APPENDIX B4

Construction Soil and Water Management Sub Plan

*The Northern Road Upgrade*

*Between Mersey Road and Eaton Road*

November, 2018
# Document control

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Plan reviewed by:

![Signatures]

GEJV Project Manager

GEJV Environmental Manager

Roads and Maritime Representative

Environmental Representative

Project Soil Conservationist
Revision history

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<table>
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<th>Expanded text</th>
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<tr>
<td>ANZECC</td>
<td>ANZECC Australian and New Zealand Environment and Conservation Council</td>
</tr>
<tr>
<td>ARI</td>
<td>Average Recurrence Interval</td>
</tr>
<tr>
<td>ARMCANZ</td>
<td>Agriculture and Resources Management Council of Australia and New Zealand</td>
</tr>
<tr>
<td>ASS</td>
<td>Acid Sulfate Soil</td>
</tr>
<tr>
<td>AWS</td>
<td>Automatic weather station</td>
</tr>
<tr>
<td>BoM</td>
<td>Bureau of Meteorology</td>
</tr>
<tr>
<td>Catchment</td>
<td>The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location</td>
</tr>
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<td>CCS</td>
<td>Community Communication Strategy</td>
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<td>CEMP</td>
<td>Construction Environmental Management Plan</td>
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<td>CCLMP</td>
<td>Construction Contaminated Land Management sub plan</td>
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<td>CMS</td>
<td>Complaints Management System</td>
</tr>
<tr>
<td>CoA</td>
<td>Condition of approval</td>
</tr>
<tr>
<td>Compliance audit</td>
<td>Verification of how implementation is proceeding with respect to an CEMP (which incorporates the relevant approval conditions)</td>
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<tr>
<td>CPESC</td>
<td>Certified Practicing Erosion and Sediment Control Professional</td>
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<tr>
<td>CSSI</td>
<td>Critical State Significant Infrastructure</td>
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<tr>
<td>CSWMP</td>
<td>Construction Soil and Water Management Plan</td>
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<tr>
<td>CWEMP</td>
<td>Construction Waste and Energy Management Plan</td>
</tr>
<tr>
<td>DEC</td>
<td>Department of Environment and Conservation (NSW) (former)</td>
</tr>
<tr>
<td>DECC</td>
<td>Department of Environment and Climate Change (NSW) (former)</td>
</tr>
<tr>
<td>DEOH</td>
<td>Defence Establishment Orchard Hills</td>
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<tr>
<td>Department, the Commonwealth Department of the Environment and Energy</td>
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<tr>
<td>DIPNR</td>
<td>Department of Infrastructure, Planning and Natural Resources</td>
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<tr>
<td>DoEE</td>
<td>Commonwealth Department of the Environment and Energy</td>
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<td>DoI</td>
<td>Department of Industry - Water</td>
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<tr>
<td>DP&amp;E</td>
<td>NSW Department of Planning and Environment</td>
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<td>DPI</td>
<td>NSW Department of Primary Industries</td>
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<tr>
<td>EEC</td>
<td>Endangered Ecological Community</td>
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<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
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<tr>
<td>EMS</td>
<td>Environmental management system</td>
</tr>
<tr>
<td>Environmental aspect</td>
<td>Defined by AS/NZS ISO 14001:2015 as an element of an organisation’s activities, products or services that can interact with the environment</td>
</tr>
<tr>
<td>Term</td>
<td>Expanded text</td>
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</tr>
<tr>
<td>Environmental impact</td>
<td>Defined by AS/NZS ISO 14001:2015 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation’s environmental aspects</td>
</tr>
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<td>Environmental incident</td>
<td>An unexpected event that has, or has the potential to, cause harm to the environment and requires some action to minimise the impact or restore the environment</td>
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<tr>
<td>Environmental objective</td>
<td>Defined by AS/NZS ISO 14001:2015 as an overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve</td>
</tr>
<tr>
<td>Environmental Representative (ER)</td>
<td>A suitably qualified and experienced person independent of project design and construction personnel employed for the duration of Construction. The principal point of advice in relation to all questions and complaints concerning environmental performance</td>
</tr>
<tr>
<td>Environmental target</td>
<td>Defined by AS/NZS ISO 14001:2015 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives</td>
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<tr>
<td>EPA</td>
<td>NSW Environment Protection Authority</td>
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<td>EP&amp;A Act</td>
<td>NSW Environmental Planning and Assessment Act 1979</td>
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<td>EPBC Act</td>
<td>Commonwealth Environmental Protection and Biodiversity Conservation Act 1999</td>
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<td>ERG</td>
<td>Environmental Review Group</td>
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<td>ERSED</td>
<td>Erosion and Sediment</td>
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<tr>
<td>ESR</td>
<td>GEJV’s Environmental Site Representative</td>
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<td>EWMS</td>
<td>Environmental Work Method Statement</td>
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<td>Federal-CoA</td>
<td>Condition of the Federal Department of the Environment and Energy Approval Decision</td>
</tr>
<tr>
<td>GDE</td>
<td>Groundwater dependent ecosystem</td>
</tr>
<tr>
<td>GMS</td>
<td>Georgiou management system</td>
</tr>
<tr>
<td>GEJV</td>
<td>Georgiou Ertech Joint Venture</td>
</tr>
<tr>
<td>Hold Point</td>
<td>A point beyond which a work process must not proceed without express written authorisation from Roads and Maritime</td>
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<tr>
<td>HRC</td>
<td>Healthy Rivers Commission</td>
</tr>
<tr>
<td>LDP</td>
<td>Licenced Discharge Points</td>
</tr>
<tr>
<td>m bgl</td>
<td>metres below ground level</td>
</tr>
<tr>
<td>MP</td>
<td>Monitoring Program</td>
</tr>
<tr>
<td>Non-compliance</td>
<td>Failure to comply with the requirements of the Project approval or any applicable licence, permit or legal requirements</td>
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<tr>
<td>Non-conformance</td>
<td>Failure to conform to the requirements of Project system documentation including this CEMP or supporting documentation</td>
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<tr>
<td>NRAR</td>
<td>NSW Natural Resources Access Regulator</td>
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<tr>
<td>Term</td>
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<td>NSW-CoA</td>
<td>Condition of the NSW DP&amp;E Infrastructure Approval</td>
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<td>NSW Infrastructure Approval</td>
<td>The infrastructure approval for the Northern Road Upgrade issued by the New South Wales Government on 30 May 2018</td>
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<tr>
<td>NTU</td>
<td>Turbidity</td>
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<td>OACEMP</td>
<td>Overarching Construction Environmental Management Plan developed by Roads and Maritime and approved by DP&amp;E</td>
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<tr>
<td>PASS</td>
<td>Potential Acid Sulfate Soil</td>
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<td>PESCP</td>
<td>Progressive Erosion and Sediment Control Plan</td>
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<tr>
<td>pH</td>
<td>A figure expressing the acidity or alkalinity of an aqueous solution on a logarithmic scale. 7 is neutral, lower values are more acid and higher values are more alkaline</td>
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<td>PIRMP</td>
<td>Pollution Incident Response Management Plan</td>
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<td>PMF</td>
<td>Probable Maximum Flood</td>
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<td>Principal, the Roads and Maritime</td>
<td>The Northern Road Upgrade Between Mersey Road and Eaton Road</td>
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<td>Project, the The Northern Road Upgrade Between Mersey Road and Eaton Road</td>
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<td>Remediation Action Plan</td>
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<td>Revised Environmental Management Measure as provided in the Final EIS / SPIR</td>
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<td>Roads and Maritime, NSW Roads and Maritime Services</td>
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<td>RTA</td>
<td>Roads and Traffic Authority</td>
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<td>RUSLE</td>
<td>Revised Universal Soil Loss Equation</td>
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<td>SEARs</td>
<td>Secretary’s Environmental Assessment Requirements</td>
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<tr>
<td>Secretary Secretary of the NSW Department of Planning and Environment, or delegate</td>
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<td>SPIR</td>
<td>Submissions and Preferred Infrastructure Report</td>
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<td>TNR</td>
<td>The Northern Road</td>
</tr>
<tr>
<td>TDS</td>
<td>Total Dissolved Solids</td>
</tr>
<tr>
<td>TSS</td>
<td>Total suspended solids</td>
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1 Introduction

1.1 Context

This Construction Soil and Water Management Sub Plan (CSWMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for The Northern Road Upgrade between Mersey Road and Eaton Road (the Project). The Project is being delivered by Georgiou Ertech Joint Venture (GEJV).

An Overarching Construction Environmental Management Plan (OACEMP) has been prepared by Roads and Maritime to address the State and Federal conditions of approval (CoA) and environmental management measures listed in The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park NSW Environmental Impact Statement / Commonwealth Draft Environmental Impact Statement (EIS) as amended by The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park Submissions and Preferred Infrastructure Report (SPIR), Roads and Maritime specifications, EPL conditions and all applicable legislation.

This CSWMP has been prepared by GEJV to address the requirements of the OACEMP, all relevant Roads and Maritime specifications, EPL conditions and legislation.

An overview of the Project is shown on Figure 1-1.

1.2 Background

As part of EIS development, a detailed construction soils, water and contamination assessment was prepared and was included in the EIS as Appendix L. Further assessment of soil and water was undertaken subsequent to exhibition of the EIS. This assessment was included in Section 5.2.2 of the SPIR. Revised environmental management measures were provided within the SPIR.

1.3 Environmental management system overview

The overall Environmental Management System for the Project is described in Section 3.1 of the Construction Environmental Management Plan (CEMP).

The CSWMP forms part of GEJV’s environmental management framework for the Project, as described in Section 3.4 of the CEMP.

Management measures identified in this Plan will be incorporated into site or activity specific Environmental Work Method Statements (EWMS) and Progressive Erosion and Sediment Control Plans (PESCP).

EWMS will be developed and signed off by environment and management representatives prior to associated works and Construction personnel will be required to undertake works in accordance with the identified mitigation and management measures.

PESCPs are designed for use as a practical guide and may be produced in conjunction with Environmental Work Method Statement (EWMS) to provide more detailed site-specific environmental mitigation measures. PESCP will be developed by the environment team in consultation with Construction personnel and the Project Soil Conservationist, and modified as required when:

- Site conditions evolve.
Flow paths change.
Construction activities that affected the characteristics of ground conditions change.

Used together, the CEMP, strategies, procedures, EWMS and PESCP form management guides that clearly identify required environmental management actions for reference by GEJV personnel and subcontractors.

The review and document control processes for this Plan are described in Sections 6.7 and 6.8 of the CEMP.

