
Sediment control - Concentrated Flows	
Sediment traps	<ul style="list-style-type: none"> <li>• Stacked rock with geotextile</li> <li>• Excavated and geotextile lined sediment traps</li> <li>• Straw bale or sand bag structures</li> <li>• Gully pit, field inlet and kerb inlet traps</li> </ul>

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**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**

<b>1. Planning, permits &amp; personnel</b>		
<b>Environmental Management Controls</b>	<b>Person Responsible</b>	<b>Timing / Frequency</b>
1. All necessary licences, permits and approvals required by legislation will be obtained prior to works commencing.	Project Manager / Supervisor / Project HSE Support	Duration
2. Copies of any relevant licences, permits and approvals will be kept on site for inspection upon request or otherwise, as required.	Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment
3. All works and site activities will comply with the explicit requirements of any relevant licence, permit or approval.	Construction Manager / Site Supervisor / Contractor HSE Support	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.	Construction Manager / Site Supervisor / Contractor HSE Support	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 ' <i>Soils and Construction: Managing Urban Stormwater</i> ' 4 <sup>th</sup> Edition. - Landcom 2004.	Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration
6. The CEMP & SWMP & construction PESCP's may be supplemented by site-specific Environmental Management Plans (EMP's) which would be developed in response to a significant environmental issue emerging. The EMP's would outline the relevant environmental risks and issues, mitigation of potential risks, and detail strategies for remediation and/or management.	Construction Manager / Site Supervisor / Contractor HSE Support	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	Construction Manager / Site Supervisor / Contractor HSE Support	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 will be undertaken by personnel with direct involvement with erosion and sediment control.	Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration

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Environmental Management Controls	Person Responsible	Timing / Frequency
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)	Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration
<b>2. Clearing, site establishment, topsoil stripping, stockpiling and bulk earthworks</b>		
1. Exclusion areas ('No Go' zones) to be identified, delineated where practical, and personnel instructed to avoid disturbance in these areas.	Greenfields Project Manager / Project HSE Support	Site establishment
2. Temporary fencing or barricading such as parawebbing or perimeter tape is to be utilised on the perimeter with accompanying signage as required.	Greenfields Project Manager / Project HSE Support	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.	Greenfields Project Manager / Project HSE Support	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.	Greenfields Project Manager / Project HSE Support	Site establishment
5. The extent of earthworks and formation stripping will be demarcated to the footprint necessary for the proposed works. Disturbance outside the earthworks footprint will be limited to necessary operations such as stockpiling, lay downs, etc.	Greenfields Project Manager / Project HSE Support	Site establishment & duration
6. Early establishment of suitable stockpiling and processing areas to reduce unnecessary soil disturbance from double handling of soil by machinery in the early works phase.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration
7. 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment
8. 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration

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Environmental Management Controls	Person Responsible	Timing / Frequency
9. Design and construction of haul roads and temporary watercourse crossings as per Blue Book 2C as a minimum requirement.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration
10. Vegetation will be progressively cleared to minimise disturbance by area and duration. Cleared vegetation to be windrowed parallel to the contour until mulching/removal to control flows across cleared areas	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment
11. Temporary drains, banks or diversions are to be formed and stabilised to divert concentrated 'clean' flows around disturbed works areas.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration
12. During the process of topsoil stripping, the soils should be handled when it is not wet or dry, but sufficiently moist to avoid damage to the soil structure.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment
13. During grubbing and topsoil stripping provide short term, temporary topsoil windrows as upper and mid-slope controls to control 'clean' flows until stabilised 'clean' water drains/berms are installed	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration
14. Strip any viable topsoil in the required locations and stockpile locally where possible. The topsoil will be handled and stored in the correct manner necessary for successful rehabilitation.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration
15. Any viable stripped topsoil to be stored in stockpiles less than two metres in height where possible. The stockpile locations are to avoid concentrated surface flows or areas subject to inundation during wet weather. The height of stockpiles of other soil materials to be minimised where practical and to mitigate wind-blown erosion risks.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration

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Environmental Management Controls	Person Responsible	Timing / Frequency
16. The stockpile locations are to avoid concentrated surface flows or areas subject to inundation during wet weather.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration
17. Temporary stockpiles are to be covered for the duration of high winds, rainfall and/or storm conditions. Long term stockpiles to be cover crop seeded as appropriate to the season.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration
18. The long-term soil stockpile locations are to be located away from major drainage lines, and 5 metres from any waterway. The stockpiles will not be established in areas subject to concentrated surface flows, waterlogging or prolonged inundation during wet weather.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration
19. 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration
20. The use of existing, available materials on-site (i.e. soils, rock, mulch etc) to be salvaged and stored where it can be utilised for temporary or permanent works (where practical) to reduce import requirements.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration
21. Prioritise planning for early and rapid cut-to-fill earthworks in periods of seasonal risk and/or other high-risk areas.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration
22. Where practical, cut earthworks should be staged from the upslope approaches to control dirty water within the excavation (i.e. the excavation proceeds downslope whilst maintaining unexcavated remnant earth as a control bund)	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration

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<b>Environmental Management Controls</b>	<b>Person Responsible</b>	<b>Timing / Frequency</b>
23. Subgrade excavations and engineered fill formations at risk of temporary inundation during flood events may be stabilised with moisture-repelling soil binders.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
24. As the earthworks progress, areas of fill should generally be graded to shed flows away from the edges of fill batters to sediment controls where possible	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
25. Progressively form and maintain lip berms and batter chutes with velocity dams on fill formations	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
26. Maintain minor benches or contour berms on long or steep fill batter formations until profiling for topsoiling is imminent	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
27. 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
28. Earthworks and hauling, and vehicular movements to be limited in wet conditions.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
29. Appropriate sediment tracking controls such as an aggregate/geotextile apron, shaker grid, etc may be installed at exit point/s from the site, where required.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration



**East Coast Gas Expansion – Construction of Compressor Station MW880 at Milne (via Condobolin) - Primary Erosion and Sediment Control Plan**

<b>Environmental Management Controls</b>	<b>Person Responsible</b>	<b>Timing / Frequency</b>
30. The adjoining local road network to be regularly monitored for tracked sediments with affected areas cleaned as soon as possible in a safe manner.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
31. 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
32. Imported quarry product and fill materials required for construction are to be clean, and free of contaminants (ie. weeds, waste, liquids, etc).	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
33. Bunded or controlled areas for re-fueling, material stockpiling, (and contaminated soil treatment area if required) are to be formed prior to commencement of those works in the relevant risk areas.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Site establishment & duration
34. Water carts are to regularly spray access tracks, works areas, & temporary stockpiles, during dry weather conditions.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
35. The progress of earthworks will minimise slope lengths and gradients where practical utilising contour berms, batter berms, diversion banks, etc.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
36. Personnel to ensure visual dust monitoring is maintained during works, and dust suppression is undertaken regularly.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration

East Coast Gas Expansion – Construction of Compressor Station MW880 at Milne (via Condobolin) - Primary Erosion and Sediment Control Plan

<b>Environmental Management Controls</b>	<b>Person Responsible</b>	<b>Timing / Frequency</b>
37. Minimise earthworks, soil handling and general disturbance during periods of strong and/or gusty winds.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
38. Apply water sprays for dust suppression where earthworks, soil handling, rock saw cutting and/or potentially contaminated soils are generating dust.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
<b>3. Drainage and water management</b>		
1. Construct diversion drains or banks upslope of proposed works to direct off-site water flows to existing drainage or adequately stable vegetated areas.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
2. Immediately line any constructed off-site water diversions with appropriate RECP's (i.e. geotextile, plastic, etc.), OFM's (coir matting, jute mesh, etc.) and/or geobinders. Temporary spillways and associated structures to be suitably stabilised for the volume and turbulence of flows.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
4. Temporary 'dirty' water drainage will be adjusted progressively to maximise flows to sediment filters and traps.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
5. Permanent storm water drains, and outlet structures will be stabilised as soon as possible following completion.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration

**East Coast Gas Expansion – Construction of Compressor Station MW880 at Milne (via Condobolin) - Primary Erosion and Sediment Control Plan**

<b>Environmental Management Controls</b>	<b>Person Responsible</b>	<b>Timing / Frequency</b>
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	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
7. Trenching works on grade will be controlled with methods detailed in the 'Blue Book' – Volume 2A' - Section 6	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
11. Water quality should meet the following proposed minimum criteria prior to discharge to any waterway or drainage line: <ul style="list-style-type: none"> <li>• Total suspended solids (TSS) – less than 50 mg/L</li> <li>• pH – 6.5 to 8.5</li> <li>• oil and grease – not visible and less than 10 mg/L</li> </ul>	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration

East Coast Gas Expansion – Construction of Compressor Station MW880 at Milne (via Condobolin) - Primary Erosion and Sediment Control Plan

