



Primary Erosion and Sediment Control Plan

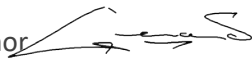
Parkes to Narromine Inland Rail Project

Project # 808 – J013

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Job No.: 808 - J013

Principal: Australian Rail Track Corporation, (ARTC)

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0	15/02/2019	Approved Base Document	GO
1	30/09/2019	Six Month Review	GO
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3	06/05/2020	Removed reference to Landform Construction Specification	GO

Primary Erosion and Sediment Control Plan (PESCP)

Parks to Narromine Inland Rail
Project # 808 – J013

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Attachments

Attachment A – Environmental Representative Endorsement

Attachment B – Progressive Erosion and Sediment Control Plan

Glossary of Terms

Term	Definition
AQMP	Air Quality Management Plan
ARI	Average Recurrence Interval
ARTC	Australian Rail Track Corporation
CEMF	Construction Environmental Management Framework
CEMP	Construction Environmental Management Plan
CoA	Conditions of Approval
CPESC	Certified Professional in Erosion and Sediment Control
CSSI	Critical Significant State Infrastructure
DPIE	Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EMS	Environmental Management System
EP&A	Environmental Planning and Assessment
EPA	Environment Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act
EPL	Environment Protection Licence
ESCP	Erosion Sediment Control Plan
HCMMP	Hazardous and Contaminated Materials Management Plan
IECA	International Erosion Control Association
P2N	Parkes to Narromine
PESCP	Primary Erosion and Sediment Control Plan
POEO Act	Protection of the Environment Operations Act
PWMP	Pest and Weed Management Plan

SWMP	Soil and Water Management Plan
TTAMP	Traffic, Transport and Access Management Plan
WMP	Waste Management Plan



1 Scope

1.1 Purpose

This Primary Erosion and Sediment Control Plan (PESCP) outlines measures to manage erosion and sedimentation impacts that may result from construction works. It does not consider any post construction operational impacts or mitigation. It will be complemented by the preparation of detailed Progressive (site, activity and/or phase specific) Erosion and Sediment Control Plans (ESCP) which will be appended to Attachment B. This plan should be read in conjunction with the Soil and Water Management Plan (SWMP), including Attachment A Water Quality Monitoring Program, which is a sub plan to and resides under the Construction Environmental Management Plan (CEMP) for the Inland Rail Parkes to Narromine (P2N) project.

This plan addresses the following key requirements:

- Conditions of Approval (CoA) dated June 2018;
- Environmental Protection Licence (EPL) dated October 2018;
- Environmental Impact Statement (EIS) requirements; and
- Construction Environmental Management Framework.

The Environmental Management System (EMS) and project overview are outlined in Section 1 of the CEMP.

2 Objectives

2.1 Environmental Objectives

This PSECP has the following key objectives:

- Prevent pollution of waters by implementing effective control measures;
- Maintain water quality levels in surrounding waterways;
- Provide an organised, integrated and systematic approach to effectively address erosion and sedimentation throughout construction; and
- Make personnel aware of erosion and sediment issues and management practices to manage the risk of erosion and sedimentation during construction.

3 References

3.1 Key Legislative Requirements

Local, State and Commonwealth legislation that may apply to the management of erosion and sediment control on the project include:

- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Protection of the Environment Operations Act 1997* (POEO Act);
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Commonwealth);
- *Water Act 1912*; and
- *Water Management Act 2000*.

3.2 Standards and Guidelines

Local, state and commonwealth guidelines and standards relating to the management of erosion and sediment control include:

- A Resource Guide for Local Councils: Erosion and Sediment Control (DEC 2006);
- Managing Urban Stormwater: Soils and Construction Volume 1 (4th Edition) (Landcom 2004) “Blue Book”;
- Managing Urban Stormwater: Soils and Construction Volume 2 (DEC 2006) “Blue Book”; and
- Waste Classification Guidelines (EPA) 2014.

3.3 State and Commonwealth Requirements

Under Part 5.1 of the EP&A Act a declared Critical State Significant Infrastructure (CSSI) project is assessed and must be approved by the Minister for Planning. Table 3-1 outlines the CoA for the project from the NSW Department of Planning, Industry and Environment (DPIE) related to erosion and sediment control.

Part 5.4 Division 1 of the Protection of Environment Operations (POEO) Act 1997 Sections 124-132 outlines requirements to prevent environmental impacts and stipulates offences and penalties applicable. These conditions form the EPL. Those related to the preparation of a PESCP are outlined in Table 3-2 below.

Table 3-1 – Conditions of Approval

Ref ID	Details	Where addressed
A5	Where the terms of this approval require a document to be prepared or a review to be undertaken in consultation with identified parties, consultation must be carried out in accordance with the Communications Strategy required by Condition B1. Evidence of the consultation undertaken must be submitted to the Secretary with the document.	Section 3.4
A5a)	The evidence must include:	Section 3.4

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Ref ID	Details	Where addressed
	Documentation of the engagement with the party (ies) identified in the condition for approval that has occurred prior to submitting the document for approval.	Section 3.4
A5b)	The evidence must include: A log of the points of engagement or attempted engagement with the identified party (ies) and a summary of the issues raised by them.	Section 3.4
A5c)	The evidence must include: Documentation of the follow-up with the identified party (ies) where feedback has not been provided to confirm that they have none or have failed to provide feedback after repeated requests.	Section 3.4
A5d)	The evidence must include: An outline of the issues raised by the identified party (ies) and how they have been addressed.	Section 3.4
A5e)	The evidence must include: A description of the outstanding issues raised by the identified party (ies) and the reasons why they have not been addressed.	Section 3.4
A19d)	For the duration of the works until the completion of construction, the approved ER must: Review documents identified in Conditions C1, C4, and C13 and any other documents that are identified by the Secretary, to ensure they are consistent with requirements in or under this approval and if so: i) make a written statement to this effect before submission of such documents to the Secretary (if those documents are required to be approved by the Secretary); or ii) make a written statement to this effect before the implementation of such documents (if those documents are required to be submitted to the Secretary / Department for information or are not required to be submitted to the Secretary / Department)	Section 5.17
A19e)	For the duration of the works until the completion of construction, the approved ER must: Regularly monitor the implementation of the document listed in Conditions C1, C4 and C13 to ensure implementation is being carried out in accordance with the document and the terms of this approval.	Section 5.17
E71	All reasonably practicable erosion and sediment controls must be installed and appropriately maintained to minimise any water pollution. When implementing such controls, any relevant guidance in the Managing Urban Stormwater series must be considered.	Section 5.7
C4	The following CEMP Sub-plans must be prepared in consultation with the relevant government agencies and relevant councils	Section 3.4

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Ref ID	Details	Where addressed						
	identified for each CEMP Sub-plan and be consistent with the CEMP referred to in the EIS.							
C5 a)	The CEMP Sub-plans must state how the environmental performance outcomes identified in the EIS and Submissions Report, as modified by these conditions will be achieved.	Section 2 Section 5.7						
C5 b)	The mitigation measures identified in the EIS and Submissions Report, as modified by these conditions will be implemented	Section 5.7						
C5 c)	The relevant terms of this approval will be complied with	Section 3.3						
C5 d)	Issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.	Section 4.5 Section 4.6						
C6	The CEMP Sub-plans must be endorsed by the ER and then submitted to the Secretary for approval no later than one month before the commencement of the construction activities to which they apply.	Section 3.4						
C7	Any of the CEMP Sub-plans may be submitted to the Secretary along with, or subsequent to, the submission of the CEMP.	Section 3.4						
C12	Construction must not commence until the CEMP and all CEMP Sub-plans have been approved by the Secretary. The CEMP Sub-plans, as approved by the Secretary, including any minor amendments approved by the ER, must be implemented for the duration of the construction. Where the CSSI is being staged, construction of the at stage is not to commence until the relevant CEMP and sub-plans have been endorsed by the ER and approved by the Secretary.	Section 3.4						
C13	<p>The following Construction Monitoring Program must be prepared in consultation with the relevant government agencies and relevant councils identified for the Construction Monitoring Programs to compare actual performance of construction of the CSSI against performance predicted performance.</p> <table border="1" data-bbox="387 1420 1070 1637"> <thead> <tr> <th></th> <th>Required Construction Monitoring Programs</th> <th>Relevant government authorities to be consulted for each Construction Monitoring Program</th> </tr> </thead> <tbody> <tr> <td>d)</td> <td>Soils and Water</td> <td>Relevant councils and Crown Lands & Water</td> </tr> </tbody> </table>		Required Construction Monitoring Programs	Relevant government authorities to be consulted for each Construction Monitoring Program	d)	Soils and Water	Relevant councils and Crown Lands & Water	Section 5.8.
	Required Construction Monitoring Programs	Relevant government authorities to be consulted for each Construction Monitoring Program						
d)	Soils and Water	Relevant councils and Crown Lands & Water						
E27 a)	<p>The CSSI must be designed, constructed and operated so as to:</p> <p>Maintain the NSW Water Quality Objectives where they are being achieved as at the date of this approval; and</p>	Section 5.6 Section 5.7						
E27 b)	<p>The CSSI must be designed, constructed and operated so as to:</p> <p>Contribute towards achievement of the NSW Water Quality Objective over time where they are not being achieved as at the</p>	Section 5.6 Section 5.7						