1.4 Consultation

Ongoing consultation between GEJV, Roads and Maritime and stakeholders, the community and relevant agencies regarding the management of soil and water impacts will be undertaken during the Construction of the Project as required. Where relevant, consultation will be undertaken with proponents of other nearby developments to increase the overall awareness of project timeframes and impacts. The process for the community consultation will be documented in the Community Communication Strategy (CCS), described in Section 5.5.3 of the CEMP.
Figure 1-1: Overview of the Project
2 Purpose and objectives

2.1 Purpose

The purpose of this Plan is to describe how GEJV proposes to manage and protect soil and water quality during Construction of the Project.

2.2 Objectives

The key objective of the CSWMP is to ensure that impacts to soil and water are minimised. To achieve this objective, GEJV will undertake the following:

- Ensure best management practice controls and procedures are implemented during Construction activities to avoid or minimise erosion/sedimentation impacts and potential impacts to water quality in rivers, creeks and groundwater along the Project corridor.
- Ensure appropriate measures are implemented to address the relevant mitigation measures outlined in the OACEMP, conditions of approval, and Roads and Maritime QA specifications.
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements as described in Section 3.1 of this Plan.

2.3 Targets

The following targets have been established for the management of soil and water impacts during the Project:

- Ensure full compliance with the relevant legislative requirements, the OACEMP, conditions of approval, and Roads and Maritime QA specifications
- Manage downstream water quality impacts attributable to the Project (i.e. maintain waterway health by avoiding the introduction of nutrients, sediment and chemicals outside of that permitted by the Environment Protection Licence (EPL) 21121 and/or ANZECC guidelines)
- Ensure training on best practice soil and water management is provided to all Construction personnel through site inductions
- Achieve full compliance with EPL water quality discharge parameters for all planned basin discharges (i.e. those within design capacity)
- Minimise impacts on, and complaints from, the community and stakeholders.
3 Environmental requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation

Legislation relevant to soil and water management includes:

- Environmental Planning and Assessment Act 1979 (EP&A Act)
- Environmental Planning and Assessment Regulation 2000
- Protection of the Environment Operations Act 1997
- Water Management Act 2000
- Fisheries Management Act 1994
- Commonwealth Environment Protection and Biodiversity Conservation Act 1999
- Work Health and Safety Act 2011 (WHS Act)
- Contaminated Land Management Act 1997 (NSW)
- Water Act 1912.

Relevant provisions of the above legislation are identified in the register of legal requirements included in Appendix A1 of the CEMP.

3.1.2 Guidelines and standards

The main guidelines, specifications and policy documents relevant to this Plan include:

- Roads and Maritime QA Specification G1 – Job Specific Requirements for The Northern Road Upgrade
- Roads and Maritime QA Specification G38 – Soil and Water Management
- Roads and Maritime QA Specification R178 – Vegetation
- Roads and Maritime QA Specification R44 – Earthworks
- Roads and Maritime QA Specification R272 – Automatic Weather Stations
- Roads and Maritime QA Specification G36 – Environmental Protection (Management System)
- Roads and Maritime QA Specification G38 – Soil and Water Management
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000).
- Volume 2A Installation of Services (DECCW 2008).
- Volume 2C Unsealed Roads (DECCW 2008).
- Volume 2D Main Roads Construction (DECCW 2008).
• New South Wales State Emergency Management Plan (EMPLAN, 2012)
• The Constructed Wetlands Manual (Department of Land and Water Conservation NSW (DLWC), 1998)
• Policy and Guidelines for Fish Habitat Conservation and Management (NSW DPI, 2013)
• RTA’s Water Policy (Roads and Traffic Authority (RTA), 1997)
• Procedure for Selecting Treatment Strategies to Control Road Runoff (RTA, 2003)
• Guideline for Construction Water Quality Monitoring (RTA, 2003)
• RTA’s Code of Practice for Water Management – Road Development and Management (1999).
• Approved Methods for the Sampling and Analysis of Water Pollutants in NSW – March 2004.
• Guidelines for the Management of Acid Sulphate materials: Acid Sulphate Soils, Acid Sulphate Rock and Monosulphidic Black Ooze (RTA 2005).
• Stockpile Site Management Guideline, Roads and Maritime 2011.
• Environment Direction - Management of Tannins from Vegetation Mulch (Roads and Maritime, 2012)
• Guideline for the Management of Contamination (Roads and Maritime, 2013)
• Management of Wastes on Roads and Maritime Services Land (Roads and Maritime, 2014)
• How to Safely Remove Asbestos Code of Practice (Safe Work Australia, 2011)
• Defence Instruction General (DI(G)) on Explosive Ordnance Management in Defence - DI(G) LOG 4-1-013 Management of Explosive Ordnance in Defence (Department of Defence, 2006)
• Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005)
• AS/NZS 5667.1.1988 (R2016) Water quality -Sampling Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples.

Roads and Maritime specifications are a key source of environmental protection management processes relevant to this CSWMP. The specifications set out environmental protection requirements, including Hold Points that must be complied with by GEJV during Construction of the Project. A Hold Point is a point beyond which GEJV will not proceed without express written authorisation from Roads and Maritime.
3.2 Environment Protection Licence conditions

The Project is subject to EPL 21121 as a Scheduled Activity for ‘road construction’ and ‘extractive activities’. The EPL prescribes water quality parameters to be measured, the associated discharge criteria and monitoring and analytical requirements. These requirements will be managed by the planned management measures specified in Section 8.4 of this CSWMP and the Construction Water, Soil and Contamination Monitoring Program (Annexure A) and Sediment Basin and Discharge Procedure (Annexure B).

The EPL conditions relevant to the management of soil and water are provided in Table 3-1. The EPL conditions relevant to the monitoring of soil and water are provided in Annexure A.

The water quality discharge criteria for the EPL Licenced Discharge Points for the Project are listed in Table 3-2.

The EPL also prescribes requirements for complaints handling, reporting and record keeping. These requirements will be implemented in accordance with the incident and complaints reporting outlined in Section 8 of this CSWMP and Section 5.3 of the CEMP.

### Table 3-1: EPL requirements relevant to the management of soil and water

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Relevant requirement</th>
<th>Reference</th>
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<td>3</td>
<td>Limit conditions</td>
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<tr>
<td>L1</td>
<td>Pollution of waters</td>
<td></td>
</tr>
<tr>
<td>L1.1</td>
<td>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.</td>
<td>Section 7.1</td>
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<tr>
<td>4</td>
<td>Operating conditions</td>
<td></td>
</tr>
<tr>
<td>O4</td>
<td>Processes and management</td>
<td></td>
</tr>
<tr>
<td>O4.1</td>
<td>The licensee must maximise the diversion of run-on waters from lands upslope and around the site whilst land disturbance activities are being undertaken.</td>
<td>Section 7.1</td>
</tr>
<tr>
<td>O4.2</td>
<td>The drainage from all areas that will mobilise suspended solids when stormwater runs over these areas must be controlled and diverted through appropriate erosion and sediment control measures.</td>
<td>Section 7.1</td>
</tr>
<tr>
<td>O4.3</td>
<td>The licensee must minimise the area of the site that is able to generate suspended material when water runs over it.</td>
<td>Section 7.1</td>
</tr>
<tr>
<td>O4.4</td>
<td>All soil erosion and sediment controls must be designed (stability, location, type and size), constructed, operated and maintained in accordance with the guideline &quot;Managing Urban Stormwater – Soils and Construction, Volume 2D, Main road construction&quot; (DECC, 2008), to be read and used in conjunction with volume 1 &quot;Managing urban stormwater: soils and construction&quot; (Landcom, 2004).</td>
<td>Section 7.2</td>
</tr>
<tr>
<td>O4.5</td>
<td>The licensee must endeavour to maximise the reuse of captured stormwater on the premises.</td>
<td>Section 7.4</td>
</tr>
</tbody>
</table>
The licensee must inspect the operation of all erosion and sediment controls installed on the premises and undertake any works required to repair and/or maintain these controls:

a) at least weekly during normal construction hours outlined in Condition L4.1;

b) daily during periods of rainfall that causes run-off to occur; and

c) prior to any site closure of greater than 24 hours.

In relation to Condition O4.6, the licensee must record all such inspections, including observations and works undertaken to repair and/or maintain soil and water management works.

The licensee must ensure the design storage capacity of any sediment basin installed on the premises is reinstated within 5 business days of the cessation of a rainfall event that causes run-off to occur on or from the premises.

Where sediment basins are necessary, all sediment basins and associated drainage must be installed and commissioned prior to the commencement of any clearing or grubbing works within the catchment area of the sediment basin that may cause sediment to leave the site.

Note: This Condition does not apply to those works associated with the actual installation of sediment basins or associated drainage.

All feasible and reasonable erosion and sediment controls are to be implemented to minimise sediment (including dust) leaving the premises. These controls are to be implemented before any soil disturbance commences and maintained until disturbed areas are stabilised.

### Table 3-2: Discharge water quality criteria

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units of measure</th>
<th>100 percentile concentration limit</th>
<th>Frequency</th>
<th>Sampling method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil and Grease</td>
<td>Visible</td>
<td>No visible</td>
<td>Special Frequency 1</td>
<td>Visual inspection</td>
</tr>
<tr>
<td>pH</td>
<td>pH</td>
<td>6.5 – 8.5</td>
<td>Special Frequency 1</td>
<td>Probe</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>TSS</td>
<td>50 mg/L</td>
<td>Special Frequency 1</td>
<td>Grab Sample</td>
</tr>
</tbody>
</table>

EPL 21121 Clause M2.3 For the purposes of Condition M2.2 and the Table thereto, ‘Special Frequency 1’ means:

(a) less than 24 hours prior to a controlled discharge and daily for any continued controlled discharge; and

(b) when rainfall causes a discharge from a basin which has not been emptied within 5 business days of the cessation of a rainfall event.
4 Existing environment

The following sections summarise what is known about factors influencing soils and water within and adjacent to the Project corridor. The key reference document is the EIS.

4.1 Topography and soil characteristics

The Project is located on the Cumberland Plain, a low lying and gently undulating sub-region of the Sydney Basin. The Sydney Basin is a large geological feature stretching from Batemans Bay to the south to Newcastle in the north and Lithgow in the west. The Project area traverses a north–south oriented ridge that forms the watershed separating the catchment areas of South Creek in the east and the Nepean River in the west. The ridge is characterised by gentle to moderately inclined slopes with narrow to broad crests and drainage lines. Landscape character varies from generally semi-rural to occasional pockets of suburban areas including at Luddenham.

The soil landscape groups within the Project consist of three principal soil landscapes. These are erosional Luddenham (lu), residual Blacktown (bt) and fluvial South Creek (sc) soil landscape groups. South Creek soils are found within the immediate vicinity of major creeks, transitioning to Blacktown soils on crests and low rises and Luddenham soils on hills and ridge slopes. Soils within these landscapes are generally highly or moderately erodible and are reported to be moderately reactive. See figure 4-1 for the mapped soil landscapes for the Project area.