<b>Environmental Management Controls</b>	<b>Person Responsible</b>	<b>Timing / Frequency</b>
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	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
14. Adequately designed and constructed concrete washout facilities will be constructed in a suitable location away from drainage lines and 40m from waterways. Concrete wash down to occur directly into lined receptacles or formed washouts.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
<b>4. Sediment Controls</b>		
1. Commonly used sediment control devices are outlined in Section 8 – Table 8, and some construction details are shown in the Standard Drawings shown in this ESCP 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'.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
2. Substitute materials may be utilised in the construction of erosion or sediment controls where functionality is not affected.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
3. Sediment fencing, non-woven geotextile, mulch/topsoil berms, etc, will be installed on down slope work boundaries, down slope of stockpiles, cut/fill batters, access tracks, etc, to filter sheet flows.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
4. Sediment filters will be formed from rock & shade cloth/geotextile structures, aggregate & geotextile filter bags, coir logs, compacted mulch formations, etc, to control concentrated on-site water flows as required	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
5. Excavated sediment traps may be utilised at critical locations at the toe of the contributing catchment. They will be desilted at 60% capacity and are to be dewatered prior to the onset of further rainfall.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration

East Coast Gas Expansion – Construction of Compressor Station MW880 at Milne (via Condobolin) - Primary Erosion and Sediment Control Plan

Environmental Management Controls	Person Responsible	Timing / Frequency
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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
7. Aggregate filter bags or sandbag inlet traps are to be deployed on roadside pit inlets or other inlets to the drainage system.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
8. Gully pit inlets will be protected with filter inlet controls formed from sediment fence, filter bags, straw bales & geotextile, coir logs, etc.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
9. The sediment captured by control devices is to be removed when 60% of 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
<b>5. Soil Contamination &amp; Acid Sulphate Soils (ASS)</b>		
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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
2. Potentially contaminated soils or ASS are to be stored within an appropriately bunded area and covered with heavy grade plastic or other impermeable covers for the duration of rainfall.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	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 ' <i>Waste Classification Guidelines: Parts 1 and 2</i> ' (DECC 2008)'.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration

East Coast Gas Expansion – Construction of Compressor Station MW880 at Milne (via Condobolin) - Primary Erosion and Sediment Control Plan

Environmental Management Controls	Person Responsible	Timing / Frequency
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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
5. Vehicles transporting potentially contaminated soils or ASS both on internal access tracks and public roads will correctly cover loads to mitigate dust generation or spillage.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
6. The ground disturbance and machinery/vehicle movements in potentially contaminated areas will be minimised to essential works.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
7. Earthworks, soil handling and general disturbance in potentially contaminated areas are to be avoided during periods of strong and/or gusty winds.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
8. Water sprays are to be utilised to mitigate dust from contaminated soils in works areas, contaminated soil handling or temporary stockpile areas.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
<b>6. Soil &amp; Water pollution control</b>		
1. All waste will be handled, stored and disposed of in accordance with the ' <i>Waste Classification Guidelines: Parts 1 and 2</i> ' (DECC 2008)'.	Site Supervisor / Contractor HSE Support	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.	Site Supervisor / Contractor HSE Support	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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration

**East Coast Gas Expansion – Construction of Compressor Station MW880 at Milne (via Condobolin) - Primary Erosion and Sediment Control Plan**

<b>Environmental Management Controls</b>	<b>Person Responsible</b>	<b>Timing / Frequency</b>
4. Large amounts of concrete, excess to construction requirements, should not be discharged on site. Residual concrete from hoppers and discharge lines is to be blown into a concrete washout and the remainder in the concrete delivery vehicle returned to the supplier's batch plant for recycling.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
5. The effluent from concrete wash down is to be captured by an excavated wash out pit lined with an impervious membrane at least 5 metres away from any waterway or major drainage lines. 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
6. 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
7. 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
8. 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
9. Mobile plant, machinery and vehicles are to be regularly inspected and maintained to manufacturer's specifications.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
10. 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration

East Coast Gas Expansion – Construction of Compressor Station MW880 at Milne (via Condobolin) - Primary Erosion and Sediment Control Plan

<b>Environmental Management Controls</b>	<b>Person Responsible</b>	<b>Timing / Frequency</b>
11. 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
12. 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
13. Containment bunds are to be monitored regularly and captured materials removed as required to ensure bund capacity is maintained.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
14. Bunded areas will satisfy requirements of the relevant Australian Standards and 'Bunding and Spill Management (DEC, 1997)'	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
15. 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
16. 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
17. A MSDS register and will be maintained and be readily accessible on site for all hazardous chemicals transported, handled, or applied.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration



East Coast Gas Expansion – Construction of Compressor Station MW880 at Milne (via Condobolin) - Primary Erosion and Sediment Control Plan

<b>Environmental Management Controls</b>	<b>Person Responsible</b>	<b>Timing / Frequency</b>
18. An adequate record or log of all environmentally hazardous chemicals received, used and/or disposed of will be maintained.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
19. Substitution of less hazardous materials or chemicals or modifying methods of use/storage etc. will be implemented where possible.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
20. The quantities of hazardous materials and chemicals stored or used will be minimised as far as practical.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
21. Sensitive areas (ie. 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
22. The application methods and dilution ratios specified in manufacturer's directions and/or associated MSDS will be observed by personnel.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
<b>7      Stabilisation</b>		
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)	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
2. Stabilisation of areas is to occur progressively in conjunction with the completion of earthworks.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration

**East Coast Gas Expansion – Construction of Compressor Station MW880 at Milne (via Condobolin) - Primary Erosion and Sediment Control Plan**

<b>Environmental Management Controls</b>	<b>Person Responsible</b>	<b>Timing / Frequency</b>
3. Suitable design and construction techniques are to be selected for stabilisation of relevant areas such as drain linings, batter treatments, etc.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
6. Compounds, lay down areas and other areas of heavy construction impact to be restored to an acceptable condition. Destocking, waste removal & cleaning to be followed by scarification, topsoiling and stabilisation.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
7. 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.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
8. Any areas subject to heavy compaction and disturbance from vehicle movements and machinery will be subject to surface roughening and scarification (up to 300mm) to reduce compaction of the upper layer of soil.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
9. Topsoil to be re-used locally within the precincts, with batters prioritised for topsoil application and timely application of soil stabilisers where applicable.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration

East Coast Gas Expansion – Construction of Compressor Station MW880 at Milne (via Condobolin) - Primary Erosion and Sediment Control Plan

<b>Environmental Management Controls</b>	<b>Person Responsible</b>	<b>Timing / Frequency</b>
10. The remaining stored topsoil should be utilised to topsoil disturbed areas, rehabilitate compounds, and haul roads, or be spread to a uniform depth over the disturbed non-structural areas that are of low gradients.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
11. Determine the cover crop mix seed blend suitable to the site & seasonal conditions to provide adequate protection until final landscaping commences.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
12. Lands recently stabilised with cover crops will not be regularly watered except for initial germination or during prolonged hot & dry conditions. During milder seasons the cover crop will be monitored as received precipitation should be adequate.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration
13. Further application of seed may be necessary in latter stages in areas of inadequate vegetation establishment. Pedestrian and vehicular traffic will be restricted from all recently stabilised areas.	Greenfield Project Manager / Construction Manager / Site Supervisor / Contractor HSE Support	Duration

## **Appendix A**

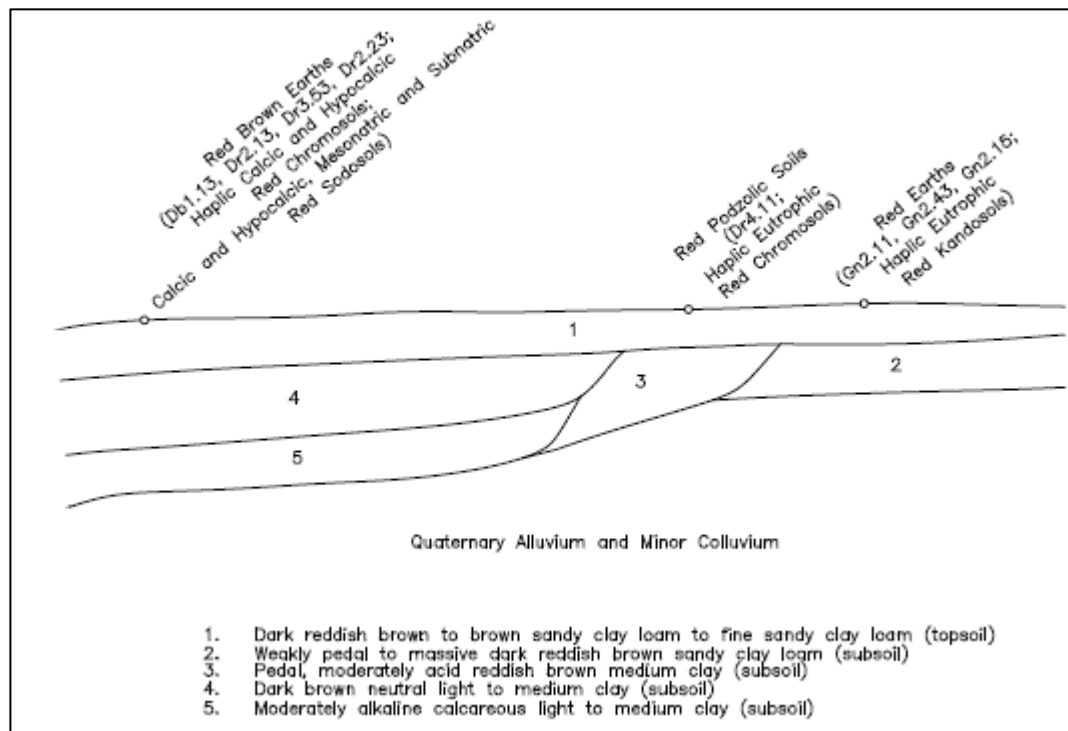
### **Site Characteristics & Revised Universal Soil Loss Equation Assessment**