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Ref ID	Details	Where addressed
	date of this approval, unless an EPL in force in respect of the CSSI contains different requirements in relation to the NSW Water Quality Objectives in which case those requirements must be complied with.	
E28	Drainage feature crossings (permanent and temporary watercourse crossings and stream diversions) and cess drains and depressions must be designed and constructed in accordance with relevant DPI guidelines	Section 5.6 Section 5.7
E31	Prior to the installation of a new culvert, the Proponent must consult with the landowner that is located immediately downstream of the new culvert to determine the potential for impacts on the agricultural productivity of the land due to the introduction of flows. Where potential adverse impacts are identified, the Proponent must consult with the affected landowner on the management measures that will be implemented to mitigate the impacts.	Section 5.6 Section 5.7
E32	All scour protection works associated with replacement culverts or the construction of new culvers must be restricted to the rail corridor, or as agreed to by the relevant land owner.	Section 5.6 Section 5.7
E33	The CSSI must not result in changes to the direction of watercourses or the direction of flood flows except within the rail corridor.	Section 5.6 Section 5.7
E34	The CSSI (including the cess drains adjacent to the new and upgraded rail track) must be designed and constructed to ensure that there is no permanent interception of, and/or connection with, groundwater.	Section 5.6 Section 5.7
E35	All discharges from the cess drains adjacent to the new and upgraded track must be released at a controlled rate to prevent scour.	Section 5.6 Section 5.7
E36	Works on waterfront land must be undertaken in accordance with the DPI guidelines for controlled activities on waterfront land.	Section 5.6 Section 5.7
E37	Any recycled wastewater (including recycled / treated water) proposed for use by the CSSI, must befit for purpose and does not pose a risk to human health or the receiving environment.	Section 5.7
E71	All reasonable and practicable erosion and sediment controls must be installed and appropriately maintained to minimise any water pollution. When implementing such controls, any relevant guidance in the <i>Managing Urban Stormwater</i> series must be considered.	Section 5.7

Table 3-2 –Conditions of Environment Protection Licence

Ref ID	Details	Where addressed
A5	Where the terms of this approval require a document to be prepared or a review to be undertaken in consultation with identified parties, consultation must be carried out in accordance with the Communications Strategy required by Condition B1.	Section 3.4

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Ref ID	Details	Where addressed
	Evidence of the consultation undertaken must be submitted to the Secretary with the document.	
L1.1	Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.	Section 5
O5.1	The licensee must manage erosion and sediment laden water in accordance with the document titled 'Primary Erosion and Sediment Control Plan, Parkes to Narromine Inland Rail Project'.	Section 5
M1.1	The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.	Section 5.8
M1.2	All records required to be kept by this licence must be: <ul style="list-style-type: none"> a) In a legible form or in a form that can readily be reduced to a legible form b) Kept for at least 4 years after the monitoring or event to which they relate took place c) Produced in a legible form to any authorised officer of the EPA who asks to see them 	CEMP Section 7.4
M1.3	The following records must be kept in respect of any samples required to be collected for the purposes of this licence: <ul style="list-style-type: none"> a) The date on which the sample was taken b) The time at which the sample was collected c) The point at which the sample was taken d) The name of the person who collected the sample 	CEMP Section 7.4
M4.1	The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.	CEMP Section 8
M4.2	The record must include details of the following: <ul style="list-style-type: none"> a) The date and time of the complaint b) The method by which the complaint was made c) Any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect d) The nature of the complaint e) The action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant f) If no action was taken by the licensee, the reasons why no action was taken 	CEMP Section 8
M4.3	The record of a complaint must be kept for at least 4 years after the complaint was made.	CEMP Section 7.4

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Ref ID	Details	Where addressed
M4.4	The record must be produced to any authorised officer of the EPA who asks to see them.	CEMP Section 7.4
M5.1	The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.	CEMP Section 6.3
M5.2	The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that impacted community knows how to make a complaint.	ARTC Communications Strategy
M5.3	The preceding two conditions do not apply until 3 months following the date of the issue of this licence	CEMP Section 6.3
M5.4	The licensee must ensure that the community notification is undertaken: <ul style="list-style-type: none"> • By including details on the project website: <ol style="list-style-type: none"> i) how the public can make a complaint on the complaints telephone line; and ii) how complaints will be processed • By displaying clear signage at the boundary of each work site that contains both the telephone complaints line number and project website details. 	CEMP Section 6.3
R1.1	The licensee must complete and supply to the EPA an Annual Return in the approved form comprising: <ul style="list-style-type: none"> • Statement of Compliance • Monitoring and Complaints Summary • Statement of Compliance – Licence Conditions • Statement of Compliance – Load Based Fee • Statement of Compliance – Requirement to Prepare Pollution Incident Response Management Plan • Statement of Compliance – Requirement to Publish Pollution Monitoring Data; and • Statement of Compliance – Environmental Management Systems and Practices. <p>At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.</p>	CEMP Section 7.4
R1.2	An Annual Return must be prepared in respect of each reporting period, except as provided below.	CEMP Section 7.4
R1.6	The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.	CEMP Section 7.4
R2.1	Notifications must be made by telephoning the Environment Line service on 131 555. The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the	CEMP Section 7.4

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Ref ID	Details	Where addressed
	incident in accordance with the requirements of Part 5.7 of the Act.	
R2.2	The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.	CEMP Section 7.4
R3.1	Where an authorised officer of the EPA suspects on reasonable grounds that: <ul style="list-style-type: none">a) Where this licence applies to premises, an event has occurred at the premises; orb) Where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence, and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.	CEMP Section 7.4
R3.3	The request may require a report which includes any or all of the following information: <ul style="list-style-type: none">a) The cause time and duration of the eventb) The type, volume and concentration of every pollutant discharged as a result of the eventc) The name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the eventd) The name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable efforte) Action taken by the licensee in relation to the event, including any follow-up contact with any complainantsf) Details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an eventg) Any other relevant matters	CEMP Section 6.5

3.4 Stakeholder Consultation

In accordance with the CoA this PESCP has been developed in consultation with Crown Lands and Water and relevant Councils.

Further, this PESCP as a Sub-plan to the CEMP is required to be approved by the Department of Planning, Industry and Environment (DPIE) and endorsed by the Environmental Representative (ER) prior to the commencement of construction as required by the CoA (Attachment A).

This consultation is intended to assist in development and finalisation of the plan. Table 3-3 summarises relevant stakeholder reviews and response to review.

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Table 3-3 – Summary of Consultation

Agency	Requirement	Status	Response ¹	Date
Crown Lands and Water	Consultation	Completed	No response received.	-
DPI Water	Consultation	Completed	<ul style="list-style-type: none">• Letter with comments• Comments included in Revision B of PESCP	26 October 2018
Parkes Shire Council	Consultation	Completed	<ul style="list-style-type: none">• Comments sheet• Comments included in Revision B of PESCP	26 September 2018
Narromine Shire Council	Consultation	Completed	<ul style="list-style-type: none">• Comments sheet• Comments included in Revision B of PESCP	8 October 2018
DPIE	Approval	Approved	<ul style="list-style-type: none">• Letter with comments	14/02/2019
ER	Endorsement	Approved		

¹ Evidence of consultation is provided by ARTC as a separate report

4 Key Risks

4.1 Existing Environment

The project site crosses flat to undulating rises along the lower western slopes of a north-south trending range. The range is associated with the meta-sedimentary units of the Hervey syncline in the south, and the granitic Bulga Range in the north.

The project is located in the Central Lachlan Fold Belt. Near surface materials include Tertiary to Quaternary aged red silty alluvium over intermittently outcropping folded and faulted Silurian and Ordovician aged sedimentary and minor metamorphic sequences.

Thick reactive brown and grey clay soils are predominantly associated with the near level terrain north of Peak Hill. The undulating terrain south of Peak Hill consists of moderately thick red and brown sandy and silty clay soils. Soil types along the project alignment are shown in Figure 3.1a- 31.f. Further detail on subsurface soil and rock types encountered can be found in the EIS (GHD 2016).