The EIS assessed the presence and risk of Acid Sulfate Soils (ASS) along the proposed alignment using the ASRIS ASS map and the ASS Probability within the proposed alignment was classified as Extremely Low Probability of occurrence. ASS is therefore not considered to be a risk to the Project.

In addition, the assessment of salinity potential along the alignment was undertaken using the map of the salinity potential in western Sydney (NSW Department of Infrastructure, Planning and Natural Resources, 2002). The majority of the alignment occurs in areas of moderate salinity potential.
4.2 Surface water

The Project lies within the Mid Nepean River Catchment Management Zone and the Upper South Creek Management Zone. The Nepean River is the ultimate downstream receiving environment to the Project area. It is significant both environmentally and economically and provides for a range of domestic and irrigation uses.

The catchment is shale-based and is characterised by meandering streams. It is also highly disturbed due to increasing urbanisation and associated land clearing. The Project falls within the hydrological catchments of Badgerys Creek, Duncans Creek and Cosgroves Creek. The watercourses of the Badgerys Creek and Cosgroves Creek catchments drain east to South Creek which then flows north to join the Hawkesbury River at Windsor. Duncans Creek catchment drains north east eventually into the Nepean River. See Figure 4-3 for the catchments in the Project area.

The Project directly traverses a number of unnamed tributaries and drainage lines (some of which are associated with farm dams) which are ephemeral in nature and have largely been modified due to the clearing of riparian vegetation and construction of farm dams.

The Project will directly impact on two waterways: Badgerys Creek and Site 29a (an intermittent stream). These two waterways, in addition to the large dam at ‘Site 39’, fed by several minor 1st and 2nd order streams, are identified as sensitive receiving waterways for the Project. The location of the waterways is shown on Figure 4-2.

Although Badgerys Creek is classified as key fish habitat in the vicinity of the Project, based on the DPI Fisheries key fish habitat mapping, the water quality of the waterway is generally poor to moderate and it is unlikely to support protected or threatened fish.
4.2.1 Geomorphology and river style

The geomorphology and hydrology of Badgerys Creek has been significantly modified by disturbance, riparian corridor clearing and reshaping, dams and altered hydrologic conditions from catchment land use change. Alterations of channel form, removal of riparian vegetation and interruption of sediment transmission has caused significant degradation on the upper reaches of the watercourses. Numerous farm dams are located on the watercourses.

The River Styles Framework is used in NSW to describe the condition of river reach and its likely recovery potential, based on the fragility of the river and its geomorphic condition. Within the framework, watercourses, or portions of watercourses are classified with a river style, level of fragility, geomorphic condition and recovery potential:

- **river styles** – detail the physical setting in which the watercourse occurs. It includes four main groups comprising the swampy meadow group, confined valley setting, partially confined valley setting, and unconfined valley setting
- **fragility** – refers to the susceptibility or sensitivity of certain geomorphic categories to physical adjustments and changes when subjected to degradation or certain threatening activities
- **geomorphic condition** – a measure of departure from a natural or expected state and can be defined as the ability of a river or reach to perform functions expected for a specific river type
- **recovery potential** – provides the potential of the river reach to return to good condition, through the consideration of existing physical disturbance threats.

Badgerys Creek has developed from fine grained sedimentary materials. They form a mixture of low fragility laterally unconfined low sinuosity, fine grained channels and high fragility swamp meadow cut and fill channels. These river styles are common in the Cumberland Plain portion of the Nepean River catchment, and have been significantly disturbed where agricultural and more recently urban development has disturbed catchment runoff concentrations and peak times of concentration, as well as disturbance to channel form and removal of riparian vegetation.

Badgerys Creek possess several river styles, including portions of the watercourse that are classified as highly fragile and rare in the context of the Cumberland Plain. The watercourse is moderate geomorphic condition and the recovery potential provides that with mitigation of impacts and remediation, there is potential for the watercourse to return to good condition following disturbance due to the Project.

4.2.2 Surface water quality

A visual inspection of the two key waterways that traverse the Project area revealed the waterways to be of poor to moderate water quality condition as outlined in table 4-1:

Reference source not found.

Table 4-1: Water quality condition based on a visual site inspection
Badgerys Creek
Water quality appeared moderate, tannin stained and with some frothing and instream rubbish. Runoff from surrounding agriculture is likely to impact upon water quality.

‘Site 29a’
Water quality appeared moderate, with anoxic odour within residual pools, tannin staining and filamentous algae present. Some rubbish such as tyres were present.

Results from monthly sampling over five months (November 2015 – March 2016) carried out at Badgerys Creek as shown on Figure 4-2 as part of the Western Sydney Airport EIS were compared to a range of ANZECC/ARCMANZ and Healthy Rivers Commission (HRC) trigger values as an initial characterisation of water quality in the vicinity of the Project. The 20th percentile (lower limit where applicable) and 80th percentile results for the monitoring are provide in Table 4-2.

Table 4-2: Western Sydney Airport EIS water quality monitoring data (20th – 80th percentile results)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>ANZECC/ARMCANZ (2000) trigger levels</th>
<th>HRC trigger values</th>
<th>U/S Airport New (Badgerys Creek)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductivity (µS/cm)</td>
<td>200-300</td>
<td>-</td>
<td>2,250</td>
</tr>
<tr>
<td>pH (in situ)</td>
<td>6.5 - 8.5</td>
<td>-</td>
<td>7.4 - 7.8</td>
</tr>
<tr>
<td>Dissolved Oxygen (% sat)</td>
<td>85-110</td>
<td>-</td>
<td>12 - 30</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>50</td>
<td>-</td>
<td>462</td>
</tr>
<tr>
<td>Suspended Solids (mg/L)</td>
<td>80</td>
<td>-</td>
<td>163</td>
</tr>
<tr>
<td>Ammonia (mg/L)</td>
<td>20</td>
<td>-</td>
<td>23,000</td>
</tr>
<tr>
<td>TN (µg/L)</td>
<td>350</td>
<td>700</td>
<td>11,861</td>
</tr>
<tr>
<td>TP (µg/L)</td>
<td>25</td>
<td>35</td>
<td>9,520</td>
</tr>
<tr>
<td>Chl-a (µg/L)</td>
<td>3</td>
<td>-</td>
<td>32</td>
</tr>
<tr>
<td>NOx (µg/L)</td>
<td>40</td>
<td>-</td>
<td>7,592</td>
</tr>
<tr>
<td><strong>Metals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arsenic (mg/L)</td>
<td>0.0240</td>
<td>0.0092</td>
<td></td>
</tr>
<tr>
<td>Cadmium (mg/L)</td>
<td>0.0002</td>
<td>0.00006</td>
<td></td>
</tr>
<tr>
<td>Chromium (mg/L)</td>
<td>0.0010</td>
<td>0.0032</td>
<td></td>
</tr>
<tr>
<td>Copper (mg/L)</td>
<td>0.0014</td>
<td>0.0704</td>
<td></td>
</tr>
<tr>
<td>Lead (mg/L)</td>
<td>0.0034</td>
<td>0.0032</td>
<td></td>
</tr>
<tr>
<td>Mercury (mg/L)</td>
<td>0.0019</td>
<td>0.00005</td>
<td></td>
</tr>
<tr>
<td>Nickel (mg/L)</td>
<td>0.0110</td>
<td>0.0154</td>
<td></td>
</tr>
<tr>
<td>Zinc (mg/L)</td>
<td>0.0080</td>
<td>0.124</td>
<td></td>
</tr>
</tbody>
</table>

Note: Exceedance of the ANZECC/HRC trigger levels shown in red font

As shown in Table 4-2, the results of this monitoring identified large exceedances of the trigger levels of a number of physical, chemical and nutrient water quality parameters including total nitrogen, suspended solids, turbidity, ammonia and phosphorus, with conditions commonly found to be below the standard required for protection of aquatic ecosystems. Metal concentrations in Badgerys Creek were generally elevated and the
concentrations of some metals exceeded the recommended limit for protection of aquatic species. The visual amenity of the creek was generally poor. The creek is considered eutrophic and generally exceed the nominated HRC and ANZECC/ARMCANZ guidelines for protection of aquatic ecosystems.

Baseline data for the Project has been collected during the 12 month pre-Construction phase, commencing from August 2017. The sampling locations for surface water sites are shown (in green) on Figure 4-3. The sites located in the Project area include; waterways and farm dams (sites SW39US, SW39DS, SW29AUS, SW29ADS, SW5), and Badgerys Creek (site BG).
Figure 4-3 Surface and groundwater quality sampling locations
General observations on the baseline water quality in the vicinity of the Project include:

- Nutrient enrichment of both farm dams and flowing waterways is common, indicated by highly elevated TP, TN, NOx and Ammonia-N concentrations. These nutrients are associated with land that has historically been used for cattle grazing and other farming activities.

- Although Cyanobacterial blooms have not been detected, Chlorophyll-a measurements indicate highly productive water bodies, dominated by algal growth, which is a direct outcome of nutrient enrichment. The predisposition to Cyanobacterial growth is indicated by low N:P ratios evident at some sites.

Further observations on the characteristics of the specific sites are as follows.

- **Site SW5** - The water quality of this farm dam, within a property in Willowdene Avenue, is quite poor with regard to high EC, low DO, high nutrient concentrations, including elevated, readily available P (SRP).

- **Sites SW29A US and SW29A DS** – These two flowing waterway sites, through Commonwealth lands, were sampled mostly from pools of water, instead of flowing water. The sites are therefore, highly ephemeral in nature with regard to water flows. The water quality at these pool sites is quite poor, with high EC, low DO and elevated nutrients.

- **Site SWBG – Badgerys Creek** site is quite poor in water quality, characterised by high EC, low DO and highly elevated nutrient concentrations. It recorded extremely high, average TN concentrations, indicating serious pollution of the waterway from upstream sources. Algal growth is prolific at the site, reflecting very high TN concentrations.

Regular ongoing surface water monitoring of these sites will be carried out during Construction in accordance with the overarching Construction Water, Soil and Contamination Monitoring Program (refer OACEMP Appendix B4) and compared to the site specific trigger values.

### 4.3 Groundwater

The EIS concluded that the majority of cuttings are not likely to be deep enough to intercept the shallow groundwater table of the Wianamatta Group shales. If by chance cuttings do intercept the shallow groundwater table, the extent of drawdown is likely to be minimal and limited in extent due to the low permeability of the shallow aquifer system (clay regolith and weathered shale).

The proposed fill locations are not expected to impact the groundwater. The existing surface geology is comprised of low permeability material which is expected to match the material characteristics of the compacted fill used for the road alignment which will also be low permeability.

In this regard there are no expected material changes to groundwater levels or flow direction to the shallow groundwater table.