### **Site Characteristics Table & Revised Universal Soil Loss Equation (Rusle) Data**

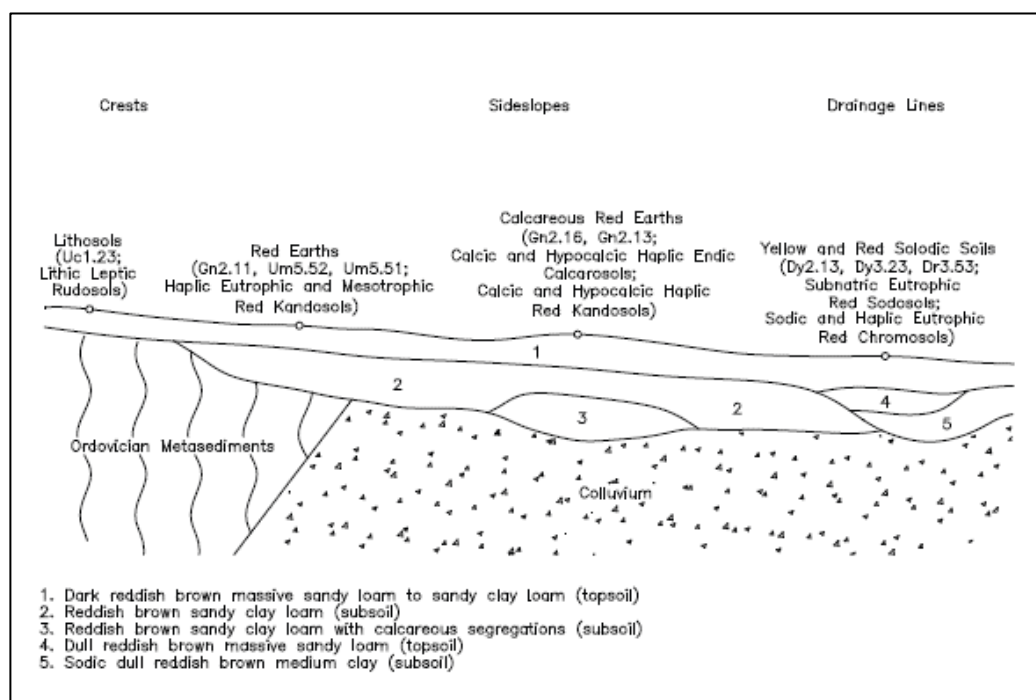
Location	Compressor Station MW880 at Milne (via Condobolin)
Construction duration	<12 months earthworks – 80 <sup>th</sup> ile adopted (Sect. 6.3.4 – (f). Blue Book)
Erosion Hazard	Low (Sect 4.4.1 & Figure 4.6 – Blue Book)
Soil Loss Class	Class 1 (Sect 4.4.2. & Table 4.2 – Blue Book)
Batter Restrictions	No restrictions under 20m batter slope length Generally, >25m batter length @ 2H:1V ranging to >30m @ 2.5H: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 – Please refer to the Project SWMP Section 4.2.5	
Euglo (eg) Soil Landscape:	Please refer to the Project SWMP Section 4.2.5
Weelah (wl) Soil Landscape:	Please refer to the Project SWMP Section 4.2.5
USCS Class	Please refer to the Project SWMP Section 4.2.5
Soil erodibility factor – K factor	0.071- Adopted. Please refer to the Project SWMP Table 4.5
Sediment Type	Type D Adopted - Please refer to the Project SWMP Section 5.1
Soil hydrologic group	Group D Adopted - Please refer to the Project SWMP Table 4.5
80th %ile, 5-day rainfall event	20.4mm – Nyngan (Sect 6.3.4 – Table 6.3a - Blue Book)
Rainfall Intensity - millimetres per hour	5.87mm/hour - Please refer to the Project SWMP Section 4.4.1
Rainfall Erosivity – R factor	990.3 - Please refer to the Project SWMP Section 4.4.1
Volumetric runoff coefficient - Cv	0.50 (Blue Book – Appendix F: Table F2)
Grade	Euglo (eg) Soil Landscape: 0-1% (commonly 0%) Weelah (wl) Soil Landscape: 1-3%
Slope Length	80 metres adopted
LS Factor	0.19 -0.41
Erosion control practice factor – P factor	1.3
Ground cover – C Factor	1.0

## Typical Soil Profile diagrams

### Euglo (eg) Soil Landscape



### Weelah (wl) 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: Oakdale West Estate - Building 2A

Site Location:

Precinct:

Description of Site: Building 2A Construction Area

Site area	Sub-catchments						Remarks
	1%/80	2%/80	1%/85	2%/85			
Total catchment area (ha)	8.05	8.05	8.05	8.05			
Disturbed catchment area (ha)	8.05	8.05	8.05	8.05			

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

Sediment Type (C, F or D) if known:	D	D	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	D	D			Automatic calculation from above

#### Rainfall data

Design rainfall depth (days)	5	5	5	5			See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	80	80	85	85			See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	24.6	24.6	32.2	32.2			See Section 6.3.4 (h)
Rainfall R-factor (if known)	1920	1920	1920	1920			See Appendix B
IFD: 2-year, 6-hour storm (if known)	9.2	9.2	9.2	9.2			See IFD chart for the site

#### RUSLE Factors

Rainfall erosivity (R-factor)	1920	1920	1920	1920			Auto-filled from above
Soil erodibility (K-factor)	0.05	0.05	0.05	0.05			RUSLE LS factor calculated for a high rill/inter-rill ratio.
Slope length (m)	80	80	80	80			
Slope gradient (%)	1	2	1	2			
Length/gradient (LS-factor)	0.19	0.41	0.19	0.41			
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)	24	51	24	51			
Soil Loss Class	1	1	1	1			See Section 4.4.2(b)
Soil loss (m <sup>3</sup> /ha/yr)	19	39	19	39			
Sediment basin storage volume, m <sup>3</sup>	25	53	25	53			See Sections 6.3.4(i) and 6.3.5 (e)



## SWMP Commentary, Detailed Calculations

### 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:

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

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

$R_{x\text{-day}, y\text{-}\%ile}$  = 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:

<input type="checkbox"/>	50% of settling zone capacity,
<input checked="" type="checkbox"/>	2 months soil loss calculated by RUSLE

#### Total Basin Volume

Site	$C_v$	$R_{x\text{-day}, y\text{-}\%ile}$	Total catchment area (ha)	Settling zone volume (m <sup>3</sup> )	Sediment storage volume (m <sup>3</sup> )	Total basin volume (m <sup>3</sup> )
1%/80	0.50	20.4	1	102	2	104
2%/80	0.50	20.4	1	102	5	107
Site	0.50	20.4	3.5	357	8	365
Site	0.50	20.4	3.5	357	17	374

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

## **Appendix C**

### Site Dewatering Procedure

## 1.1 Purpose

The purpose of the Site Dewatering Procedure (the Procedure) is to detail the actions to be taken regarding 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:

- 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 construction water management (dewatering of excavations, culverts, etc) and management of leachate collected in ponds from acid sulfate material stockpiles.