Of the soils present in the project site, the main potential issue relates to dispersive soils are located north of Peak Hill. The presence of gulying or other erosion features in this area were noted during a contamination and geotechnical investigation (EIS GHD 2016).

Based on regional groundwater bore information, groundwater is anticipated to be located between 7m – 60m below the ground surface, but generally over 20m below the ground surface.

4.2 Prediction of Annual Soil Loss

The annual predicted soil loss has been determined for ground disturbing construction activities for specific locations along the project site alignment. It is not meaningful to determine a predicted soil loss value for the project alignment given variability in parameters such as slope length/gradient factor.

An erosion risk assessment was conducted using the Revised Universal Soil Loss Equation (RUSLE) based on a construction phase scenario (i.e. prior to installation of any controls). The only exception to this is in adopting a maximum slope-length of 80m, which is considered the maximum before which some form of berm or bund should be installed. Rather than implying an acceptable level of risk, the calculated soil loss is then used to determine the level of sediment control required, as well as stabilisation and staging requirements.

The predicted Soil Loss Rate (A) has been calculated using the Revised Universal Soil Loss Equation (RUSLE) as per Managing Urban Stormwater Vol. 1 (Landcom, 2004) guidelines:

$$A = R \times K \times LS \times P \times C$$

Where:

A = Estimated Soil Loss in Tonnes per Ha per Year, and

R = Rainfall erosivity factor

K = Soil erodibility factor

LS = Slope length/gradient factor

P = Erosion control practice factor

C = Ground cover and management factor

During the development of the progressive sediment and erosion control plans, the above equation was utilised for determining the values for the predicted soil loss. The alignment has been broken into 314 individual catchments in which the predicted soil loss has been calculated (refer to Pages 52-72).

It's acknowledged that the soil loss calculations do not allow for batters, with factors used that were considered to represent the catchment for the largest period of time (in terms of slope and area), this was typically representative of a clear and grub/stripping phase. The sediment controls applied throughout site (mostly Type 2) do however exceed the minimum standard required (Type 3) but have been adopted as more suitable to concentrated flow and minimises the cost and waste associated with applying Type 3 (sediment fence) along the alignment. It was also considered to provide a heightened level of sediment control after the formation of batters, or introduction of stockpiling. Likewise, large flat areas (such as sidings and stockpile areas) were allocated for Type 1 control (despite a very low calculated soil loss) to provide for concentrated flow, allow for the introduction of stockpiles and generally increase the net sediment control capacity throughout the greater project. It is also widely considered that RUSLE should not be used for estimating soil loss from batters. However, if required, calculations can be undertaken assuming worse case factors for batters; for example, 1:2 batter (50% slope) over a max of 5m, the maximum internal catchment along the alignment is 2km, the batter catchments will rarely exceed 10,000m² (1 ha). The soil loss for that catchment will be less than 110m³/yr – mainly based on the short length and the small area.

Allocated sediment controls according to the calculated soil loss are presented on the Progressive Erosion and Sediment Control Plans (Attachment B).

Table 4-1 provides a summary of the soil landscape groups along the Project area.

Table 4-1– Soil Landscape Groups

Range Soil Type Occurs	Classification	Location	Soil Type	Soil Landscape	Erosion Salinity
450-455	Parkes	Parkes Forbes	Shallow to moderately deep (<60cm), moderately well drained Red Earths, and Red Podzolic Soils on side slopes. Lower slopes have moderately deep (>80cm) imperfectly drained Red Brown Earths. Narrow drainage lines have deep (>150cm) poorly drained Brown Solodic Soils.	Stoniness Sodicity Dispersibility Hardsetting surfaces Low permeability	High water erosion hazard Salinity Moderate to high erodibility
450-460	Brolgan Plain	Plains west of Parkes	Deep (>100cm) imperfectly drained Red Brown Earths and Non-calcic Brown Soils.	Sodicity / Dispersibility	Low to moderate erosion hazard

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Range Soil Type Occurs	Classification	Location	Soil Type	Soil Landscape	Erosion Salinity
		Brolgan Plain	Deep (>100cm) moderately well drained Red Podzolic Soils and Red Earths also occur on some plains.	Hardsetting surface Flood hazard Foundation hazard Seasonal waterlogging	Topsoils have erodibility Clay rich subsoils have moderate erodibility
450-465	Goonumbla	Vicinity of Goonumbla Cooks Myalls	Shallow (<10cm) well drained Lithosols and shallow (<50cm) moderately well drained Red Podzolic Soils occur on crests. Shallow (<50cm) moderately well drained Red Earths / Euchronsems and Red Podzolic Soils occur on upper and mid-slopes. Moderately deep (>80cm) moderately well drained Non-calcic Brown Soils occur on lower slopes.	Stoniness Hardsetting surfaces Rock outcrop	Moderate to high water erosion hazard Moderate topsoil erodibility Very low subsoil erodibility
460-480	Cooks Myalls	Parkes to Bogan Gate	Soils are moderately deep (>50cm), moderately well drained Red Podzolic Soils, deep (>100cm) poorly drained Red Solodic Soils along drainage lines and lower slopes. Shallow to moderately deep (<80cm) well drained Terra Rossa Soils, Red Podzolic Soils and Red Earths / Calcareous Red Earth intergrades occur on limestone and sandstone / chert / siltstone bedrock. Moderately deep (>60cm), moderately well drained Non-Small areas of gilgai soils.	Alkalinity Sodicity / Dispersibility Hardsetting surfaces Seasonal waterlogging	High water erosion hazard Salinity High erodibility

4.3 Sensitive Environments

The majority of the proposal site is located within the Macquarie-Bogan River basin. A small portion of the proposal site, between the southern end of the Project corridor and approximately 7 km and north-west of Parkes, is located within the Lachlan River basin.

A total of 15 ephemeral watercourses with a stream order of three or above are across the Project corridor. All of these watercourses could experience adverse effects from the impact of sedimentation.

Mitigation measures are included in Section 5.

4.4 Impact Identification

Of the soils present in the project site, the main potential issue relates to dispersive soils are located north of Peak Hill. The presence of gullying or other erosion features in this area were notable during a contamination and geotechnical investigation (EIS GHD 2016).

Excavation and ground disturbance activities, if not adequately managed, could have the following impacts:

- Erosion of exposed soil and stockpiled materials, particularly in areas where dispersive soils are present;
- Dust generation from excavation, backfilling and vehicle movements over exposed soil;
- An increase in sediment loads entering the stormwater system and / or local runoff, and therefore nearby receiving waterways; and
- Increase salinity levels in soil through rising water table.

These impacts are considered to be minimal, as exposure of soils would be temporary and short-term in duration. It is expected that the majority of excavated spoil, consisting of either ballast, fill, or natural soils, would be reused during track formation works, or used to construct permanent spoil mounds within the rail corridor in accordance with E52 and E53. Excess spoil not able to be used for either backfill or spoil mounds due to the presence of contamination would be stockpiled in a suitable location for transport and disposal off-site at an appropriately licensed waste facility in accordance with requirements of the Hazardous and Contaminated Materials Management Plan (HCMMP), Waste Management Plan (WMP) CoA and EPL requirements.

Earthworks and vegetation removal during construction would temporarily expose the ground surface through vegetation removal, and excavation of construction footprints for structures, including culverts. The temporary exposure of these areas to water runoff and wind could increase soil erosion potential, particularly where construction is undertaken in areas which are characterised by dispersive soils. In addition, the removal of vegetation and top soils could increase the amount of water infiltration, particularly in areas of perched groundwater, causing the water table to rise and bringing salt to the root zone and soil surface. Increased salinity in soils can affect plant health, leading to a loss of productive species and a dominance of salt-tolerant species.

Periods of heavy and frequent rainfall could also lead to increased runoff and flooding. Loose material may be eroded during rainfall events by runoff, increasing the potential for movement of soils and sedimentation of local drainage lines. This may in turn influence the vegetation and habitat of adjacent areas by smothering groundcover vegetation or by changing soil surface characteristics.

Reinstatement activities would require minor earthworks that could lead to the erosion of disturbed soils where they are not stabilised appropriately. Vehicle movements and machinery used during construction could result in compaction or erosion of surface soils, and / or deposit of excess material onto sealed roads.

Erosion of dispersive soils to the north of Peak Hill could result in silting of drainage infrastructure, including culverts during the construction phase of the Project. To manage this potential impact, dispersive soils would be treated where exposed in cut batters, culvert crossings, and drainage lines

during construction. Culverts would be designed in accordance with CoAs E26, E27, E28, E29, E30, E31, E32, E34 and E35 to reduce erosion impacts.