### 4.4 Catchments and flooding

The catchments relevant to the Project area are shown below in Figure 4-3. The flood characteristics for both the Cosgroves Creek and Duncans Creek Catchments are that high hazard conditions are generally confined to the existing dams and the incised reaches of the drainage system for events up to 100 year ARI.
The Badgerys Creek floodplain is relatively wide in the vicinity of where The Northern Road crosses the main arm of the creek and the depths of flow on its overbank are relatively shallow for events up to the 100 year Average Recurrence Interval (ARI). Some dwellings on the western (upstream) side of the road corridor are impacted in a 100 year ARI flood.

![Map of Badgerys Creek and its vicinity](image)

**Figure 4-4 Catchments in the Project Area**

### 4.5 Rainfall

The rainfall records from Badgerys Creek 067108 have been selected to reflect the potential rainfall conditions across the Project site due to its proximity to the overall site, and extent of available data (from 1870 to present). A summary of the rainfall records from the Bureau of Meteorology is provided in Table 4-3 below.

**Table 4-3 Summary of rainfall records**

<table>
<thead>
<tr>
<th></th>
<th>Summer / Autumn</th>
<th>Winter / Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dec</td>
<td>Jan</td>
</tr>
<tr>
<td>Mean rainfall (mm)</td>
<td>57.1</td>
<td>79.4</td>
</tr>
<tr>
<td>Mean rain days &gt;1mm</td>
<td>6.6</td>
<td>7</td>
</tr>
</tbody>
</table>
Rainfall is typically higher during summer and early autumn. Winter and early spring are typically drier periods during the year.

### 4.6 Erosion Risk Assessment

An erosion risk assessment has been conducted using the Revised Universal Soil Loss Equation (RUSLE). The calculated soil loss has been used to determine the appropriate level of sediment control required, as well as stabilisation and staging requirements.

The RUSLE equation is defined as:

\[ A = K \times R \times LS \times P \times C \]

Where:
- \( A \) is the predicted soil loss per hectare per year
- \( K \) is the soil erodibility factor
- \( R \) is the rainfall erosivity factor
- \( LS \) is the slope length/gradient factor
- \( P \) is the erosion control practice factor
- \( C \) is the ground cover and management factor

#### 4.6.1 Soils – K-Factor

The soil erodibility factor (K factor) is a measure of the susceptibility of soil particles to detachment and transport by rainfall and runoff. Soil texture is the principle component affecting the K factor, but soil structure, organic matter and profile permeability also contribute. For the purposes of the risk assessment, a K factor of 0.04 has been applied, which has been adopted from the Indicative Erosion and Sediment Control Plan (ErSed 2017).

#### 4.6.2 Rainfall – R-Factor

The rainfall erosivity factor is a measure of the ability of rainfall to cause erosion (referred as “R” in the Revised Universal Soil Loss Equitation RUSLE). The rainfall erosivity factor is used to determine the soil loss in tonnes per hectare over one year, and is used in calculations when sizing construction sediment basins.

The Project has a Rainfall Erosivity Factor of 2200 as determined in the R-Factor maps (Appendix B) of Managing Urban Stormwater: Soils and Construction (Landcom 2004) and adopted from the Indicative Erosion and Sediment Control Plan (ErSed 2017).

#### 4.6.3 Slope Length/Gradient – LS-Factor

The LS factor (length-slope) is a combination of both the slope length factor (L) and slope steepness factor (S), which are evaluated together as a numerical representation of LS. A slope length of 80m has been adopted as the maximum allowable slope length during construction from the Managing Urban Stormwater: Soils and Construction (Landcom 2004). The slope gradient used for the soil loss calculations varies between catchments.

#### 4.6.4 Cover and Practice – C and P Factors

The C factor measures the combined effect of all the interrelated cover and management variables adopted over the site. It also represents non-structural methods for controlling erosion (i.e. covering exposed areas via matting and geofabrics; use of chemical stabilisers; soil binders; mulching; and any other means of providing a barrier from raindrop impact, including stabilisation by temporary or permanent vegetation). A conservative default C factor
of 1 from the Managing Urban Stormwater: Soils and Construction (Landcom 2004) has been adopted for the purpose of conducting the erosion risk assessment.

The P factor refers to erosion control practice and measures the combined effect of all support practices and management variables. This factor is reduced by practices that either reduce the velocity of runoff or the tendency of runoff to flow directly downhill. It also represents structural methods for controlling erosion. A P-factor of 1.3 has been adopted from the Managing Urban Stormwater: Soils and Construction (Landcom 2004), this is representative of a smooth and compact ground surface typical of a civil construction site.

### 4.7 Results

RUSLE calculations were undertaken to calculate soil loss estimations and 80th percentile 5 day basin volumes for the construction catchments. Results of these calculations are presented in Table 4-4.

**Table 4-4 Soil Loss Calculations, basin sizes and Licence Discharge Points (LDPs)**

<table>
<thead>
<tr>
<th>Construction catchments and location of basin (Chainage)</th>
<th>Area (Ha)</th>
<th>LS Factor</th>
<th>Estimated Soil Loss (T/ha/year)</th>
<th>Erosion hazard rating (fig 4-6 Blue Book)</th>
<th>Sediment basin total volume (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>560R (LDP)</td>
<td>2.3</td>
<td>0.65</td>
<td>74</td>
<td>1</td>
<td>560.8</td>
</tr>
<tr>
<td>1375R (LDP)</td>
<td>2.2</td>
<td>0.65</td>
<td>74</td>
<td>1</td>
<td>985.4</td>
</tr>
<tr>
<td>2205L (LDP)</td>
<td>2.2</td>
<td>1.19</td>
<td>136</td>
<td>1</td>
<td>379</td>
</tr>
<tr>
<td>2580L (LDP)</td>
<td>2.1</td>
<td>1.76</td>
<td>201</td>
<td>2</td>
<td>379.6</td>
</tr>
<tr>
<td>3245L (LDP)</td>
<td>2.4</td>
<td>0.91</td>
<td>104</td>
<td>1</td>
<td>404</td>
</tr>
<tr>
<td>3360L (LDP)</td>
<td>2.8</td>
<td>5.06</td>
<td>201</td>
<td>2</td>
<td>506.8</td>
</tr>
<tr>
<td>3725L (LDP)</td>
<td>3</td>
<td>2.05</td>
<td>235</td>
<td>3</td>
<td>555.7</td>
</tr>
<tr>
<td>3810L (LDP)</td>
<td>3</td>
<td>2.05</td>
<td>235</td>
<td>3</td>
<td>555.7</td>
</tr>
<tr>
<td>4400L (LDP)</td>
<td>1.6</td>
<td>1.19</td>
<td>136</td>
<td>1</td>
<td>275.3</td>
</tr>
<tr>
<td>4750L (LDP)</td>
<td>3</td>
<td>1.76</td>
<td>201</td>
<td>2</td>
<td>542.7</td>
</tr>
<tr>
<td>5150L (LDP)</td>
<td>2</td>
<td>2.05</td>
<td>235</td>
<td>3</td>
<td>370.1</td>
</tr>
</tbody>
</table>

The RUSLE calculations in Table 4-4 show the estimated annual soil loss for the identified basin catchments and the associated erosion risk hazard rating. In accordance with section 6.3.2d of Managing Urban Stormwater: Soils and Construction (Landcom 2014) a sediment retention basin will be required for all catchments with estimated annual soil loss greater than 150 m³. Sediment basins on the Project will be designed for the 80th percentile, five day rainfall depth (27.6mm). The basin locations and design capacity are available in table 4-4 and have been reviewed by the Soil Conservationist.

Other construction catchments can be managed with the use of effective localised erosion and sediment control measures. These measures would be aimed at minimising erosion and the volume of sediment which is transported from disturbed areas in the absence of large-scale sediment retention basins. Measures would include use of the following smaller scale elements such as:

- Temporary revegetation/rehabilitation work to reduce the extent of disturbed surfaces
- Application of temporary surface treatments or blanketing on exposed earth surfaces
- Sediment barriers, check dams and sumps, in series where necessary
- Vegetation buffer strips
  These measures are discussed in Section 7.2 of this Plan.
5 Environmental aspects and impacts

5.1 Construction activities

Key aspects of the Project that could result in adverse impacts to soils and water include:

- site establishment
- vegetation clearing and topsoil stripping
- earthworks, including excavation or filling
- transportation of cut or fill materials
- movement of heavy vehicles across exposed earth
- removal of riparian vegetation
- construction in areas of highly erodible soils
- construction in any contaminated land
- site access
- culvert and drainage works
- removal / modification of existing built features
- riparian-based construction
- material stockpiles
- paving activities
- water use / extraction
- dam dewatering
- landscaping and re-vegetation
- Ancillary facility operation including fuel and chemical storage, refuelling and chemical handling.
- Noxious weed treatment including herbicide spraying.

Refer also to the Aspects and Impacts Register included in Appendix A2 of the CEMP.

5.2 Impacts

The potential for impacts on soil and water will depend on a number of factors. Primarily impacts will be dependent on the nature, extent and magnitude of Construction activities and their interaction with the natural environment. Potential impacts attributable to Construction might include:

- exposure of soils during vegetation clearing and earthworks, creating the potential for off-site transport of eroded sediments and pollutants
- decline in water quality and visual amenity, and generation of turbidity due to disturbance of sediments during in-stream or riparian zone works
- scour in the receiving drainage lines at the downstream limit of the drainage works
- damage to ancillary facilities (including flood damage) that could result in an export of pollutants to receiving waters
- disturbance of asbestos-containing material from imported fill sites, historical dump sites or during demolition of structures
- Contamination of soils, and surface and groundwater from accidental spills or oil leaks that could pollute receiving waterbodies. This might include grease or fuel from
machinery and vehicles, Construction sites or ancillary facilities, or spills of other chemicals that may be used during the course of Construction

- contamination of surface and groundwater from disturbance of unknown in-situ contaminated soils (such as asbestos, hydrocarbons or chemical impacted soils)
- changes to hydrology and flow have the potential to impact on artificial wetlands (farm dams, roadside drains, effluent treatment systems)
- contamination or other impacts to underlying aquifers from dewatering associated with piling and utility relocation activities that occur in areas where the perched shallow water table is present and close to the ground surface
- off-site discharge of water containing sediment from dewatering activities
- removal of riparian vegetation resulting in sediment release to adjoining watercourses, reducing water quality and affecting the health of aquatic ecosystems
- soil loss from the stockpiling of spoil and topsoil due to the effects of wind or water in the absence of suitable stabilisation and management measures.
- Flooding has the potential to impact Construction sites, temporary ancillary facilities and cause damage to Construction vehicles, plant and equipment.
- An increase in impermeable surface extent due to Construction sites could increase potential runoff to catchments during heavy rainfall.
- Earthworks or other Construction activities may result in existing drainage infrastructure becoming partially blocked or temporarily diverted, resulting in local flooding upstream of the Construction areas.

Some impacts on soil and water attributable to the Project are anticipated. Relevant aspects and the potential for related impacts have been considered in the construction risk assessment workshop (CRAW) and sections 6 and 7 provide a suite of mitigation measures that will be implemented to avoid or minimise those impacts.