## 2. Site Dewatering Procedure

Environmental Management Controls	Person Responsible	Timing / Frequency
<b>Planning</b>		
A copy of this Site Dewatering 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
<b>Training and Awareness</b>		
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 <ul style="list-style-type: none"> <li>Preliminary post-rainfall inspections</li> <li>Testing and recording</li> <li>Treatment methods and recording</li> <li>Details of the Water Discharge Permit</li> <li>Dewatering requirements, methods and recording</li> <li>Maintenance requirements, methods and recording</li> <li>Storage, Handling and Application of Flocculants</li> </ul>	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
<b>Water Quality Testing, Treatment &amp; Criteria for Discharge</b>		
Captured water to be discharged from site must meet the following criteria: <ul style="list-style-type: none"> <li>pH between 6.5 – 8.5</li> <li>TSS &lt; 50mg/L and</li> <li>Oil and grease - no visible trace.</li> </ul>	Supervisor / Environmental Site Representative	Duration
Potential contamination of any 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 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
<b>Water Treatment</b>		
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.	Supervisor / Environmental Site Representative	Duration

Environmental Management Controls	Person Responsible	Timing / Frequency
<p>Before any de-watering to off-site areas, excavations, etc, the parameters of pH, T.S.S. and oil and grease are to be tested and meet the following criteria:</p> <ul style="list-style-type: none"> <li>• pH between 6.5 – 8.5</li> <li>• TSS &lt; 50mg/L; and</li> <li>• Oil and grease &lt; 10mg/L (and no visible trace).</li> </ul> <p>Treatment should commence as soon as practical following cessation of a rain to allow enough time for settlement of suspended solids.</p>	Supervisor / Environmental Site Representative	Duration
<p>Records of water quality management must be maintained and the required records include:</p> <ul style="list-style-type: none"> <li>• The date(s) on which the sample was taken;</li> <li>• The time(s) at which the sample was collected;</li> <li>• The name of the person who collected the sample.</li> </ul>	Supervisor / Environmental Site Representative	Duration
<p><b>pH</b></p> <p>Treatment should be undertaken as follows:</p> <ul style="list-style-type: none"> <li>• Test water with a suitable pH meter. No action is required if the pH reading is between 6.5 and 8.5</li> <li>• 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</li> <li>• Determine volume of water to be treated.</li> <li>• 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.</li> <li>• 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.</li> <li>• Add the required amount of lime or acid to the basin and mix the water well</li> <li>• Treat for pH prior to T.S.S.</li> </ul>	Supervisor / Environmental Site Representative	Duration
<p><b>Total Suspended Solids</b></p> <ul style="list-style-type: none"> <li>• Test the 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.</li> <li>• When the comparative NTU readings indicate T.S.S. levels are &lt;50mg/l obtain a grab sample in accordance with approved sampling methods promptly analysed by a laboratory.</li> <li>• No further treatment action is required if T.S.S. results are &lt;50mg/l.</li> </ul>	Supervisor / Environmental Site Representative	Duration

Environmental Management Controls	Person Responsible	Timing / Frequency
<p><b><u>Total Suspended Solids</u></b></p> <ul style="list-style-type: none"> <li>If waters require flocculation (e.g. T.S.S. &gt;50mg/l), a flocculant/coagulant is to be utilised at the determined dosage initially, then treated with incremental doses should more flocculant be required.</li> <li>The water should be monitored daily after flocculation until desired TSS is achieved and to assist in determination of optimal dosage levels.</li> </ul> <p>Methods of application to include:</p> <ul style="list-style-type: none"> <li>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.</li> <li>For 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.</li> <li>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.</li> <li>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.</li> <li>The process outlined may need to be repeated if acceptable water quality is not achieved initially.</li> </ul> <p><b><u>Oil and Grease</u></b></p> <ul style="list-style-type: none"> <li>Examine surface of water for evidence (e.g. sheen, discoloration).</li> <li>No action if no visual contamination.</li> <li>Oil absorbent material to be spread if there is contamination (e.g. cell-u-sorb). Leave basins to compensate for 24 to 48 hours.</li> </ul>	Supervisor / Environmental Site Representative	Duration
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
<b><u>Discharging Water</u></b>		
Where possible, ponded water will be reused on site for compaction, dust suppression, and irrigation.	Supervisor / Environmental Site Representative	Duration
The whole process of water quality management will be completed within 5 days of cessation of a rain period.	Supervisor / Environmental Site Representative	Duration

Environmental Management Controls	Person Responsible	Timing / Frequency
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 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.	Supervisor / Environmental Site Representative	Duration
Where ponded waters are to be <u>dewatered by pump</u> , suitable inlet protection devices (i.e. float & housing or extraction tube) will be provided to prevent the extraction of settled sediments. 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 <u>pumps</u> 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
<b>Assessment and use of Coagulants &amp; Flocculants</b>		
<p>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.</p> <p>The following procedure will be implemented to determine the suitability and effectiveness of the various water treatment products.</p> <ul style="list-style-type: none"> <li>• The product will be sourced from a reputable and traceable supplier together with MSDS and any other supporting documentation.</li> <li>• Controlled 'jar testing' will be undertaken using site sourced water. The jar testing will establish the site-specific dosing rates for any given products.</li> <li>• Initial dosing will be undertaken incrementally up to the site specific/determined dosing rate in the event that the water responds to a lower dose in the 'real world' application.</li> <li>• Settling rates will be assessed to determine the efficiency of each product.</li> <li>• On site water sampling and testing will progressively assess the water's pH and turbidity in NTU's prior to lab testing.</li> <li>• Lab testing for TSS, NTU &amp; pH will be completed prior to any dry weather/controlled discharge to downstream waterways.</li> </ul>	Supervisor / Environmental Site Representative	Duration
<p>The range and type of suitable flocculants/coagulants (including typical dosing rates described as product required to water volume)) that may be utilised include;</p> <ul style="list-style-type: none"> <li>• Calcium Sulphate (Gypsum - powder) – 300ppm (30kg/100m3)</li> <li>• Anionic Polyacrylamide (gel blocks) – 200ppm (20kg/100m3)</li> <li>• Calcium Chloride (solid - flakes), – 200ppm (20kg/100m3)</li> <li>• Aluminium Chlorohydrate (liquid) – 40ppm (4L/100m3)</li> <li>• PAC23 (poly aluminium chloride 23% - solution) - 50ppm (12.5L/100m3)</li> <li>• Aluminium Sulphate (crystals) – 200ppm (20kg/100m3)</li> </ul>	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		
Records to be kept of the rainfall events, inspections undertaken, field tests undertaken, dosage rates and when 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: <ul style="list-style-type: none"> <li>• Volume to be discharged</li> <li>• Treatment details (e.g. Coagulant/ flocculant used, dosage, duration and treatment date)</li> <li>• Water quality monitoring results (including date and time of testing)</li> <li>• Discharge water quality results</li> <li>• Date and time of discharge</li> </ul>	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

### 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 Discharge Record**

## **Site Dewatering Discharge Record**

Date Inspected		Discharge point ID:	
Date of last rainfall event:		Amount of rainfall received:	
Estimated basin level in %?		Approximate volume of water prior to treatment:	
Initial turbidity reading of NTU's		Initial pH of the water? (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 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

## 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
<b>Planning</b>		
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
<b>Training and Awareness</b>		
Training & instruction of site personnel will be the responsibility of the Environment Manager/ Environmental Site Representative.	Environmental Site Representative	Site Establishment / Duration
<p>Training sessions will be conducted with Supervisors, Foreman, Environmental Work Crew and relevant personnel. The training will address</p> <ul style="list-style-type: none"> <li>Weather forecast monitoring procedures and interpretation of forecasting by BOM and other sources</li> <li>Site erosion and sediment control status and high-risk areas</li> <li>Roles and responsibilities for wet weather preparation</li> <li>Temporary measure selection for augmentation or additional ERSED measures</li> <li>Pre &amp; post-rainfall inspections and recording</li> <li>Dewatering requirements, methods and recording</li> <li>Identification of stabilisation and rectification works required.</li> </ul>	Supervisor / Environmental Site Representative	Site Establishment / Duration
<b>Identification of significant rainfall events</b>		
The daily BOM forecasts for the Condobolin 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
<b>Wet Weather Management Procedures</b>		
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
<b>Wet Weather Management Procedures</b>		
<p>The high-risk work areas that are identified will be managed by;</p> <ul style="list-style-type: none"> <li>• Completion and temporary/permanent stabilisation of the high-risk work areas where time &amp; resource constraints allow, prior to the onset of the potential rainfall event.</li> <li>• Re-allocating resources from low risk activities to assist with completion of high risk works prior to the onset of a rainfall event.</li> <li>• Implementation of erosion controls in high risk areas to minimise sediment control requirements. Erosion controls will be employed such as; <ul style="list-style-type: none"> <li>○ temporary geotextile linings or soil binders will be installed around culverts, scour protection works and drain junctions,</li> <li>○ 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.</li> </ul> </li> </ul>	Project Manager / Senior Engineer / Supervisors / Environmental Site Representative	Duration
<p>The site sediment controls and sediment basins are to be inspected and any necessary rectification works undertaken such as;</p> <ul style="list-style-type: none"> <li>• Sediment basins are to be managed in accordance with Sediment Basin Management Procedure to regain the maximum runoff capacity parameters, where possible,</li> <li>• Sediment traps and filters to be desilted where more than 60% storage capacity is exceeded,</li> <li>• Spillways and discharge points from sediment traps to be inspected and reinstated as required.</li> <li>• Sediment fences, mulch bunds, earth berms to be inspected and repairs or reinstatement implemented as required.</li> </ul>	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
<b>Post-Rainfall/Storm Procedure</b>		
The Post Rainfall Inspection will be conducted in accordance with Section 7.7 of this ESCP. 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 Section 7.7 of this ESCP.	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