4.5 Environmental Risk Assessment

An environmental risk assessment was undertaken as part of the EIS for the project (GHD 2017). The purpose of the risk assessment was to identify potential environmental impacts and risks associated with construction and operation of the project.

4.6 Quantitative Risk Assessment

A risk management approach utilising the CEMP Risk and Opportunities Register, and RUSLE will be used to determine the severity and likelihood of an activity's impact on the environment and to prioritise its significance. This process considers potential regulatory and legal risks as well as taking into consideration the concerns of community and other key stakeholders.

The objectives of risk assessment are to:

- Identify activities that have the potential to adversely affect the local environment and/or human health;
- Qualitatively evaluate and categorise each risk item;
- Assess whether risk issues can be managed by environmental protection measures;
- Quantitatively evaluate and categorise each risk item; and
- Assess whether risk issues can be managed by environmental protection measures.

Risk assessments for the Project are based on AS/NZS ISO 31000:2009, the Australian and New Zealand Standard for Risk Assessments. The purpose of risk evaluation is to separate risk to be tolerated from those to be treated, by determining the severity of each risk and developing a prioritised list of risks that require treatment. The severity of each risk is determined from the Project Risk Level Matrix.

A risk register has been developed (Risk and Opportunities Register Attachment C of the CEMP) and includes a list of activities associated with the Project, related aspects and corresponding risks. Measures to minimise the identified environmental risks are also provided (Section 3 of the CEMP).

The Project has adopted a risk management approach for the implementation of erosion controls within the culverts. This risk-based approach includes 'staged' erosion controls for the installation of the culverts:

- Stage 1 – Clean water routed through site via existing pipes
- Stage 2 – Redundant pipes removed. New culvert area excavated. No clean water flow through, special conditions apply:
 - Special Conditions:
 - Prior to the removal of existing pipes and commencing permanent stormwater works, complete a formalised forecast-based risk assessment to ensure:
 - Significant rainfall (<50% or more than 20mm) is not expected during stage 2 works

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- Adequate machinery and materials are available to temporarily stabilised the flow path and separate site runoff from clean water should the forecast change during stage 2 works
- Flocculant/coagulant is available to dewater the culvert excavation (rock filter dams should not be used for dewatering unless under normal flow conditions)
- Stage 3 – New culverts and inlet/outlets installed and complete. Clean water conveyed through site via new stormwater.

Likelihood	Consequence					Risk	Action
	Insignificant	Minor	Moderate	Major	Severe		
Almost Certain	Medium	High	Extreme	Extreme	Extreme	Extreme	Notify Environmental Team. Cease works immediately.
Certain	Medium	Medium	High	Extreme	Extreme	High	Notify Environmental Team to discuss proposed actions
Likely	Medium	Medium	High	Extreme	Extreme	Medium	Notify Environmental Team. Proceed with works
Possible	Low	Medium	Medium	High	Extreme	Low	No action
Unlikely	Low	Low	Medium	Medium	High		
Rare	Low	Low	Low	Medium	Medium		

5 Management

5.1 Erosion and Sediment Control

The following sections outline a wide array of erosion and sediment control measures to be implemented during construction. Table 5-1 illustrates the design criteria which was adopted for the development of the Erosion and Sediment Control Plans. The design events are presented on the individual site-specific erosion and sediment control plans and the design of the controls are detail below in Section 5.4.

Table 2-1: Design Criteria Adopted for the development of the Erosion and Sediment Control Plans

PLAN COMPONENT	DESIGN CRITERIA	REFERENCE
Temporary Diversion Drains/Bunds	Q10	Managing Urban Stormwater – Soils and Construction, Vol. 1, Fourth edition
Temporary Waterway Crossings	Q10	Managing Urban Stormwater – Soils and Construction, Vol. 1, Fourth edition
Type 2 Sediment Controls	0.5 x Q1 (critical)	IECA 2008 and Catchments and Creeks (G Witheridge)
Sediment Basins	80th %ile 5-day	Value for Dubbo - Managing Urban Stormwater – Soils and Construction, Vol. 1, Fourth edition
Sediment Basin Spillways	Q10	Managing Urban Stormwater – Soils and Construction, Vol. 1, Fourth edition

5.2 Progressive Erosion and Sediment Controls Plans

Detailed progressive Erosion and Sediment Control Plans (ESCP) have been developed and endorsed/approved for the Project by a Certified Professional in Erosion and Sediment Control (CPESC) (Attachment B), and address the following aspects:

- The different stages of construction (e.g. General Arrangements, Typical Rail Corridor, Drainage, Level Crossings, Stockpiles and Laydowns, North West Loop and Sidings); and
- Various work areas (e.g. construction compounds; service installations; sediment basins).

The Progressive ESCP will be prepared in consultation with construction personnel, will identify risk and be prepared prior to construction activities commencing. Plans will typically be prepared over A3 drainage drawings and indicate (where relevant):

- Catchment areas;
- Construction boundaries;
- Exclusion zones and sensitive areas;
- Maintenance of buffer zones where possible;

- Assumed catchment boundaries;
- Access points and tracks;
- Compounds and storage areas;
- Stockpile sites;
- Temporary work areas;
- Material processing areas;
- Permanent and temporary controls (including order of implementation); and
- Notes specific to high risk activities if applicable.

In some instances, more than one ESCP may be required for an activity due to:

- Staging rendering the process complicated;
- Change in the construction process, scope of work or work method; and
- Controls are found to be ineffective following rainfall.

Additionally, the ESCP will be developed in consideration of other environmental aspects (e.g. sensitive vegetation).

The ESCP will be prepared for works in sensitive areas such as around drainage features or waters.

The ESCP will be electronically recorded with hardcopies present on site for reference by site personnel and available for inspections. The ESCP will be prepared according to the 'Blue Book' and are to be read in conjunction with this PESCP, SWMP and the CEMP.

5.3 Key Erosion and Sediment Control Strategies

The following subsections outline the methods that should be undertaken to minimise the erosion potential of the site and controls for capture of any subsequent sediment. Identified below are works considered "high risk" in terms of erosion potential and the following management practices shall be implemented as a minimum to reduce this risk.

Additionally, all construction will be undertaken to comply with section 120 of the *Protection of the Environment Operations Act 1997*, which prohibits the pollution of waters.

5.3.1 Experience and Expertise

A qualified Soil Conservationist with experience in rail construction will be engaged. The Soil Conservationist will be a Certified Professional in Erosion and Sediment Control (CPESC) and will coordinate and oversee all erosion and sediment control aspects during construction.

5.3.2 Training

All site personnel will be trained to recognise erosion and sediment concerns and understand what needs to be done and who needs to be contacted in the event of an erosion and sediment control failure.

Specific site personal will be trained in the installation and maintenance of erosion and sediment controls to ensure that when these tasks are undertaken on site they done in accordance with appropriate guidelines.

All site personnel have a responsibility to contact the Supervisor if any erosion and sediment control failures are identified or when maintenance is required. The issues identified should be noted and corrected as per monitoring and maintenance requirements and recorded in the Corrective and Improvement Action Database.

5.3.3 Construction Staging

Works will be planned and staged to facilitate effective erosion and sediment control. Strategies include:

- Ensuring perimeter surface water controls are in place prior to disturbance;
- Ensuring primary sediment control structures are in place prior to work in each catchment;
- Planning to minimise site disturbance, construction footprint and duration between commencement and stabilisation works;
- Installation of permanent drainage as soon as practical;
- Identification of high-risk areas and work planning in these areas to achieve stabilisation as soon as possible; and
- Staging of clearing operations.

5.3.4 Staged Implementation of Erosion and Sediment Controls

Erosion and sediment control will be staged according to the following principles:

- Control erosion before controlling sediment – sediment is only generated when erosion occurs;
- Minimise the extent and duration of disturbance;
- Control stormwater flows onto, through and from the site;
- Use erosion control in accordance with the Blue Book (2004) to prevent on-site damage;
- Use sediment controls in accordance with the Blue Book (2004) to prevent off-site damage;
- Control erosion and sediment at the source;
- Stabilise disturbed areas progressively;
- Inspect and maintain control measures every day; and
- Site works will not start until the erosion and sediment controls are installed and functional.