5.3 Water Use

Various water sources will be used for the Project, which may include, but are not limited to the following:

- Water retained in sediment basins / traps.
- Water sourced from dams to be dewatered and filled on the Project.
- Potable water from hydrants along the existing road.

Where possible water captured in sediment basins and other detention areas will be reused for dust suppression, compaction, or other Construction activities in preference to sourcing from potable supplies.
6 Environmental mitigation and management measures

A range of environmental requirements and control measures are identified in the various environmental documents, including the EIS and SPIR, the conditions of approval and relevant Roads and Maritime documents. Specific measures and requirements to address impacts on soil and water are outlined in Table 6-1. Further detail is provided in Section 7.
<table>
<thead>
<tr>
<th>ID</th>
<th>Measure / Requirement</th>
<th>When to implement</th>
<th>Responsibility</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>TRAINING AND AWARENESS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SW1</td>
<td>Training will be provided to all project personnel, including relevant sub-contractors on sound erosion and sediment control practices and the requirements from this plan through inductions, toolboxes and targeted training. The soil conservationist will train selected personnel for ERSED training.</td>
<td>Pre-Construction/Construction</td>
<td>Project Manager, ESR Soil Conservationist</td>
<td>G38 Clause 2.1.2 NSW-CoA C5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SW2</td>
<td>The personnel responsible carrying out dewatering activities will be adequately trained and inducted on the use of the dewatering procedure. GEJV ESR will oversee the training and ensure the personnel conducting dewatering activities follow the practices in which they were trained.</td>
<td>Pre-Construction/Construction</td>
<td>Project Manager, ESR</td>
<td>G38 Clause 3.5.3 NSW-CoA C5</td>
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<td></td>
<td><strong>STOCKPILING</strong></td>
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<tr>
<td>SW3</td>
<td>Stockpiling of material will not occur within vegetation protection areas and outside tree protection zones in accordance with AS 4970. The Project boundary and sensitive areas will be identified to ensure stockpiles are not placed in those areas.</td>
<td>Pre-Construction/Construction</td>
<td>Project Manager, ESR</td>
<td>G38 Clause 3.2</td>
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<tr>
<td>SW4</td>
<td>Stockpiles will be located at least 5 m from likely areas of concentrated water flows and at least 50 metres Pre-Construction/Construction Project Manager, ESR G38 Clause 3.2</td>
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<td>When to implement</td>
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<td>from the nearest waterway in an area of low ecological and heritage conservation significance.</td>
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<tr>
<td>SW5</td>
<td>Stockpile heights to be no greater than 2m unless otherwise approved by Roads and Maritime, and on relatively flat land.</td>
<td>Pre-Construction/Construction</td>
<td>Project Manager, ESR</td>
<td>G38 Clause 3.2</td>
</tr>
<tr>
<td>SW6</td>
<td>Protect from erosion (water and wind), stockpiles that will be in place for more than 20 days Stockpiles that are highly susceptible to wind or water erosion will be protected within 10 days of stockpiling.</td>
<td>Pre-Construction/Construction</td>
<td>Project Manager, ESR</td>
<td>G38 Clause 3.2</td>
</tr>
<tr>
<td>SW7</td>
<td>Clean topsoil will be retained for rehabilitation purposes, Weed contaminated topsoil will be separated from clean topsoil and identified. Weeds growth is to be suppressed on topsoil stockpiles.</td>
<td>Pre-Construction/Construction</td>
<td>Project Manager, ESR</td>
<td>G38 Clause 3.2</td>
</tr>
<tr>
<td>SW8</td>
<td>GEJV will implemented control measures to prevent and minimise the growth of weeds in topsoil</td>
<td>Construction</td>
<td>Project Manager, ESR</td>
<td>G38 Clause 3.2</td>
</tr>
<tr>
<td>SW9</td>
<td>Stockpiles to be located outside the 1 in 10 year ARI floodplain.</td>
<td>Construction</td>
<td>Supervisor</td>
<td>G38 Clause 3.2</td>
</tr>
<tr>
<td>SW10</td>
<td>The compounds, access tracks and stockpiles will be located in areas that minimise erosion</td>
<td>Pre-Construction/Construction</td>
<td>Project Manager, ESR</td>
<td>G38 Clause 3.1.1</td>
</tr>
<tr>
<td>SW11</td>
<td>No stockpiling of soil or construction materials will occur within utility easement corridors.</td>
<td>Pre-Construction/Construction</td>
<td>Supervisor</td>
<td>OACEMP App B4 Table 6-1 (REMM SWC-12)</td>
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<td>ID</td>
<td>Measure / Requirement</td>
<td>When to implement</td>
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<tr>
<td>SW12</td>
<td>ERSED controls will be planned and placed around stockpiles and immediately downslope of excavations to minimise siltation and sedimentation.</td>
<td>Pre-Construction</td>
<td>Supervisor</td>
<td>G38 Clause 2.2.2</td>
</tr>
</tbody>
</table>

**PLANS AND PROCEDURES**

<table>
<thead>
<tr>
<th>SW13</th>
<th>A Construction Soil and Water Management Plan (CSWMP) (this plan) has be developed in accordance with the Roads and Maritime specification G38 – Soil and Water Management and the Blue Book – <em>Soils and Construction – Managing Urban Stormwater Volume 1</em> (Landcom, 2004) and Volume 2D (DEC, 2008a).</th>
<th>Pre-Construction / Construction</th>
<th>ESR, Soil Con.</th>
<th>G38 Clause 2.2.1 OACEMP App B4 Table 6-1 (REMM SWC-1) NSW-CoA C5</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW14</td>
<td>Progressive erosion and sediment control plans will be prepared in consultation with a soil conservationist in advance of construction, including earthworks and stockpiling. ERSED plans will be updated as required and underpin this CSWMP. The ERSED plan implementation will be inspected by the ESR at a minimum weekly and the ESR and soil conservationist monthly.</td>
<td>Pre-Construction Construction</td>
<td>Project Manager, ESR, Soil Con.</td>
<td>G38 Clause 2.2.1 OACEMP App B4 Table 6-1 (REMM SWC-1) NSW-CoA E45</td>
</tr>
<tr>
<td>SW15</td>
<td>The Dewatering Procedure (Annexure C) has been prepared for all identified dewatering activities</td>
<td>Pre-Construction</td>
<td>ESR</td>
<td>G38 Clause 3.5 (REMM SWC-1)</td>
</tr>
<tr>
<td>SW16</td>
<td>The farm dam dewatering procedure (Annexure E) has been developed and details;  - Included is a map showing locations of farm dams to be dewatered</td>
<td>Pre-Construction</td>
<td>ESR</td>
<td>G38 Clause 3.5 OACEMP App B4 Table 6-1 (REMM SWC-1)</td>
</tr>
<tr>
<td>ID</td>
<td>Measure / Requirement</td>
<td>When to implement</td>
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<tr>
<td></td>
<td>- Methodology for dewatering dams with consideration to aquatic ecology</td>
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<td>- Location of any offsite discharge points</td>
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<td></td>
<td>- Requirements to manage encounters of contaminated water.</td>
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<td></td>
<td>- Aquatic fauna relocation</td>
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<tr>
<td>SW17</td>
<td>An incident emergency spill plan has been developed as part of the PIRMP the plan includes measures to avoid spillages of fuels, chemicals and fluids onto any surfaces or into any nearby waterway</td>
<td>Pre-Construction</td>
<td>ESR</td>
<td>G38 Clause 3.5</td>
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<td></td>
<td>OACEMP App B4</td>
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<td>Table 6-1</td>
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<td>(REMM SWC-1)</td>
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<tr>
<td>SW18</td>
<td>A water quality monitoring program has been developed.</td>
<td>Pre-Construction</td>
<td>ESR</td>
<td>G38 Clause 3.5</td>
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<td>Roads and</td>
<td>OACEMP App B4</td>
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<td>Maritime</td>
<td>Table 6-1</td>
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<td>(REMM SWC-2)</td>
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</tbody>
</table>