<b>Environmental Management Controls</b>	<b>Person Responsible</b>	<b>Timing / Frequency</b>
High risk work areas that are inundated will be prioritised for dewatering by; <ul style="list-style-type: none"> <li>• Dewatering to a sediment basin where sufficient capacity is available,</li> <li>• Flocculated in-situ and discharged at a licensed discharge point when EPL water quality parameters are attained,</li> <li>• Dewatered by water cart and utilised for construction purposes.</li> </ul>	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, PMP, 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.
5. All erosion and sediment controls generally to be constructed in accordance with ‘Blue Book’ specifications and standard drawings being
  - MANAGING URBAN STORM WATER: SOILS AND CONSTRUCTION - 4<sup>th</sup> EDITION, LANDCOM, MARCH 2004;
  - MANAGING URBAN STORM WATER: SOILS AND CONSTRUCTION – VOLUME 2D MAIN ROAD CONSTRUCTION, DEC, 2008;
  - RMS QA SPECIFICATION G36 - ENVIRONMENTAL MANAGEMENT (SOIL AND WATER MANAGEMENT PLAN)
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. During the process of clearing, maintain a control bund of cleared vegetation to control run-off as works progress. Boundary sediment controls to be installed as soon as practical as the clearing front advances. Maintain clearing slash and minimise disturbance of ground vegetation, where possible.
10. 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.
11. Construction zones in constrained areas to be managed in smaller, defined sub-catchments to reduce slope lengths and minimise sediment loads to boundary controls.
12. 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.
13. Short term on-site stockpiles to be located away from drains and flow lines and be controlled with sediment fence or storm covers.
14. 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
15. Vehicles transporting bulk materials on public roads are to correctly cover loads to prevent loss of load and/or dust generation.
16. 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)

17. 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.
18. 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.
19. Where possible, provide sand bag or other bunding controls at on-site collection points & pit inlets to prevent flows bypassing controls to downslope areas.
20. Protect all existing and constructed inlets to pits & culverts from sediment ingress.
21. Where practical, maintain and/or improve existing stabilised drains to assist in the diversion of ‘clean’ (off site) flows.
22. 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

23. Vegetation to be progressively cleared to minimise disturbance by area and duration. Cleared vegetation to be windrowed parallel to the contour until mulching/removal to control flows across cleared areas
24. The installation of preliminary sediment controls such as perimeter sediment fencing, windrowed vegetation/mulch, excavated sediment traps, check dams, straw bale filters, etc, will be implemented prior to soil disturbance within the catchment.
25. Accumulated water in sediment traps/sumps cannot be pumped, discharged or released from site without completing a dewatering checklist.
26. 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.
27. 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.
28. 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.

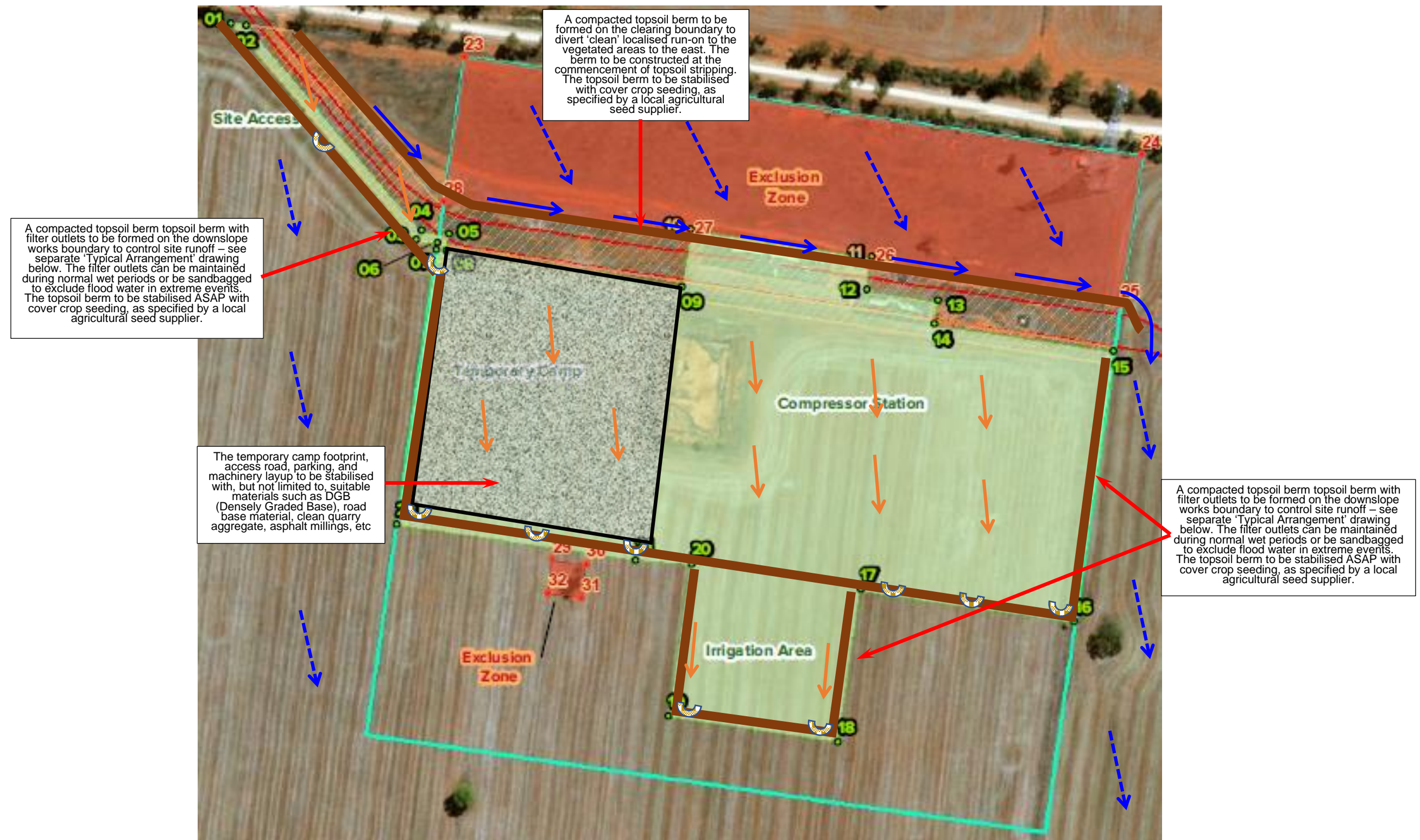
Monitoring & Reporting and Inspection & Maintenance

32. Inspections of erosion and sediment controls will occur following rainfall events >10mm (daily on work days 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.