5.3.5 Minimising Extent and Duration of Disturbance

The following measures will be implemented to minimise extent and duration of disturbance:

- Marking clearing limits;

- Sediment basins, diversion drains, and sediment and erosion controls will be installed prior to the commencement of clearing and construction;
- Staging of clearing operations;
- Initially clearing and grubbing to leave the soil surface in a reasonably rough condition with surface vegetative cover;
- Emphasis on management of construction activities adjacent to creeks or areas of concentrated flows;
- No clearing of vegetation undertaken during overland flow events; and
- Minimise disturbance water courses where possible by implementing the following methods:
 - Minimise disturbance to grasses;
 - Minimise disturbance to small understorey; and
 - Use the cut-stump method for larger trees instead of stump removal.

5.3.6 Site Access

The following access controls will apply during construction controlled in accordance with the Transport Traffic and Access Management Plan (TTAMP):

- All access to and within the construction project alignment will be, restricting vehicle and plant access to well-defined roads and access tracks to avoid excessive ground disturbance;
- All-weather access surfaces shall be provided, and care should be taken that this material itself does not erode;
- Vehicle wheel washers and/or other devices to remove soil materials from wheels, where appropriate, should be placed at access points; and
- Access points should be stabilised with aggregate or similar.

5.3.7 Temporary Stockpiles

The following measures will apply to the management of stockpiles of spoil and other materials or as otherwise described within the Certified Erosion and Sediment Control Plans:

- Located at least 5 m away from roads, existing rail corridors, channelised flow, steep batters, sensitive vegetation;
- Not located within the 20-year flood zone for defined water courses or within 20m of defined drainage channels;
- If the material is not being worked with must be stabilised (within 10 days); and
- An earth bank is to be installed on the upslope and a sediment fence is to be installed on the downslope

5.3.8 Permanent Stockpiles

The following measures will apply to the management of stockpiles of spoil and other materials:

- Within the existing rail corridor;
- At least 50 metres from any watercourse or culvert or where the rail formation is predicted to be overtopped during a flood event;
- At least 500 metres from any residence;
- Outside the line of sight of drivers approaching level crossings; and
- Outside the drip lines of trees located on private property.
- Maximum height must not exceed the top height of the upgraded rail line;
- Not result in the clearing or covering of native vegetation beyond that described in the EIS and Submissions Report;
- Not result in heritage impacts beyond that described in the EIS and Submissions Report;
- Not result in additional changes to the upstream flooding regime beyond those described in the EIS and Submissions Report;
- Not affect the downstream flood regime;
- Not impede the flow of water through culverts;
- Not contain any contaminated soil classified as unsuitable for the proposed land use, acid sulphate soils or green waste;
- Are to be stabilised during construction of the CSSI;
- Are to be stabilised prior to operation of the CSSI; and
- Once formed cover within 10 days;

5.3.9 Topsoil Management

The following measures will be implemented with respect to topsoil management or as otherwise described within the Certified Erosion and Sediment Control Plans:

- Prior to stripping, confirm topsoil is free of weed materials in accordance with the Pest and Weed Management Plan (PWMP);
- If topsoil within the area is to be disturbed, it should be stockpiled for later respreading on all exposed areas once final land shaping has been completed;
- The stockpile should not be located within 5 metres to an existing roadway, existing rail corridor, access way, waterway nor within a drainage line;
- Low, flat, elongated mounds of no more than 2 metres in height; and
- Once formed cover, spray with polymer and / or re-vegetate within 10 days.

5.3.10 Offsite Source Surface Water Management

Stormwater flowing onto areas disturbed as a result of construction activities should be intercepted and diverted around the disturbed areas. Diversions may include temporary banks or drains and are to be appropriately stabilised with consideration to the duration of the diversion and the erosion control required and will include a stable outlet area. As far as practicable existing catchment and sub-catchment boundaries should be maintained. Adjoining landholders would need to approve in writing any runoff proposed to be redirected to their property.

5.3.11 Offsite Source Surface Water Management

Stormwater produced within the construction areas (dirty water) will be utilised on this Project as required by:

- Separating 'clean' run-on water from 'dirty' construction area run-off;
- Constructing permanent drainage structures early in the project including:
 - Detention/sediment basins and traps catch drains with linings (e.g. concrete, rock, geotextile or jute mesh)
 - Culverts and associated inlet and outlet protection (e.g. dissipaters) directing water from areas disturbed by construction to sediment controls (sediment basins or traps)
- Controlling run-off during the construction of embankments (e.g. fill shaping and the construction of temporary dykes and batter drains);
- Managing for reduced catchment sizes and volumes through diverting formation run-off through sediment controls and into the stormwater drainage system as soon as practical; and
- Managing surface flows through use of temporary diversions to reduce slope length and grade of flow.

5.3.12 Dust Control

Dust control will be managed in accordance with the project Air Quality Management Plan (AQMP). Dust control measures relevant to Soil and Erosion control (potentially caused by wind erosion) include:

- Minimising disturbance;
- Applying ground cover;
- Water retained onsite from rain events will be reused on site for dust management, where appropriate; and
- The use of dust suppressants (such as water, polymer etc) will be applied where required

5.3.13 Sediment Basin Design Criteria

The following criteria will apply to the design of sediment basins if used during construction of the project.

- Managing Urban Stormwater Vol 1 (2004) Section 6.3.2 General Recommendations (d) provides that for local catchments with an average annual soil loss from the total area of land disturbance less than 150 m³ per year or (or ~195 tonnes per year) construction of sediment basin(s) may be considered unnecessary. Where site constraints do not permit the installation of a sediment basin in accordance with the erosion risk and sizing specified, the basin shall be installed to the maximum possible volume with the deficiency offset by increased maintenance and erosion control in the contributing catchment and a treatment train approach to sediment control (in consultation with the plan preparer);
- Flood assessments should distinguish between local overland flooding and mainstream flooding;
- Sediment basins should not be constructed below the 2-year ARI flood level;
- Sediment basins will be constructed with a defined and stable outlet;
- Design sediment basins and outlets to be stable in the peak flow from at least the 10-year ARI time of concentration event;
- Sediment basins will be designed to accommodate runoff from type F and D soils. Where possible flow length will be maintained within controls at 3:1 (length to width) to facilitate capture of coarse sediments;
- Sediment basin management of turbid water will be in accordance with the Managing Urban Stormwater Vol. 1 2004 after cessation of rainfall with one (1) or a combination of:
 - Flocculation with gypsum (or approved alternative flocculant); and
 - Pump-out for construction purposes or dust control
- Water is not to be released from sediment basins prior to achieving acceptable water quality standards as required by the Environmental Protection Licence (EPL), administered by the Environment Protection Authority (EPA). Unless stipulated otherwise the following discharge criteria is assumed:
 - No visible oil and grease on the water surface;
 - pH = 6.5 – 8.5; and
 - Total Suspended Solids (TSS) < 50mg/L
- Sediment basin water will be reused or discharged in accordance with the SWMP.

5.4 Design of Erosion Controls

This section provides a comprehensive list of measures that can be used for erosion control. Not all of these controls will be appropriate for the type of construction activity that is being undertaken. As

such the ESCP would outline what controls are appropriate for the construction activity and any surrounding constraints.

5.4.1 Surface Water Diversions

Description: management of surface water as a mechanism of reducing the catchment size (and hence volume) and also the flow path (grade and velocity) of flows. This is a primary method of erosion control during construction. Surface water management is also critical in separation of site and non-site water.

Application: surface water diversions may consist of formed and compacted berms or shallow drains or swale. More temporary diversions may be achieved using gravel or sand bags or shallow scratch (herringbone) drains within work areas

Design/construction aspects: diversions should be suitable for the size of catchment and volume of flow to be managed. They should be placed to facilitate movement and construction activities.

Potential issues: diversions may fail if incorrectly placed or aligned. Consideration should be given to stability of outlets and requirement/opportunity for sediment controls at outlets of diversions.

5.4.2 Turf

Description: A layer of topsoil and grass harvested from the field by specialist machinery. Reinforced turf is similar to conventional turf except that the grass is grown through an artificial two-dimensional polypropylene grid to provide additional strength.

Application: Turf and reinforced turf can be used where there is both sheet flow and concentrated flow. It is often used as a 'softer' alternative to 'hard' channel linings such as rock and concrete in urban situations.

Design/construction aspects: Turf is capable of withstanding only relatively low flow velocities. Reinforced turf can withstand higher flow velocities than ordinary turf. Deposited sediment can kill turf and so upstream erosion protection and sediment detention measures should be installed before the turf can be placed. As turf and reinforced turf rely on the grass root system for strength, the underlying soil must be suitable for plant growth – i.e. fertile and with good structure. The edges of the turf must be installed flush with the existing soil surface to avoid erosion along the turf/soil interface.