**EROSION AND SEDIMENT CONTROL**

<p>| SW19| All feasible and reasonable erosion and sediment controls are to be implemented to minimise sediment (including dust) leaving the premises. These controls are to be implemented before any soil disturbance commences and maintained until disturbed areas are stabilised. | Construction    | Supervisor      | OACEMP App B4                  |
|     |                                                                                                                                      |                   |                | Table 6-1                      |
|     |                                                                                                                                      |                   |                | EPL O4.11                      |
|     |                                                                                                                                      |                   |                | NSW-CoA E45                    |</p>
<table>
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</thead>
<tbody>
<tr>
<td>SW20</td>
<td>Clearing of vegetation and site stabilisation of disturbed areas will be undertaken progressively to limit the time disturbed areas are exposed to erosion processes.</td>
<td>Construction</td>
<td>Supervisor</td>
<td>Good practice OACEMP App B4</td>
</tr>
<tr>
<td>SW21</td>
<td>High risk soil and erosion activities such as earthworks would not be undertaken immediately before or during high rainfall or wind events. The weather forecasts will be regularly monitored and an onsite weather station will provide real time forecasts.</td>
<td>Construction</td>
<td>Supervisor</td>
<td>OACEMP App B4</td>
</tr>
<tr>
<td>SW22</td>
<td>To assist onsite/offsite water separation the permanent catch drains would be installed as soon practicable to act as diversion drains during the construction phase</td>
<td>Construction</td>
<td>Supervisor</td>
<td>G38 Clause 3.1.1 OACEMP App B4</td>
</tr>
<tr>
<td>SW23</td>
<td>Immediately after the swales and catch drains are constructed, they will be stabilised until permanent lining or vegetation is applied. Similarly, temporary drains will be stabilised during construction.</td>
<td>Construction</td>
<td>Supervisor</td>
<td>G38 Clause 3.1.1</td>
</tr>
<tr>
<td>SW24</td>
<td>Scour protection at the base of drainage outlets to be installed and maintained</td>
<td>Construction</td>
<td>Supervisor</td>
<td>G38 Clause 3.1.1</td>
</tr>
<tr>
<td>SW25</td>
<td>Staged revegetation of the site as works proceed in accordance with Roads and Maritime R178</td>
<td>Construction</td>
<td>Supervisor</td>
<td>G38 Clause 3.1.1</td>
</tr>
<tr>
<td>SW26</td>
<td>Drains to be constructed in a manner that directs runoff from disturbed areas to sediment basins or to areas</td>
<td>Construction</td>
<td>Supervisor</td>
<td>G38 Clause 3.1.1</td>
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<tr>
<td>SW27</td>
<td>The project will filter sediment (via sediment barriers and sumps) prior to water entering any pit and will manage any stormwater discharges through any pits.</td>
<td>Construction</td>
<td>Construction supervisor</td>
<td>G38 Clause 3.1.1</td>
</tr>
<tr>
<td>SW28</td>
<td>Stabilised access points will be constructed using suitable materials (rock, recycled concrete, rumble grids, hardstand material etc) to minimise dirt and mud tracking. Any material transported onto road surfaces will be swept and removed at the end of each working day and before rainfall.</td>
<td>Construction</td>
<td>Construction Supervisor</td>
<td>G38 Clause 3.1.1</td>
</tr>
<tr>
<td>SW29</td>
<td>Access tracks, road formations and the edge of small batters will be regularly trimmed, compacted and maintained as required to keep surfaces tight and minimise erosion.</td>
<td>Construction</td>
<td>Construction Supervisor</td>
<td>G38 Clause 3.1.1</td>
</tr>
<tr>
<td>SW30</td>
<td>Ensure that all loads are covered when materials are being hauled to and from site</td>
<td>Construction</td>
<td>Construction Supervisor</td>
<td>OACEMP App B4 Table 6-1</td>
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<td>(REMM AQ-3)</td>
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<td>EPL O3.2</td>
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<tr>
<td>SW31</td>
<td>Erosion and sediment control measures will be maintained until the works are complete and areas are stabilised by revegetation</td>
<td>Construction</td>
<td>Construction Supervisor</td>
<td>OACEMP App B4</td>
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<td>NSW-CoA E45</td>
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<tr>
<td>CHEMICALS AND HYDROCARBONS</td>
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<tr>
<td>SW32</td>
<td>All fuels, chemicals, and liquids will be stored at least 50 m away from the existing stormwater drainage</td>
<td>Construction</td>
<td>Construction Supervisor</td>
<td>G36 Clause 2.1.1</td>
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<td>ID</td>
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<td>system and would be stored in an impervious bunded area within the compound site.</td>
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<td>OACEMP App B4 Table 6-1</td>
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<td>(REMM HR-4, REMM SWC-8)</td>
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<tr>
<td>SW33</td>
<td>Storage of dangerous goods and hazardous materials will occur in accordance with suppliers' instructions and relevant Australian Standards and may include bulk storage tanks, chemical storage cabinets / containers or impervious bunds.</td>
<td>Construction</td>
<td>Supervisor</td>
<td>OACEMP App B4 Table 6-1</td>
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<td>(REMM HR-1)</td>
</tr>
<tr>
<td>SW34</td>
<td>Emergency spill kits for the management of wet and dry chemical spills will be available at all compound areas</td>
<td>Construction</td>
<td>Supervisor</td>
<td>G36 Clause 2.1.2</td>
</tr>
<tr>
<td>SW35</td>
<td>Vehicle wash downs and/or concrete truck washouts will be constructed within a designated bunded area of an impervious surface or undertaken off-site.</td>
<td>Construction</td>
<td>Supervisor ESR</td>
<td>G38 Clause 3.1.1</td>
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<td></td>
<td>OACEMP App B4 Table 6-1</td>
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<td>(REMM SWC-8)</td>
</tr>
<tr>
<td>SW36</td>
<td>The refuelling of plant and maintenance machinery will be undertaken at least 50 m from waterways with appropriate spill kits available.</td>
<td>Construction</td>
<td>Supervisor ESR</td>
<td>OACEMP App B4 Table 6-1</td>
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<td>(REMM SWC-8)</td>
</tr>
<tr>
<td>SW37</td>
<td>Material Safety Data Sheets are to be obtained for dangerous goods and hazardous substances stored onsite prior to their arrival.</td>
<td>Construction</td>
<td>Supervisor ESR</td>
<td>OACEMP App B4 Table 6-1</td>
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<td>(REMM HR-5)</td>
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<tr>
<td>SW38</td>
<td>Storage, handling and use of dangerous goods and hazardous substances would be in accordance with the <em>Work Health and Safety Act 2011</em> and the <em>Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005).</em></td>
<td>Construction</td>
<td>Supervisor</td>
<td>ESR</td>
</tr>
<tr>
<td>SW39</td>
<td>Sedimentation basins will be installed prior to topsoil stripping. The in conjunction with the soil conservationist the ESR will devise ERSED plans prior to topsoil stripping in an area. An RMS approved EWMS for topsoil stripping and earthworks will be developed.</td>
<td>Pre-Construction</td>
<td>Supervisor</td>
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**EARTHWORKS**

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<tr>
<th>ID</th>
<th>Measure / Requirement</th>
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<th>Responsibility</th>
<th>Reference</th>
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<tbody>
<tr>
<td>SW40</td>
<td>The works will be staged in a manner that minimises areas of exposed soil.</td>
<td>Pre – Construction</td>
<td>Project Manager</td>
<td>G38 Clause 3.1.1</td>
</tr>
<tr>
<td>SW41</td>
<td>ERSED plans will be developed and implemented to stabilised exposed areas. Examples of stabilisation methods are geotextile fabric, stabilised mulch, soil binder or spray grass or similar.</td>
<td>Construction</td>
<td>Supervisor</td>
<td>ESR</td>
</tr>
<tr>
<td>SW42</td>
<td>The batters will be constructed in a manner that reduces the risk of topsoil scouring during heavy rain.</td>
<td>Construction</td>
<td>Supervisor</td>
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</tr>
<tr>
<td>SW43</td>
<td>As far as practicable disturbed surfaces will be compacted at the end of the day and prior to expected heavy rain.</td>
<td>Construction</td>
<td>Supervisor</td>
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<tr>
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<tr>
<td>SW44</td>
<td>High risk soil and erosion activities such as earthworks would not be undertaken immediately before or during high rainfall or wind events</td>
<td>Construction</td>
<td>Supervisor</td>
<td>G38 Clause 3.1.1</td>
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</tbody>
</table>

**CONSTRUCTION SEDIMENT BASINS**

| SW45 | The sediment basins will be sized by the project soil conservationist and these will be managed during construction in accordance with the requirements of the *Managing Urban Stormwater: Soils and Construction* (Landcom 2004).
Sediment basins would be located outside of the riparian corridor where possible. | Construction | Soil conservationist ESR | OACEMP App B4 Table 6-1 (REMM SWC-4) NSW-CoA E45 |

| SW46 | Construction, operation and maintenance of sediment basis will be in accordance with the guideline “Managing Urban Stormwater – Soils and Construction, Volume 2D, Main road construction” DECC 2008 and in conjunction with volume 1 ‘Managing urban stormwater: soils and construction” Landcom 2006. | Construction | Supervisor | G38 Clause 3.7.2 NSW-CoA E45 |

| SW47 | Where material from excavations is unsuitable for the embankments and trench backfill, materials may be borrowed or imported. Surplus materials will be disposed of. | Construction | Supervisor | G38 Clause 3.7.1 |

<p>| SW48 | The Soil Conservationist will ensure the design storage capacity of any sediment basin installed on the premises is reinstated within 5 business days of the | Construction | Supervisor | G38 Clause 3.7.5 |</p>
<table>
<thead>
<tr>
<th>ID</th>
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<th>Responsibility</th>
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<tbody>
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<td></td>
<td>cessation of a rainfall event that causes run-off to occur on or from the premises.</td>
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<tr>
<td>SW49</td>
<td>The silt in sediment basins will be removed at minimum, whenever the accumulated sediment exceeds 40% of the sediment storage zone. The basins must have greater than 60% capacity for collecting surface runoff.</td>
<td>Construction</td>
<td>Supervisor</td>
<td>G38 Clause 3.7.5</td>
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<td></td>
<td>WASTE QUALITY MANAGEMENT AND REUSE</td>
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<tr>
<td>SW50</td>
<td>Water captured in sediment basins and other areas will be maximised for reuse such as dust suppression, compaction, or other construction activities in preference to potable water.</td>
<td>Construction</td>
<td>Supervisor</td>
<td>Good practice</td>
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<td>NSW-CoA E71</td>
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<tr>
<td>SW51</td>
<td>Flocculants (other than gypsum) used to treat water before discharge from the premise will be tested prior to use and will achieve a 48-hour EC50 (immobilisation) for water fleas and a 96-hour (EC50) (imbalance) for fish, greater than 100 milligrams per litre.</td>
<td>Pre-Construction</td>
<td>ESR</td>
<td>G38 Clause 3.7.4</td>
</tr>
<tr>
<td>SW52</td>
<td>Water analysis will be undertaken by an NATA accredited laboratory.</td>
<td>Pre-Construction</td>
<td>ESR</td>
<td>G38 Clause 3.7.4</td>
</tr>
<tr>
<td>SW53</td>
<td>Keep daily records of rainfall at the site (in millimetres), measured at the same time each day. The weather station will maintain real time data in soft copy format.</td>
<td>Construction</td>
<td>ESR</td>
<td>G38 Clause 4</td>
</tr>
<tr>
<td>ID</td>
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<tr>
<td>SW54</td>
<td>Existing stormwater drainage systems will be retained in operation until new stormwater drains replace them to separate clean water from disturbed areas</td>
<td>Construction</td>
<td>Supervisor, ESR</td>
<td>G38 3.5.4</td>
</tr>
<tr>
<td>SW55</td>
<td>Prior to the commencement of dewatering, the entire system will be inspected, including intakes and outlets, pumping and discharge locations.</td>
<td>Construction</td>
<td>Supervisor, ESR</td>
<td>G38 3.5.4</td>
</tr>
<tr>
<td>SW56</td>
<td>Dewatering will be undertaken and managed in accordance with the Dewatering Procedure attached at Annexure C—and in a manner than does not cause erosion and/or pollute the environment.</td>
<td>Construction</td>
<td>Supervisor, ESR</td>
<td>G38 Clause 3.5.1 and 3.5.2</td>
</tr>
<tr>
<td>SW57</td>
<td>Before discharging water from a basin, test the water to ensure that it complies with Section 120 of the POEO Act or the relevant conditions of the EPL as applicable.</td>
<td>Pre-Construction/ Construction</td>
<td>Supervisor, ESR</td>
<td>G38 Clause 3.7.4</td>
</tr>
<tr>
<td>SW58</td>
<td>It is not expected that specific controls for groundwater would be required. If groundwater is encountered during excavation works a groundwater monitoring plan will be implemented. GEJV will consult with Water NSW if a permit is required.</td>
<td>Construction</td>
<td>Supervisor, ESR</td>
<td>OACEMP App B4 Table 6-1 (REMM SWC-9)</td>
</tr>
</tbody>
</table>