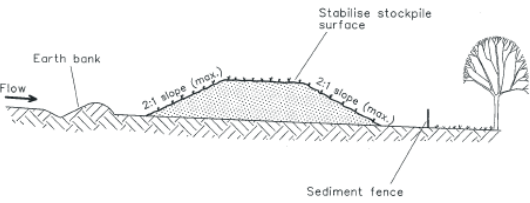
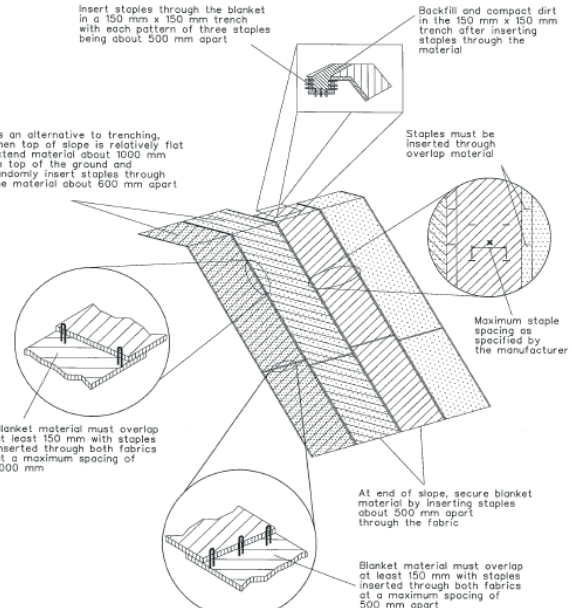
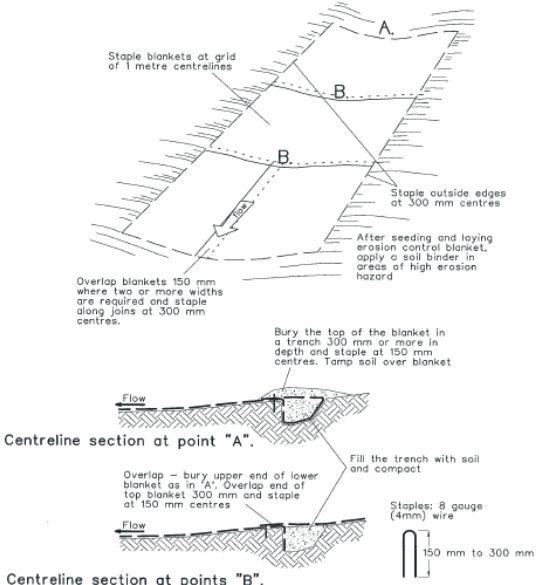
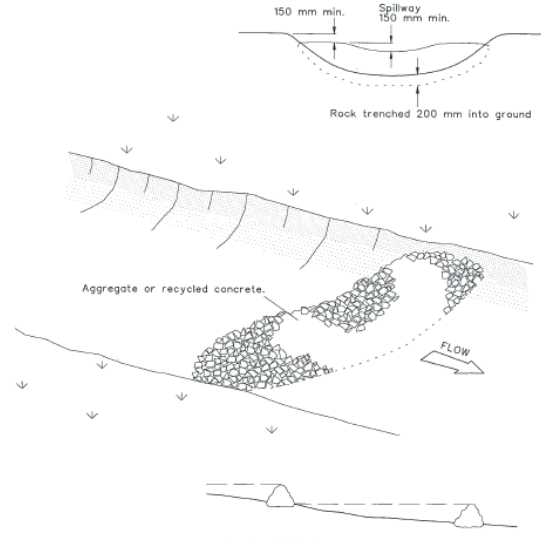
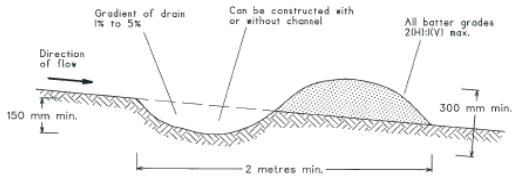
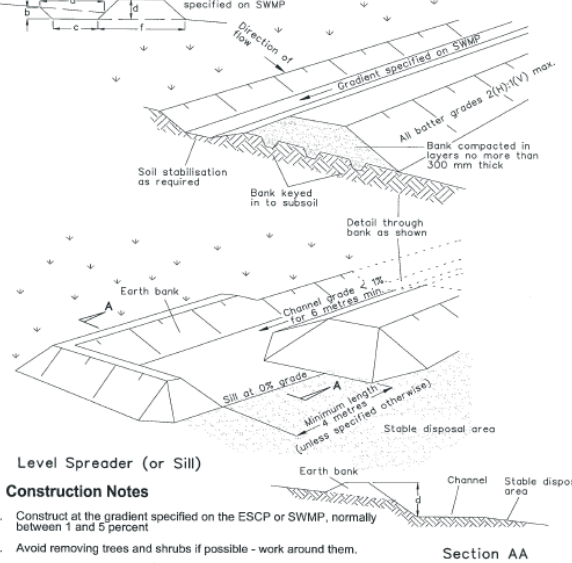
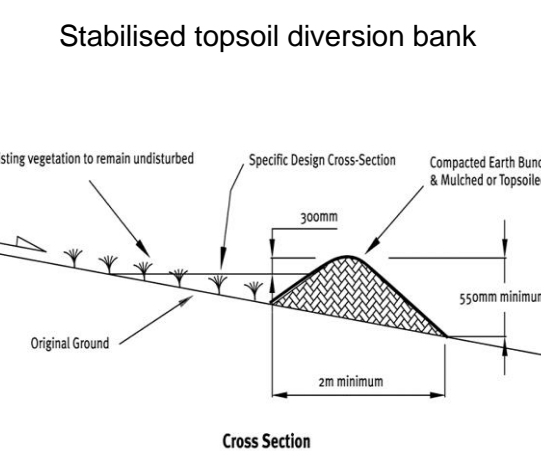
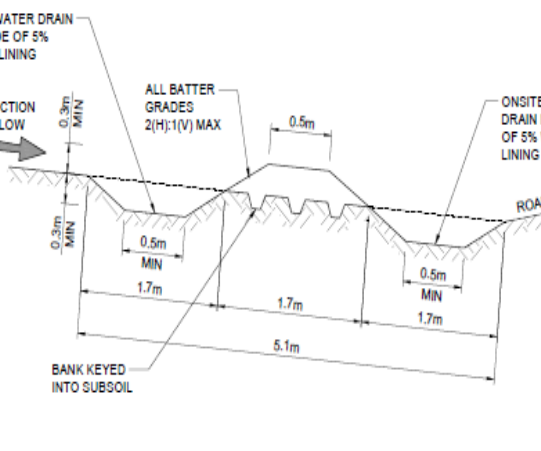
Version	Drawn by	Date	Signed	Reviewed by	Date
01	A. Littlewood	19/11/2021			
02	A. Littlewood	08/02/2022			
03	A. Littlewood	11/02/2022			



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



## Standard Drawings

 <p><b>Construction Notes</b></p> <ol style="list-style-type: none"> <li>Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.</li> <li>Construct on the contour as low, flat, elongated mounds.</li> <li>Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.</li> <li>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.</li> <li>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.</li> </ol>	 <p><b>Construction Notes</b></p> <ol style="list-style-type: none"> <li>Remove any rocks, clods, sticks or grass from the ground surface before laying the matting.</li> <li>Spread topsoil to at least 75 mm depth.</li> <li>Where appropriate, complete fertilising and seeding on a properly prepared seedbed (Standard Drawing 7-1) before laying the matting.</li> <li>Ensure the fabric can be continuously in contact with the soil by grading the surface carefully first.</li> <li>Lay the matting in "shingle-fashion" with the ends of each upstream roll overlapping the next roll downslope.</li> <li>Ensure sufficient staples are used to maintain a good contact between the soil and the matting.</li> </ol>	 <p><b>Construction Notes</b></p> <ol style="list-style-type: none"> <li>Remove any rocks, clods, sticks or grass from the surface before laying matting</li> <li>Ensure that topsoil is at least 75 mm deep.</li> <li>Complete fertilising and seeding before laying the matting.</li> <li>Ensure fabric will be continuously in contact with the soil by grading the surface carefully first.</li> <li>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).</li> <li>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.</li> <li>Divert water from the structure until vegetation is stabilised properly.</li> </ol>	 <p><b>Construction Notes</b></p> <ol style="list-style-type: none"> <li>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.</li> <li>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.</li> <li>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.</li> <li>Space the dams so the toe of the upstream dam is level with the spillway of the next downstream dam.</li> </ol>
<p><b>STOCKPILES</b> SD 4-1</p>  <p><b>Construction Notes</b></p> <ol style="list-style-type: none"> <li>Build with gradients between 1 percent and 5 percent.</li> <li>Avoid removing trees and shrubs if possible - work around them.</li> <li>Ensure the structures are free of projections or other irregularities that could impede water flow.</li> <li>Build the drains with circular, parabolic or trapezoidal cross sections, not V shaped.</li> <li>Ensure the banks are properly compacted to prevent failure.</li> <li>Complete permanent or temporary stabilisation within 10 days of construction.</li> </ol> <p><b>EARTH BANK (LOW FLOW)</b> SD 5-5</p>	<p><b>RECP : SHEET FLOW</b> SD 5-2</p>  <p><b>Construction Notes</b></p> <ol style="list-style-type: none"> <li>Construct at the gradient specified on the ESCP or SWMP, normally between 1 and 5 percent.</li> <li>Avoid removing trees and shrubs if possible - work around them.</li> <li>Ensure the structures are free of projections or other irregularities that could impede water flow.</li> <li>Build the drains with circular, parabolic or trapezoidal cross sections, not V-shaped, at the dimensions shown on the SWMP.</li> <li>Ensure the banks are properly compacted to prevent failure.</li> <li>Complete permanent or temporary stabilisation within 10 days of construction following Table 5.2 in Landcom (2004).</li> <li>Where discharging to erodible lands, ensure they outlet through a properly constructed level spreader.</li> <li>Construct the level spreader at the gradient specified on the ESCP or SWMP, normally less than 1 percent or level.</li> <li>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.</li> </ol> <p><b>EARTH BANK (HIGH FLOWS)</b> SD 5-6</p>	<p><b>RECP : CONCENTRATED FLOW</b> SD 5-7</p> <p><b>Stabilised topsoil diversion bank</b></p>  <p><b>Construction Notes</b></p> <ol style="list-style-type: none"> <li>Construct at the gradient specified on the ESCP or SWMP, normally between 1 and 5 percent.</li> <li>Avoid removing trees and shrubs if possible - work around them.</li> <li>Ensure the structures are free of projections or other irregularities that could impede water flow.</li> <li>Build the drains with circular, parabolic or trapezoidal cross sections, not V-shaped, at the dimensions shown on the SWMP.</li> <li>Ensure the banks are properly compacted to prevent failure.</li> <li>Complete permanent or temporary stabilisation within 10 days of construction following Table 5.2 in Landcom (2004).</li> <li>Where discharging to erodible lands, ensure they outlet through a properly constructed level spreader.</li> <li>Construct the level spreader at the gradient specified on the ESCP or SWMP, normally less than 1 percent or level.</li> <li>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.</li> </ol>	<p><b>ROCK CHECK DAM</b> SD 5-4</p>  <p><b>Construction Notes</b></p> <ol style="list-style-type: none"> <li>CONSTRUCT WITH GRADIENT OF 1% TO 5%.</li> <li>Avoid removing trees and shrubs if possible - work around them</li> <li>DRAINS TO BE CIRCULAR, PARABOLIC OR TRAPEZOIDAL CROSS SECTION NOT V-SHAPED.</li> <li>EARTH BANK TO BE ADEQUATELY COMPACTED IN ORDER TO PREVENT FAILURE.</li> <li>PERMANENT OR TEMPORARY STABILISATION OF THE EARTH BANK TO BE COMPLETED WITHIN 10 DAYS OF CONSTRUCTION.</li> <li>ALL OUTLETS FROM DISTURBED LANDS ARE TO BE FED INTO A SEDIMENT BASIN OR SIMILAR.</li> <li>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.</li> <li>COMPACT BANK WITH A SUITABLE IMPLEMENT IN SITUATIONS WHERE THEY ARE REQUIRED TO FUNCTION FOR MORE THAN FIVE DAYS.</li> <li>EARTH BANK TO BE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT WILL IMPEDE NORMAL FLOW.</li> </ol>