Potential issues: Turf can be killed by significant amounts of deposited sediment. Reinforced turf may become 'root bound' and therefore may take longer to bind into the soil surface. Turf should be watered until adequately established.

5.4.3 Erosion Mats and Blankets

Description: A rolled mat or blanket made from jute, coconut fibre, wool, nylon and polypropylene that is placed on the soil surface to protect it from raindrop impacts and low velocity sheet and concentrated flows.

Application: Erosion control blankets and mats have different applications. Erosion control blankets are used on batters and embankments and other sheet-flow environments to protect the soil from erosion and promote vegetation. They are generally temporary measures and are designed to degrade, being composed of wood fibre, wool and jute. Erosion control mats are designed to be used in concentrated flow environments and are therefore made from more durable materials such as coconut fibre, nylon and polypropylene, as well as jute. Within active construction areas geotextile is often used to provide immediate and temporary protection to both batters and areas of channelised flow.

Design/construction aspects: Due to the many types of proprietary products available, independent advice should be sought on the appropriate mat or blanket on a site-specific basis. Manufacturers provide specifications and installation guidelines with their products. Potential issues: Problems can occur when blankets are placed in concentrated flow areas. A blanket is designed to protect the ground from raindrop impact, while a mat is a heavier product designed for concentrated flow.

5.4.4 Surface Mulching

Description: Mulching involves placing a cover of (usually) coarse organic material to protect the soil surface from the erosive effects of raindrop impact and shallow sheet flows. Common mulch materials include wood chips, straw, wood fibre, paper pulp, bagasse, brush matt and bitumen emulsion.

Application: The type of mulch used will depend on the following factors: the environment to be protected, the climatic conditions, the location and the type of mulch material available.

Design/construction aspects: Commonly, flows should be diverted away from the area to be protected. The mulch material should be applied evenly and uniformly.

Potential issues: Mulch will be washed away where flow diversion fails. Soils can erode where insufficient mulch or soil binding agent is used. Some mulch can cause weed infestation (e.g. where hay is used instead of clean straw).

5.4.5 Vegetation

Description: Vegetation planted to prevent erosion may include native and introduced grasses, ground covers, shrubs and trees.

Application: Any erosion control program will benefit from temporary and permanent vegetation cover. Vegetation protects the soil from raindrop impact, slows flow velocities and traps eroded soil particles. Roots bind the soil surface and thus help prevent erosion.

Potential issues: Weed infestations may occur where contaminated seed is used or where soil is disturbed. Climatic/soil constraints may impede vegetation establishment.

5.5 Design of Sediment Controls

This section provides a comprehensive list of measures that can be used for sediment control. Not all of these controls will be appropriate for the type of construction activity that is being undertaken. As such the PESCPs would outline what controls are appropriate for the construction activity and any surrounding constraints.

Sediment controls will be used at various locations within the project alignment. Perimeter controls will be used where appropriate to treat sheet flows from small catchments and allow water to pass out of the project area. Controls may be used to direct surface water within work areas or at the perimeter to sediment control traps or sediment basins. Small controls will be used where appropriate to trap sediment close to its source and also at storm water outlet points.

5.5.1 Sediment Fences

Description: A sediment fence is a temporary barrier of permeable geotextile, partially installed in a trench and supported by posts.

Design/construction aspects: Sediment fences are not to be used in areas of concentrated flow. The fence should be installed on the contour with the ends turned up, anchored in a 150 mm deep compacted, backfilled trench. The sediment fence posts must be on the down-slope side of the fabric otherwise the fabric will come away from the peg when put under pressure.

Potential issues: Water will run around the ends of the fence if returns are omitted at either end. If the trench is too shallow, the fabric may pull out of the ground. Water will tunnel under the fence if the trench is not compacted after installation.

5.5.2 Mulch Berms

Description: A mulch berm is a temporary barrier of mulched vegetation shaped as a perimeter sediment control. Mulch berms can also be used as sediment traps.

Design/construction aspects: Mulch is not to be used in areas of concentrated flow. The berm should be installed on the contour with returns provided as the end to prevent water being directed out of the control. Berms may be strengthened and improved with addition of mesh to maintain its shape and form. Mulch berms may also be formed in front of sediment fence to greatly improve performance of sediment control at perimeter. Mulch berms have the benefit over sediment fence that they utilise site material and can be spread as erosion control over surfaces when no longer required.

Potential issues: Water will run around the ends of the berm if returns are not provided. Care should be taken that excessive tannin is not generated by berms and leached to waters or over concrete surface as it stains. Berms may fail if excessive volumes of water are directed to the control at single points or is made to pond in single locations.

5.5.3 Sediment Traps

Description: Sediment traps capture eroded particles by slowing the velocity of water so that the soil particles settle out. They generally consist of a stable inlet and outlet, and some form of pond. Sediment traps typically allow the bulk of water to pass over or through the permeable wall and as such do not hold great volumes of water.

Application: Their function is to trap coarse sediments in concentrated flow situations. They should be located immediately downstream of disturbed areas. Fine sediments may also be trapped if detention time is suitably long.

Design/construction aspects: Sediment traps do not need to be formally designed. They can be formed by excavating an earthen pond, or by constructing some form of structure to form a pond using materials such as rocks, logs, sandbags, reinforced geotextiles or concrete barriers. Sediment traps include specific designed type-2 sediment structures/ rock filter dams as detailed within Sheet A04 of the ESCPs.

Potential issues: Common problems include insufficient capacity, inlet and outlet erosion due to inadequate erosion protection, and poor location and design causing difficulty in cleaning out sediment.

5.5.4 Sandbags

See also Managing Urban Stormwater 2004 for notes on shape and placement of control.

Description: Sandbags, used to form a temporary sediment trap, capture eroded sediments by slowing the water so that the soil particles settle out. They also provide a function as an erosion control.

Application: Sandbags trap coarse sediments in both concentrated and (less commonly) sheet flow areas. They should be located immediately downstream of disturbed areas.

Design/construction aspects: Sandbags or other materials (such as rocks, straw bales or coir logs) can be used to form a pond to act as a sediment trap.

Potential issues: Commonly, the structures are too small to contain all the water washed from the site. Poor location and design can cause difficulty in cleaning out sediment. A defined spillway is also required when constructing these controls.

5.5.5 Site Access Control

Description: Stabilised site access are used to provide a stable all-weather access point into project areas as a means of reducing the tracking and transport of sediment out of project areas

Application: A stable hardened material is placed to facilitate the removal of sediment from wheels (such as via a shaker grid or rubble pad) or simply a hardened entrance to prevent the surface being churned.

Design/construction aspects: access points may consist of bitumen or compacted, hardened surfaces leading to cattle grid or rubble grid. The access point often may include a trafficable berm as a diversion with associated sediment control to prevent site water exiting via the gate area. Alternatively gravel bags may be placed across access points at shut down.

Potential issues: Material selected for access points is critical as gravels or grids may rapidly become clogged with transported sediment and require maintenance or replacement. Material should not be readily moved onto public roads creating traffic hazards.

5.6 Work Adjacent to and in Watercourses

The following specific management measures will also apply to works in and adjacent to watercourses (unless identified otherwise by the Certified Erosion Control Specialist):

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- Photographic record of watercourse bank areas adjacent and opposite will be taken prior to work to identify any impacts from construction activities;
- Maintain and contribute towards achievement of the *NSW Water Quality Objectives* (www.environment.nsw.gov.au/ieo);
- Works on waterfront land must be undertaken in accordance with the DPI guidelines for controlled activities on waterfront land;
- All reasonable efforts will be taken to program construction activities during those periods when flood flows and fish passage is not likely to occur;
- Any temporary side track crossings will be constructed from clean fill (free of fines) and where required to maintain flows, will use appropriately sized pipe or box culvert cells, or a temporary bridge structures;
- Temporary structures used for the construction of culverts will be designed so that they can accommodate flows to minimise potential flooding impacts when prolonged or intense rainfalls are predicted. Any structures that impede flow will be readily removable or collapsible, to allow flood waters to flow within the channel, in the event of prolonged or intense rainfall;
- Impacts on soil structure or condition, scouring and erosion either outside the rail corridor, or beyond the area of scour protection works (where an adjacent landowner has agreed to the installation of such works on their property) will be monitored;
- Where areas outside of the rail corridor currently show scour or erosion and this is directly attributable to a culvert that is to be replaced, mitigation measures will be implemented to ensure stable downstream conditions, and further scouring or erosion resulting from flows exiting the replacement culvert are mitigated;
- All temporary works, flow diversion barriers and in-stream sediment control barriers will be removed as soon as practicable and, in a manner, that does not promote future channel erosion;
- No changes must occur to the direction of watercourses or the direction of flood flows except within the rail corridor;
- Drainage feature crossings (permanent and temporary watercourse crossings and stream diversions) and cess drains and depressions must be designed and constructed in accordance with relevant DPI guidelines;
- The construction site will be left in a condition that promotes native revegetation and restoration to maintain ecological function;
- Sediment controls will be selected and placed to allow these to be maintained until riparian areas are stabilised; and
- Erosion controls will be used during works to reduce erosion potential, these include;
 - As far as possible limiting areas disturbed to allow works;
 - Surrounding works areas with low berms, covered with geotextile, to limit inflow of water into the work sites;
 - Covering and stabilising work area with gravel or similar; and

- Managing site materials so no excess material is retained near the creek.