**LAND STABILISATION**

<table>
<thead>
<tr>
<th>ID</th>
<th>Measure / Requirement</th>
<th>When to implement</th>
<th>Responsibility</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW59</td>
<td>Disturbed areas will be progressively stabilised as soon as possible during the construction phase e.g. with a cover crop, hydro mulch, hydro seeding, topsoil, stabilising agent and/or mulch.</td>
<td>Construction</td>
<td>Supervisor, ESR</td>
<td>G38 Clause 3.1.1</td>
</tr>
<tr>
<td>ID</td>
<td>Measure / Requirement</td>
<td>When to implement</td>
<td>Responsibility</td>
<td>Reference</td>
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<tr>
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</tr>
<tr>
<td>SW60</td>
<td>Wherever possible, permanent landscaping and revegetation works will take place progressively.</td>
<td>Construction</td>
<td>ESR</td>
<td>G38 Clause 3.1.1</td>
</tr>
</tbody>
</table>

| SW61 | Restoration of the site will be implemented progressively across the site. | Construction      | Supervisor     | G38 Clause 3.2      |

| SW62 | Topsoil will be stockpiled separately for possible reuse in landscaping and rehabilitation works | Construction      | Supervisor     | G38 Clause 3.1.1    |

| SW63 | All temporary erosion and sediment control devices will not be removed until the permanent measures are sufficiently established. These will be inspected at a minimum weekly and prior to a following rain events greater than 10mm | Construction      | Supervisor     | G38 Clause 3.1.1    |

| SW63 | The Erosion and sedimentation controls will remain in place until 70% of the disturbed area beyond the pavement is stabilised or as otherwise agreed with the Principal. | Construction      | Supervisor     | NSW-CoA E45         |

**MONITORING**

| SW64 | The GEJV ESR will maintain records and registers of monitoring activities will be maintained. Details may include where appropriate:  
- A copy of the environmental work method statement(s)  
- Date, time, location and name of responsible person  
- Water quality test results for each discharge  
- The personnel approving the dewatering activities | Construction      | ESR           | G38 Clause 2.1.2, 2.3 |


<table>
<thead>
<tr>
<th>ID</th>
<th>Measure / Requirement</th>
<th>When to implement</th>
<th>Responsibility</th>
<th>Reference</th>
</tr>
</thead>
</table>
|     | • Evidence of discharge monitoring, or risk assessment and mitigation measures used to eliminate the risks of pollution  
     | • Any other EPA license requirements where issued  
     | Records will be kept for at least 4 years                                                                                                                                                                          |                   |                      |
| SW65| The GEJV ESR will conduct daily monitoring of the Bureau of Meteorology for forecast heavy rainfall events in order to allow sufficient time to prepare the site and also to allow for programming of construction work to minimise the risk of erosion and sedimentation  
     | The weather station will provide real time weather monitoring.  | Construction      | ESR                  | G38 Clause 3.1.1  |
| SW66| The ESR will maintain a register of inspection and maintenance of erosion and sediment controls including, dates of discharge, water quality, flocculation measures and rainfall  | Construction      | Site Engineer, ESR    | G38 Clause 3.1.2  |
| SW67| The CSWMP and PESCP will be reviewed periodically, at least every 6 months, to assess the effectiveness of implementation. The review will identify opportunities for continual improvements.  | Construction      | Supervisor, Site Engineer, ESR | G38 Clause 2.5  |
| SW68| GEJV’s Soil Conservationist will inspect the site on a monthly basis and provide written recommendations on the PESCP drawings and the effectiveness of controls in place. A copy of the report will be provided to the Principal.  | Construction      | Supervisor, Project Engineer, Soil Conservationist | G38 Clause 4  |
| SW69| A soil conservationist John Wright TREES has been engaged to review the erosion and sedimentation plans and conduct routine inspections of the construction works  | Construction      | Soil Conservationist  | OACEMP App B4 Table 6-1  
(REMM SWC-7)  |
7 Erosion and Sediment Control Plans

Erosion and sediment control measures will be prepared and implemented prior to disturbance, or as site conditions dictate, during a change in site layout, and documented in a PESCP. These may be specific to a site, a sub-site, sub-catchment or individual component of the work. For example:

- Clearing, grubbing and removal of topsoil.
- Earthworks.
- The installation of a culvert extension.
- Works in waterways or drainage lines.

PESCPs will include but not be limited to:

- Contours and clean and dirty water drainage paths.
- Sediment basins and designated LDPS
- Limit of disturbance.
- Location and type of control measures.
- Order of works schedule.
- Specific construction details.
- Water courses, water bodies and wetlands.
- Construction boundaries.
- Environmentally sensitive areas and exclusion zones.
- Locations of all ancillary activities.
- Areas and activities that may impact on water quality e.g. tracks, stockpiles, temporary work areas etc.

PESCP will be developed by the ESR in consultation with the project soil conservationist and Construction staff with demonstrated skills and experience in preparing the PESCP in accordance with the Managing Urban Stormwater: Soils and Construction (Landcom 2004). The PESCPs will be developed in consultation with GEJV’s soil conservationist ‘TREES Pty Ltd’.

The plans will be presented as a series of drawings (based on construction drainage plans) and will be retained in a register on site by the ESR (or delegate).

GEJV’s Soil Conservationist will inspect the site on a monthly basis and provide written recommendations on the PESCP drawings and the effectiveness of controls in place. A copy of the report will be provided to the Roads and Maritime Environmental Manager (or delegate). Roads and Maritime will have its own Soil Conservationist to conduct regular inspections of the site.

7.1 Key Management Strategies

The erosion and sediment control (ESC) measures employed on the site will involve a number of principles and control measures, designed to minimize erosion and sedimentation impacts on the surrounding environment. This includes the incorporation of specific structures, such as sediment basins, and measures to minimize erosion and sedimentation associated with the Project, to be implemented in conjunction with various management techniques. This overall erosion and sedimentation management strategy will collectively fulfil the principles of best practice as detailed in the previously mentioned manuals. This will ensure a ‘preventative’ rather than a ‘cosmetic or remedial’ approach to erosion and sediment control.

The following key principles will apply to all areas and stages of Construction on the Project:

1. Minimise extent and duration of disturbance.
2. Control stormwater flows onto, through and from the site.
3. Erosion control strategies to prevent on-site damage.
Sediment control strategies to prevent off-site damage.
Progressive stabilisation following completion of work areas.
Inspection, Maintenance and Improvement.

The following additional management practices are to be adopted (in addition to those described above):

- Collaborative approach with Roads and Maritime with the design and implementation of PESCPs and controls. GEJV will present and discuss the PESCPs with the focus on improving the quality and effectiveness of the plans and controls.
- Adoption of alternative technologies/strategies including inlet sumps; pre dosing of basins including inlets and outlets.
- Construction of temporary sumps within the road corridor during bulk earthworks.
- Greater investment in erosion control as opposed to sediment control.
- Senior management representation during environmental inspections and audits (Site Supervisor).
- Regular monitoring of weather patterns and forecasts.
- Environmental inspection on controls and basin volumes prior to predicted rainfall events to ensure the Project is in a state to receive rainfall.
- Implementing a process where remedial actions or improvements to ESCs are required, and are closed out within an agreed timeframe and signed off by the ESR or delegate.

7.2 Key Erosion and Sediment Control Measures

The following measures are to be implemented where soil disturbance occurs to control water flows, and filter or capture sediment. A combination of these measures would be required in areas that cannot be directed to sediment basins and/or produce a potential soil loss of less than 150m³ per year. These would be installed in accordance with design principles contained in the Managing Urban Stormwater: Soils and Construction (Landcom 2004).

7.2.1 Diversion Banks and Berms

Diversion banks and berms are earth structures and assist in reducing site erosion by:

- Reducing the length of slope (and the potential soil loss).
- Increasing the time of concentration of overland flow.
- Managing the direction and flow path of site water.
- Directing overland flow to a stable outlet point.
- Diverting run-on water around the Construction site.

These structures are effective at reducing erosion potential and form a critical part of the PESCP. They are relatively simple to construct and are to be implemented during all stages of the Construction program where appropriate.

7.2.2 Soil Protection

Where soil disturbance is undertaken, and it is not feasible to construct sediment control measures or implement final rehabilitation, the potential for erosion will be minimised by applying mulch cover, application of a polymer or covering the site with geotextile, heavy duty plastic or similar as a temporary measure. This is particularly relevant to areas of staged construction (fill areas and culverts) and areas which drain directly into clean water diversions/watercourses.
7.2.3 Mulch

Given the location of the proposed alignment and the amount of clearing of vegetation that would be required it is proposed that the obtained mulch material would be reused on site as an erosion or sediment control as mulch berms for filtration of site water during the clearing and topsoil stripping stages. Mulch is very effective in controlling sediment and has the added benefits of being biodegradable, cheap (if available on site) and easy to maintain. However, as there can be problems with tannin seeping from the mulch which can make its way into waterways, its use will need to be appropriately managed by controlling widths, heights and locations such as using away from waterways and low lying areas.

Use of mulch will comply with Roads and Maritime protocols and leachate will be managed carefully to ensure it does not enter the environment off site or sediment basins as per Roads and Maritime Environmental Direction 25; Management of Tannins from Vegetation Mulch (Annexure H).

7.2.4 Sediment Fence

The use of sediment fence will be minimised on the Project where other measures may be more appropriate (e.g. mulch bunds, rock socks, diversion banks) for the following reasons:

- Sediment fence can be labour intensive and difficult to maintain mechanically.
- High maintenance requirement and cost.
- Sediment fence is generally ineffective for particles smaller than sand.

However, there will be occasions where sediment fence provides the most appropriate sediment control solution, particularly where space is limited or mechanical installation of measures is not considered practical. Sediment fence will be woven polypropylene and cotton/geotextile thread with a flow rate >110 litres/m²/sec in accordance with AS3706.9.

7.2.5 Sediment Basins

Sediment basins are designed to capture and provide settlement time for colloidal suspended particles with treatment. These basins are located to achieve maximum water flows from the disturbed catchments only and require other controls to ensure that clean water from undisturbed catchments is not directed to these basins.

All basins will be constructed in accordance with G38 Cl 3.7 and the principles of Managing Urban Stormwater: Soils and Construction (Landcom 2004). Training on basin construction and operation is provided in Annexure B.

As a minimum basins are to be constructed in accordance with the blue book design capacity based on the 80th percentile 5 day rainfall depth for Wallacia (Blue Book Table 6.3a). Rainfall above the basin design rainfall depth of 27.6mm will see the basins overtop via the armoured spillway and discharge to the environment in accordance with the EPL 21121.

Safe access to the basins for sampling (by site staff, Roads and Maritime and EPA) and maintenance must be available at all times in accordance with approved drawings.

Once runoff into the basin has ceased, treatment of the basin with an approved flocculent can commence. Once the flocculent has been added to the basin in accordance with Annexure B methodologies, the basin will be re-tested to check suspended solids and pH levels. Where they meet the criteria of the EPL for discharge the basins will be discharged from the Licensed Discharge Points (LDP) in the approved EPL 21121.