## Standard Drawings

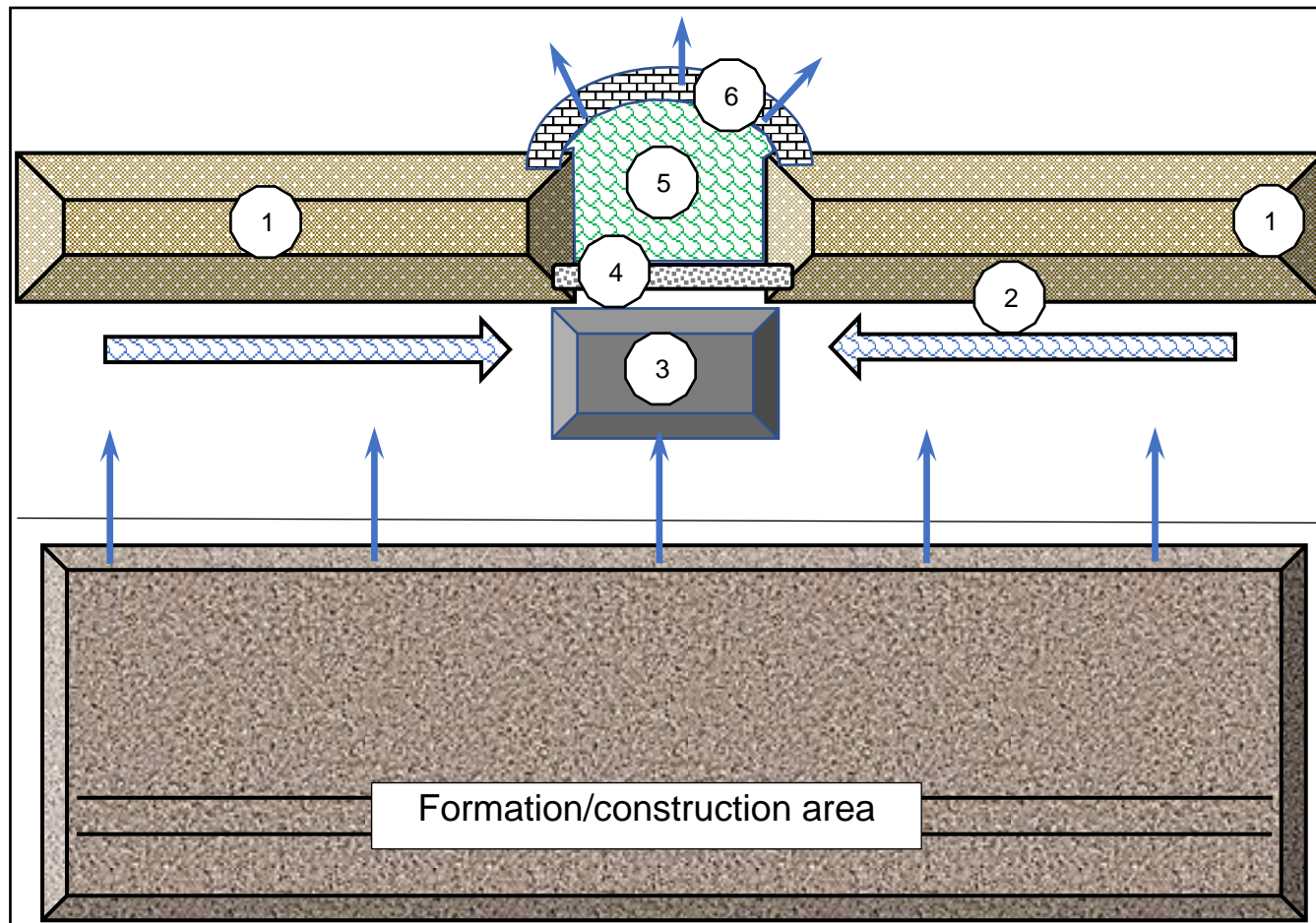
<p><b>ENERGY DISSIPATER</b> SD 5-8</p>	<p><b>STABILISED SITE ACCESS</b> SD 6-14</p>	<p><b>SEDIMENT FENCE</b> SD 6-8</p>	<p><b>ALTERNATIVE SEDIMENT FENCE</b> SD 6-9</p>
<p><b>ROCK SEDIMENT BASIN</b> SD 6-1 (APPLIES TO TYPE C SOILS ONLY)</p>	<p><b>SANDBAG SEDIMENT TRAP FOR KERB INLET</b> N.T.S.</p>	<p><b>GEOTEXTILE INLET FILTER (SD 6-12) - PERSPECTIVE</b> N.T.S.</p>	<p><b>SEDIMENT BARRIER (SD 5-4) DETAIL</b></p>