The following general staging is expected for the works around watercourses (unless identified otherwise by the Certified Erosion Control Specialist):

- Set out and define limit of works and access areas required;
- Establish access and clear work area. As required gravel will be imported to the road surface to provide a stable access;
- Push topsoil material stripped from work area and shape to low berms at perimeter of works and secure with geotextile and stakes. Excess material to be taken to a designated stockpile site;
- Where identified as exposed / unstable material can be placed over the main work area to create a covered work surface;
- Form dam at upper limit of work area within creek. Dam to be formed from sealed bulker bags filled with site ENM and wrapped in geotextile. Include central section that may be removed readily if required to accommodate low flows;
- Provide stable pick up point for pump around (via 6-inch pump) above dam. Provide pick up point for smaller pump below dam for seepage;
- Form similar but smaller dam at downstream limit of works;
- Establish stable discharge point for pump around below limit of works. Discharge point may consist of wide level geotextile apron covered with clean ballast as spreader;
- Confirm weather conditions and undertake clearing works and any excavation of channel for base and load out excavated material directly to designated stockpile area;
- Ensure materials are on site for required works and emergency shut down provisions;
- Undertake works to create slab including central low flow; and
- Upon completion of in stream works the lower dam may be removed and low flow may be engaged to allow water to pass through work area.

5.7 Mitigation and Management Measures

Mitigation measures to avoid and / or minimise impacts that may result from Erosion or Sedimentation during construction are outlined in Table 5-3 below.

Table 5-3 – Mitigation and Management Measures

Ref ID	Details	Responsibility	Source
ES01	All reasonably practicable erosion and sediment controls must be installed and appropriately maintained to minimise any water pollution. When implementing such controls, any relevant guidance in the Managing Urban Stormwater series must be considered.	Environmental Manager	CoA E71

Primary Erosion and Sediment Control Plan

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Ref ID	Details	Responsibility	Source
ES02	<p>The preparation of detailed, specific and Progressive Erosion and Sediment Control Plans (ESCPs) will be required for the following:</p> <ul style="list-style-type: none"> The different stages of construction (e.g. site establishment - clearing, stripping and stockpiling of topsoil; earthworks; drainage). Various work areas (e.g. construction compounds; service installations; sediment basins) 	Environmental Manager	Good Practice
ES03	<p>Permanent Spoil Mounds are to be located:</p> <ol style="list-style-type: none"> within the existing rail corridor; at least 50 metres from any watercourse or culvert or where the rail formation is predicted to be overtopped during a flood event; at least 500 metres from any residence; outside the line of sight of drivers approaching level crossings; and outside the drip lines of trees located on private property. <p>Note: For the purpose of Condition E52(e), the Contractor must not affect trees outside of the rail corridor for the purpose of preventing those trees' driplines overhanging spoil mounds.</p>	Environmental Manager	CoA E52
ES04	<p>Permanent Spoil mounds are to comply with the following requirements:</p> <ol style="list-style-type: none"> maximum height must not exceed the top height of the upgraded rail line; not result in the clearing or covering of native vegetation beyond that described in the EIS and Submissions Report; not result in heritage impacts beyond that described in the EIS and Submissions Report; not result in additional changes to the upstream flooding regime beyond those described in the EIS and Submissions Report; not affect the downstream flood regime; not impede the flow of water through culverts; not contain any contaminated soil classified as unsuitable for the proposed land use, acid sulphate soils or green waste; are to be stabilised during construction of the project; and are to be stabilised prior to operation of the project. 	Environmental Manager	CoA E53
ES05	<p>The environmental values of land, including soils, subsoils and landforms, are protected.</p> <p>Risks arising from the disturbance and excavation of land and disposal of soil are minimised, including disturbance to acid sulfate soils and site contamination.</p>	Environmental Manager	EIS SEAR desire outcome 15

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ES06	<p>Site-specific soil, subsoil and landform characteristics are taken into consideration during detailed design and construction.</p> <p>Any contamination is managed in accordance with relevant regulatory requirements.</p> <p>Any soil waste is assessed, classified, managed and disposed of in accordance with the Waste Classification Guidelines (EPA, 2014).</p>	Environmental Manager	EIS Proposal specific enviro. Performance 15
ES07	Mitigation measures for reinstatement must be produced in consultation with ARTC, the community and stakeholders (as necessary). Mitigation measures for reinstatement will be incorporated into the CEMP.	Environmental Manager	CEMF 5.3
ES08	Confirmation that an approved erosion and sediment control plan for the work site exists and that it is up to date and relevant for the proposed works	Environmental Manager	CEMF 7.4 d)
ES09	<p>(a) Minimise pollution of surface and ground waters through appropriate erosion and sediment control measures;</p> <p>(b) Ensure the appropriate management of soil resources for reuse during reinstatement and rehabilitation; and,</p> <p>(c) Maintain existing water quality of surrounding surface and ground waters.</p>	Environmental Manager	CEMF 10.1
ES10	<p>Procedures for the development and implementation of Erosion and Sediment Control Plans;</p> <p>The Erosion and sediment control plan must be approved by a Suitably Qualified Person as per the 'Blue Book' requirements (i.e. Certified Professional in Erosion and Sediment control (CPESC))</p>	Environmental Manager	CEMF 11.3 k)
ES11	Site-by-site Predicted Soil Loss (A) calculations are to be undertaken and considered in determining erosion and sedimentation mitigation measures to be implemented on site-by-site basis	Environmental Manager	Good Practice
ES12	Drainage feature crossings (permanent and temporary watercourse crossings and stream diversions) and cess drains and depressions must be designed and constructed in accordance with relevant DPI guidelines.	Environmental Manager	CoA E28
ES13	Prior to the installation of a new culvert, the contractor must consult with the landowner that is located immediately downstream of the new culvert to determine the potential for impacts on the agricultural productivity of the land due to the introduction of flows. Where potential adverse impacts are identified, the contractor must consult with the affected landowner on the management measures that will be implemented to mitigate the impacts.	Environmental Manager	CoA E31
ES14	All scour protection works associated with replacement culverts or the construction of new culverts must be restricted to the rail corridor, or as agreed to by the relevant land owner.	Environmental Manager	CoA E32

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Ref ID	Details	Responsibility	Source
ES15	The CSSI (including the cess drains adjacent to the new and upgraded rail track) must be designed and constructed to ensure that there is no permanent interception of, and/or connection with, groundwater.	Environmental Manager	CoA E34
ES16	All discharges from the cess drains adjacent to the new and upgraded track must be released at a controlled rate to prevent scour.	Environmental Manager	CoA E35
ES17	Works on waterfront land must be undertaken in accordance with the DPI guidelines for controlled activities on waterfront land.	Environmental Manager	CoA E36
ES18	<p>Examples of soil management that should be considered by the construction contractor include:</p> <ul style="list-style-type: none"> (a) Appropriate land disturbances/clearing processes, so that any vegetated areas are cleared in a staged or on an as needed basis, prior to works occurring within them to minimise erosion risks and impacts. (b) Erosion and sediment control must be installed prior to ground disturbance works and upgraded, as required. (c) Erosion and sediment control must be regularly maintained and inspected until vegetation is established or permanent stabilisation measures are established; (d) Erosion and scour protection must be installed on batters as per project design and Managing Urban Stormwater – Soils and Construction (Landcom 2008), to prevent and minimise potential erosion and minimise concentrated flow; (e) Appropriate procedures or specifications on the use, installation, management and use of Erosion and Sediment Control devices, so that it occurs in accordance with any suppliers and/or Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004)/ Managing Urban Stormwater: Soils and Construction Volume 2C (DECC, 2008) specifications. (f) Appropriate land disturbances/clearing processes, so that any vegetated areas are cleared in a staged or on an as needed basis, prior to works occurring within them to minimise erosion risks and impacts. (g) Topsoil must be stockpiled separately to other soils/earthen material and clearly signed/marked on site drawings and maps, to allow for its reuse in any reinstatement and rehabilitation processes; (h) All stockpiles are to be located as close as practical to the source of the material and should be clearly demarcated on the type of material they contain; (i) Minimise duration and area of disturbance within watercourses; (j) No maintenance of plant and machinery within 50 m of a watercourse. Maintenance area will be adequately bunded (as per relevant and applicable 	<p>Environmental Manager</p> <p>Contractor</p>	CEMF 11.5