## Standard Drawings

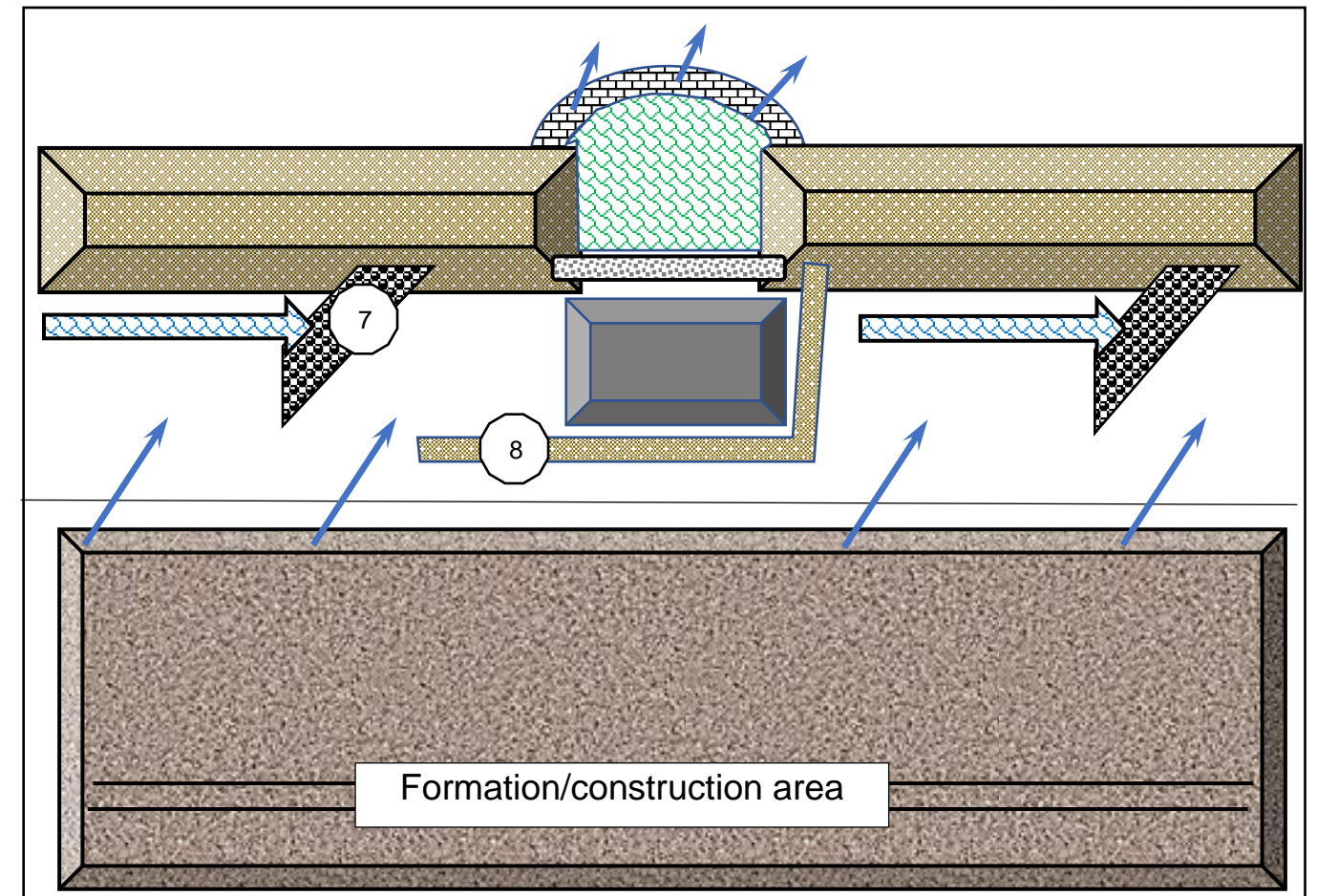
<p><b>Coir Log Filter</b></p> <p>Star pickets / wooden stakes 35mm x 38mm x 900mm min Minimum 2 per bale</p> <p>Stakes through anchor straps held in place by cable ties</p> <p>Anchor straps pinned to ground with U pins</p> <p>Construction Notes</p> <ol style="list-style-type: none"> <li>1. Use turbidity barriers only where high flows are unlikely to remove accumulated sediment and/or move the curtain significantly.</li> <li>2. Where the barrier is to remain in place for more than one month, ensure the floatation cover is a UV-resistant, durable material.</li> <li>3. Use only closed cell foam or foam-filled PVC piping as floatation elements. Do not use unfilled pipes.</li> <li>4. Use only woven or heat-set non woven geotextiles. Needle-punched, non woven geotextiles can become fouled with debris that may and delaminate them as they move with the waves or currents.</li> <li>5. Remove captured sediment before the barrier is decommissioned.</li> <li>6. In tidal areas, ensure the barrier can rise and fall without being moved from its position.</li> </ol> <p><b>TURBIDITY BARRIER</b> <b>SD 6-10</b></p>	<p><b>STRAW BALE FILTER</b></p> <p>Construction Notes</p> <ol style="list-style-type: none"> <li>1. Construct the straw bale filter as close as possible to being parallel to the contours of the site.</li> <li>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.</li> <li>3. Ensure that the maximum height of the filter is one bale.</li> <li>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.</li> <li>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.</li> <li>6. Establish a maintenance program that ensures the integrity of the bales is retained - they could require replacement each two to four months.</li> </ol> <p><b>STRAW BALE FILTER</b> <b>SD 6-7</b></p>	<p><b>MESH AND GRAVEL INLET FILTER</b></p> <p>NOTE: This practice only to be used where specified in an approved SWMP/ESCP.</p> <p>Construction Notes</p> <ol style="list-style-type: none"> <li>1. Install filters to kerb inlets only at sag points.</li> <li>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.</li> <li>3. Form an elliptical cross-section about 150 mm high x 400 mm wide.</li> <li>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.</li> <li>5. Form a seal with the kerb to prevent sediment bypassing the filter.</li> <li>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.</li> </ol> <p><b>MESH AND GRAVEL INLET FILTER</b> <b>SD 6-11</b></p>	<p><b>TEMPORARY WATERWAY CROSSING</b></p> <p>Construction Notes</p> <ol style="list-style-type: none"> <li>1. Prohibit all traffic until the access way is constructed.</li> <li>2. Strip any topsoil and place a needle-punched textile over the base of the crossing.</li> <li>3. Place clean, rigid, non polluting aggregate or gravel in the 100 mm to 150 mm size class over the fabric to a minimum depth of 200 mm.</li> <li>4. Provide a 3-metre wide carriageway with sufficient length of culvert pipe to allow less than a 3(H):1 (V) slope on side batters.</li> <li>5. Install a lower section to act as an emergency spillway in greater than design storm events.</li> <li>6. Ensure that culvert outlets extend beyond the toe of fill embankments.</li> </ol> <p><b>TEMPORARY WATERWAY CROSSING</b> <b>SD 5-1</b></p>
<p><b>TURBIDITY BARRIER</b></p> <p>Construction Notes</p> <ol style="list-style-type: none"> <li>1. Use turbidity barriers only where high flows are unlikely to remove accumulated sediment and/or move the curtain significantly.</li> <li>2. Where the barrier is to remain in place for more than one month, ensure the floatation cover is a UV-resistant, durable material.</li> <li>3. Use only closed cell foam or foam-filled PVC piping as floatation elements. Do not use unfilled pipes.</li> <li>4. Use only woven or heat-set non woven geotextiles. Needle-punched, non woven geotextiles can become fouled with debris that may and delaminate them as they move with the waves or currents.</li> <li>5. Remove captured sediment before the barrier is decommissioned.</li> <li>6. In tidal areas, ensure the barrier can rise and fall without being moved from its position.</li> </ol> <p><b>TURBIDITY BARRIER</b> <b>SD 6-10</b></p>	<p><b>REPLACING TOPSOIL</b></p> <p>Construction Notes</p> <ol style="list-style-type: none"> <li>1. Scarify the ground surface along the line of the contour to a depth of 50 mm to 100 mm to break up any handsetting surfaces and to provide a good bond between the respread material and subsoil.</li> <li>2. Add soil ameliorants as required by the ESCP or SWMP.</li> <li>3. Rip to a depth of 300 mm if compacted layers occur.</li> <li>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.</li> </ol> <p><b>REPLACING TOPSOIL</b> <b>SD 4-2</b></p>	<p><b>SEEDBED PREPARATION</b></p> <p>Construction Notes</p> <ol style="list-style-type: none"> <li>1. Loosen compacted soil before sowing any seed. If necessary, rip the soil to a depth of 300 mm. Avoid rotary hoe cultivation.</li> <li>2. Work the ground only as much as necessary to achieve the desired tilth and prepare a good seedbed.</li> <li>3. Avoid cultivation in very wet or very dry conditions.</li> <li>4. Cultivate on or close to the contour where possible, not up and down the slope.</li> </ol> <p><b>SEEDBED PREPARATION</b> <b>SD 7-1</b></p>	<p><b>KERBSIDE TURF STRIP</b></p> <p>Construction Notes</p> <ol style="list-style-type: none"> <li>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.</li> <li>2. Lay 1.4 metre long turf strips normal to the kerb every 10 metres.</li> <li>3. Rehabilitate disturbed soil behind the</li> </ol> <p><b>KERBSIDE TURF STRIP</b> <b>SD 6-13</b></p>

PLAN VIEW OF TOPSOIL BERM WITH FILTER OUTLETS ON GRADES 0-1% (Not to Scale)



1. A compacted, trapezoidal topsoil berm –1000mm base width, 500mm high, 400mm top width (nom.) The filter outlets to be constructed at localised sag points, or 50m intervals (in areas with grades up to 1%.)
2. The topsoil berm and adjacent area to be stabilised with locally suitable, cover crop seeding.
3. An excavated sediment sump be excavated - 1500mm long, 1000mm wide, 400-500mm depth (nom.) (See example photo)
4. A spillway inlet sediment filter control to be installed – i.e. Shade cloth and aggregate filter bag weir (see example photo)., staked coir log filter, shade cloth and rock filter sock
5. Stabilised outlet spillway – The spillway formed with level grade across invert, 1000mm wide stabilised with pinned close weave, coir fibre mat lining (Tec Mat 9 or similar) followed by seeding, or broadcast seeding over pinned jute mesh.
6. Install a staked coir log filter using 3m x 200mm diameter (nom.) coir logs.

PLAN VIEW OF TOPSOIL BERM WITH FILTER OUTLETS ON GRADES 1+% (Not to Scale)



7. In areas with increased longitudinal grade, check dam formations to be formed at intervals to slow runoff flow velocities, reduce erosion & scouring, and capture coarse sediment. The check dams could be formed from coarse aggregate ballast in areas with grades from 1+%. In areas with grades 3% & above, check dams could be formed as compacted topsoil groynes formed upslope, with in-line geotextile/coir mat lined spillways (See example photo). The intervals of the check dam formations to be increased with an increase of longitudinal grades. Recommended intervals are 30m for grades 1-2%, 20m for grades 2%-3% and 10-15m intervals for grades 3% and above.
8. A flow control berm to be formed from compacted topsoil, extending upslope to prevent flows outflanking the filter-controlled spillway formations. The upslope extent of the berm to achieve a height exceeding that of the spillway inlet sediment filter control to prevent out-flanking of runoff.