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Ref ID	Details	Responsibility	Source
	<p>Australian Standard) within construction compounds; and,</p> <p>(k) Reinstatement and rehabilitation are to occur progressively and as part of the completion of each construction stage, as per contract requirements. This should be in accordance with any relevant or applicable aspects of contract requirements, conditions of approval or licences.</p>		
ES19	Wherever possible stormwater collected during construction works should be utilised during onsite dust suppression activities	Environmental Manager	Good Practice
E20	Any recycled wastewater (including recycled/treated water) proposed for use by the project, must be fit for purpose and does not pose a risk to human health or the receiving environment		CoA E37
ES21	Works in and adjacent watercourses (i.e. culvert and bridge works) should be undertaken in accordance with requirements of Section 5.6 of this plan and any requirements of any applicable licences or permits including the EPL.	Environmental Manager	Good Practice
ES22	Any sediment basins used during construction should be designed in accordance with considerations outlined in section 5.3.12 of this plan or as otherwise described within the Certified Erosion and Sediment Control Plans	Environmental Manager	Good Practice
ES23	Control devices should be implemented during construction considering erosion and control strategies outlined in Section 5.3 of this plan and specific site requirements and alternatives provided in section 5.4 of this plan for erosion control devices and section 5.5 for sediment control devices.	Environmental Manager	Good Practice
ES24	<p>Rehabilitation of worksites will be undertaken in accordance with the following principles / client specifications:</p> <ul style="list-style-type: none"> • Ensuring the success of the later revegetation program by utilising a good topsoil management program. • Keying of topsoil to required batters. Topsoil depth to be specified by client. • Progressively revegetating disturbed areas utilising appropriate species. • Specific rehabilitation and stabilisation planning for riparian areas. 	Environmental Manager	Good Practice
E25	Works must be constructed to ensure that there is no permanent interception of, and / or connection with, groundwater	Environmental Manager	CoA E34
E26	Maintain and contribute towards the achievement of the <i>NSW Water Quality Objectives</i> .	Environmental Manager	CoA E27

5.8 Construction Monitoring Program

5.8.1 Erosion and Sediment Control Monitoring

Any erosion or sedimentation during construction will be investigated upon receiving a complaint, or upon request by the Client or Regulatory Authority. Any assessment and monitoring will be conducted in accordance with the principals of the International Erosion Control Association (IECA) and Bluebook and reviewed against relevant assessment criteria outlined in this plan. Consultation will be undertaken with relevant stakeholder groups, community, local state and commonwealth governments regarding construction monitoring.

On-going checks will be carried out to ensure no work activities are directly resulting in erosion or sedimentation within or adjoining the project area.

Weekly inspections will be performed by project staff and documented in Weekly Environmental Checklist. Daily visual monitoring of potential problem areas including stockpiles, access tracks, site access points, exposed earthworks, culvert work areas to be carried out by foremen and supervisory personnel and recorded in their daily diary. Erosion and sediment control measures must be regularly maintained and inspected until vegetation is established or permanent stabilisation measures are established.

Appropriate consultants may be commissioned to undertake additional impact assessment during the final construction design and initial phases of construction, should site conditions differ from that predicted in the EIS. Any further Impact assessment (if required) and analysis of data will be carried out by a competent person. Evidence of competence must be retained. Where monitoring determines non-compliance to be a risk or to have occurred, an incident report and corrective actions are to be raised and reported.

5.8.2 Water Quality Monitoring

Water quality monitoring during construction works will be undertaken in accordance with the Water Quality Monitoring Program (Attachment A of the Soil and Water Management Plan).

5.9 Roles and Responsibilities

All site personnel shall ensure that environmental nuisance or harm is minimised by adherence to all this PESCP and the CEMP and Sub-plans. Site personnel are also responsible for ensuring they do not act in contravention of the CoA or EPL.

Field Supervision are responsible for implementation and maintenance of erosion and sediment control mitigation measures for all activities and work areas.

The Environmental Manager is responsible for routine surveillance and monitoring, communication of requirements of this sub-plan, coordination of visual monitoring, and all other responsibilities related to erosion and sediment control impacts identified within this sub-plan and overall CEMP. Importantly the Environmental Manager is responsible for the immediate notification of State and / or Commonwealth government agencies of impacts that have mandatory reporting requirements.

The Project Manager is responsible for overseeing implementation of this Sub-plan and the CEMP.

5.10 Environmental Incidents, Non-Conformances and Complaints

In the event of a complaint, non-conformance or incident, an investigation will be undertaken to determine the cause of the problem lead by the Environmental Manager. Any identified impacts on erosion and sediment control, the identified source and corrective actions are to be documented and managed in accordance with the Incident and Accident Management Procedure in accordance with Section 6.1 of the CEMP and recorded in the Corrective and Improvement Action Database. Complaints will be handled in accordance with Section 6.3 of the CEMP.

5.11 Inspections and Auditing

The Environmental Team will undertake environmental inspections, audits and reporting to develop and evaluate the effectiveness of environmental controls. This will include:

- Daily visual inspections;
- Weekly inspections using the Weekly Checklist;
- Monthly reporting to the Client on this aspect will be recorded through Project Monthly Reports; and
- Annual independent audits;
- ER regular monitoring of the implementation of the documents listed in the CoA.

5.12 Performance Criteria

The following erosion and sedimentation are performance criteria against with the implement of this plan will be assessed:

- Avoid and/or minimise pollution of waters by implementing effective control measures;
- No impact on water quality levels beyond the permitted criteria (as specified in Section 5 of the SWMP) in surrounding waterways;
- Implementation of an organised, integrated and systematic approach to effectively address erosion and sedimentation throughout construction; and
- Inform all personnel of erosion and sediment issues and management practices to manage the risk of erosion and sedimentation during construction.

5.13 Communication

Stakeholder group, community and government agency consultation on in relation to this Plan should be undertaken in accordance with consultation requirements outlined in Section 8 of the CEMP.

5.14 Training and Awareness

All employees and contractors working on site will undergo site induction training relating to erosion and sediment control. The General Site Induction will address elements including:

- Recognising erosion and sediment concerns; and
- Understanding what needs to be done and who needs to be contacted in the event of an erosion and sediment control failure.

Training will also include Toolbox Talks and Prestart Meetings in which the topics of the site induction will be revisited.

5.15 Emergency Planning and Response

Where any erosion and/or sedimentation within or adjacent to the project area is identified, construction activities resulting in impacts will be ceased immediately and appropriate mitigation measures identified and implemented.

All such impacts, their identified source and corrective actions are to be documented and managed in accordance with the Incident and Accident Management Standard and recorded in the Corrective and Improvement Action Database. If applicable state and or commonwealth government agencies to be notified of impacts immediately.

5.16 Record Keeping

The results of any water quality monitoring, instances of erosion or sedimentation and discharge of waters to the environment will be kept on record.

Six monthly audits of performance against the requirements of the SWMP and the PESCP should be undertaken and reported and to include collation of the following:

- General site monitoring;
- Water quality monitoring;
- Meteorological monitoring;
- compliance with all discharges to the environment as per the EPL;
- All non-conformances and follow up rectification actions; and
- An assessment of the appropriateness of discharge locations and design.

5.17 Document Review

The PESCP must be approved by a Suitably Qualified Person as per the 'Blue Book' requirements (i.e. Certified Professional in Erosion and Sediment control (CPESC) in accordance with Condition 11.3 of the CEMF requirements.

This PESCP will be reviewed utilising the Corrective and Improvement Action database simultaneously to review of the overarching CEMP and any amendments cited and cross checked against each plan.

For the duration of the works until the completion of construction, the approved ER must:

Review documents identified in the CEMP, Sub-plans, Construction Monitoring Programs and any other documents that are identified by the Secretary, to ensure they are consistent with requirements in or under this approval and if so:

- Make a written statement to this effect before submission of such documents to the Secretary (if those documents are required to be approved by the Secretary); or

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- Make a written statement to this effect before the implementation of such documents (if those documents are required to be submitted to the Secretary / Department for information or are not required to be submitted to the Secretary / Department)



Attachment A
Environmental Representative
Endorsement

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Refer to Soil and Water ER Endorsement