All basins must have capacity returned rainfall depth marked in the basin within the required number of days (5 days) within runoff into the basin ceasing. Where an initial rainfall event ceases and a second rainfall event commences within 5 days of the first event, the 5 day time limit will re-start.
Basin flocculation takes approximately 3 days to achieve settlement, leaving 2 days to return the basin (pumping or other methods) to capacity in normal conditions, however where extended rainfall periods occur or during higher rainfall periods, some basins may not be able to return to capacity. GEJV intend to treat all basins as soon as practical and safe to access the site. In addition, pre-rainfall actions which will assist in treating basins, these include:

- Adding gypsum to the floor and walls of all basins prior to commissioning the basins.
- Adding gypsum to the inlets of all basins prior to forecast rainfall.
- Pre rainfall controls inspections.

A sediment basin register is required to be maintained in accordance with the EPL, showing which basins are currently active on site. Any changes to basins becoming inactive or active must be amended on the register, and submitted to the EPA within 48 hours of the change in accordance with the EPL.

Where basins are required, they are required to be constructed prior to clearing and grubbing works proceeding. Where clearing and grubbing is required to install and access the basin location, the EPL permits these activities.

Removal of basins will be in accordance with G38 and will only occur where the catchment of a basin has been stabilised in accordance with ‘Blue Book’ requirements for cover. The basis for these calculations will be the RUSLE contained in the Blue Book. Where the RUSLE result indicates that a basin is not required due to catchment factors resulting in less than 150m3 per year sediment loss, the basin will be removed from the EPL and decommissioned.

Details on the operation and construction of the basins are provided in Annexure B.

As Construction progresses the GEJV Soil Conservationist may recommend new basins to be installed. Any new basins becoming active must be amended on the sediment basin register, and submitted to the EPA within 48 hours of the change in accordance with the EPL.

### 7.3 Stockpile management

A Stockpile Management Protocol (Annexure F) has been prepared in accordance with the requirements of *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004), Roads and Maritime *Stockpile Site Management Guideline* and Roads and Maritime specifications and the template Stockpile Management Protocol provided in the OACEMP. The purpose of the Stockpile Management Protocol is to ensure that stockpiles are appropriately designed, established, operated and decommissioned to minimise impacts to the environment during Construction of the Project.

The Stockpile Management Protocol includes, but is not be limited to:

- Criteria for the location of stockpiles.
- Installation of erosion and sediment control measures prior to stockpiling material.
- Measures for temporary stabilisation of stockpiles.
- Weed control management of stockpiles.
- Processes to protect waterways and sensitive environmental areas.

### 7.4 Dewatering management

Dewatering is any activity that involves the removal of ponded stormwater or infiltrated groundwater from any location within the Project area (including from sediment basins and dams) and the subsequent reuse or discharge of that water. GEJV will plan dewatering activities to minimise erosion and pollution of the environment.

GEJV has prepared Dewatering Procedures including; a Sediment Basin and Discharge Procedure (Annexure B) and a Dewatering site excavations procedure (Annexure C). The Dewatering Procedures have been developed in accordance with the *Technical Guideline*.
Environmental Management of Construction Site Dewatering (RTA, 2011). GEJV will engage a suitably qualified and experienced independent person to advise and assist in determining the impact and relevant mitigation measures on farm dam impacts from stormwater yields during Construction. The Dewatering Procedures include provision for re-use of water to be removed for Construction of the Project, where possible. GEJV will endeavour to maximise the reuse of captured stormwater on the site.

GEJV has prepared a Dam Dewatering Procedure (Annexure E) as part of this plan and this procedure includes;

- a map showing locations of farm dams to be dewatered
- measures for consulting with property owners regarding dam dewatering
- methodology for dewatering dams with consideration to aquatic ecology including the capture, storage, relocation, release of fish and other aquatic fauna
- Euthanisation procedure (as required)
- location of any offsite discharge points
- Requirements to manage encounters of contaminated water.

The Dam Dewatering Procedure has been developed in consultation with a qualified ecologist who will advise on measures relevant to relocation of fauna and prevention of transfer of exotic aquatic life.

GEJV will keep records of the following and make them available to Roads and Maritime;

- dewatering procedures
- date and time for each discharge at each location
- water quality test results for each discharge
- personnel approving the dewatering activities
- evidence of discharge monitoring, or risk assessment and mitigation measures used to eliminate the risks of pollution or erosion
- any other EPA licence requirements where issued.

All site personnel undertaking dewatering activities during Construction of the Project will be trained and inducted in the use of the Dewatering Procedures.

### 7.5 Work in waterways

Work in waterways will be conducted in accordance with Guide 10: Aquatic Habitats and Riparian Zones, Biodiversity Guidelines (RTA, 2011) and Technical Guideline: Temporary Stormwater Drainage for Road Construction (Roads and Maritime, 2011). The work will be scheduled during periods of predicted low flow to minimise impacts. Where possible, existing creek bed material will be reclaimed and re-used in the reconstruction or stabilisation of creeks. Disturbed creeks will be progressively stabilised to avoid potential scouring and sedimentation. Permanent stabilisation measures will be implemented as soon as practicable.

An EWMS will be developed for working in waterways to avoid or minimise erosion and any adverse impact on water quality and riparian fauna and flora. The EWMS will include provisions to:

- Plan work to avoid, where practicable, any activities in aquatic habitats and riparian zones.
- Properly protect and signpost as environmentally sensitive areas all waterways areas in or adjacent to the site which are excluded from the work areas. Refer to Roads and Maritime Specification G36 for the requirements for working in environmentally sensitive areas.
• Minimise riparian vegetation removal where practicable, and restrict access to the waterways to the minimum amount of bank length required for the activity.
• Minimise the potential for bank erosion through retention of stumps in riparian zones and aquatic habitats for as long as feasibly possible, with removal of stumps only to occur immediately prior to commencement of earthworks in the riparian zone.
• Carry out any refuelling of plant and equipment, chemical storage and decanting at least 50 m away from aquatic habitats unless otherwise approved by the Roads and Maritime Environmental Manager (or delegate).

7.6 Culvert Construction

Areas where new and extended culverts are to be constructed are considered particularly sensitive due to the requirement for works in live flow lines and the high potential for sediment impacts.

Specific PESCPs will be developed for the culvert areas which will detail specific controls and methodologies to be implemented to minimise the potential for impacts to the flow line and water quality. Controls will be implemented prior to the commencement of culvert extension works.

These plans will be developed with sufficient lead time to gain approvals and implement controls prior to works commencing. The plans will include the following elements:

• Diversion of site runoff away from work areas.
• Staging of proposed works to minimise disturbance.
• Isolation of the work area from active flow lines.
• Diversion of clean water around the site.
• Extensive use of erosion and sediment controls.
• Final stabilisation and protection works to be completed as soon as practical.

7.7 Temporary waterway crossings

Temporary waterway crossings will be required for the Project and they will be designed, constructed and maintained consistent with Managing Urban Stormwater: Soils and Construction (Landcom, 2004). For key fish habitat waterways this would include consultation with NSW Fisheries. Temporary waterway crossings will be designed and constructed to minimise impacts on natural flow regimes and to not present any barriers.

Temporary waterway crossings will be designed by a suitably qualified and experienced person and will incorporate suitable hard, durable material that will avoid erosion of fine particles into waterways or siltation of waterways. Erosion and sediment controls will be implemented at the entry and exits points of temporary waterway crossings. These controls will be included in the PESCPs.

7.8 Refuelling, wash-down and chemical storage

All fuels, chemicals, and liquids will be stored at least 50 m away from waterways (including existing stormwater drainage systems) and flood prone areas and will be located on relatively flat land. Storage will be in bunded areas with an impermeable floor and of a size able to contain 120% of the volume of the largest single stored container within the bund. The Contractors will regularly inspect bunded areas for rainwater volumes to ensure that there is sufficient capacity available in the event of a spill or leak.

Dangerous goods and hazardous materials will be stored, handled and disposed of in accordance with suppliers’ instructions, Australian Standards, the WHS Act, Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005) and other relevant guidelines. GEJV will obtain Material Safety Data Sheets (MSDS) for dangerous goods and hazardous substances prior to their arrival on site. GEJV will maintain a register of all
hazardous materials stored on site including MSDS. The register will contain information on the materials, their location and method of storage.

GEJV will undertake daily inspections of all plant and equipment on site for leaks of fuel, oil or hydraulic fluid. Leaks will be repaired prior to re-use of the plant or equipment. GEJV has prepared a vehicle, plant and machinery maintenance routine to minimise risk of leaks.

The refuelling and maintenance of land-based plant and equipment will be undertaken in a designated sealed bunded area where spill kits are available. Refuelling will not be undertaken within 50 m of any waterway. Refuelling activities will be supervised at all times.

Vehicle wash downs and concrete washouts will be carried out within designated sealed bunded areas located at least 50 m from any drainage line (natural or built) and 100 m from areas prone to flooding.

7.9 Pollution incident response management

GEJV has prepared a Pollution Incident Response Management Plan (PIRMP) as part of the CEMP (Appendix B11) in accordance with the requirements of the POEO Act and Environmental guidelines: Preparation of pollution incident response management plans (EPA, 2012).

The objectives of the PIRMP are to:

- outline how pollution incidents will be communicated
- minimise and control the risk of a pollution incident by identifying risks and developing actions to minimise and manage risks
- ensure proper implementation through training personnel, identifying responsibilities, and regular testing the effectiveness of the PIRMP.

The EPA defines a pollution incident as “an incident or set of circumstances during or as a consequence of which there is or is likely to be a leak, spill or other escape or deposit of a substance, as a result of which pollution has occurred, is occurring or is likely to occur. It includes an incident or set of circumstances in which a substance has been placed or disposed of on premises, but it does not include an incident or set of circumstances involving only the emission of any noise.”

It is noted that the Infrastructure Approval defines an incident as:

- An occurrence or set of circumstances that causes, or threatens to cause, material harm to the environment, community or any member of the community, being actual or potential harm to the health or safety of human beings or to threatened species, endangered ecological communities or ecosystems that is not trivial; or
- results in non-compliance with the Infrastructure Approval.

Note: This meaning of "material harm" applies for the purpose of the Infrastructure Approval only.

A pollution incident must be notified if there is a risk of ‘material harm to the environment’, which is defined in section 147 of the POEO Act as:

(a) harm to the environment is material if:

(i) it involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial, or
(ii) it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000 (or such other amount as is prescribed by the regulations), and

(b) loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment.

Pollution incidents must be notified immediately to the EPA, NSW Health, Fire and Rescue NSW, WorkCover NSW and the relevant local Council.

GEJV’s PIRMP includes a description and likelihood of hazards on site, including an inventory of potential pollutants, pre-emptive actions to be taken to minimise or prevent risk of pollution incidents and harm to site personnel, safety equipment available, a list of contact details for response or notification and community communication tools. The PIRMP also sets out detailed descriptions of the actions to be undertaken in the event of a pollution incident to reduce or control pollution, and training for staff in the use and implementation of the PIRMP.

The PIRMP will be tested at least annually to ensure that the information contained in the plan is accurate and up to date and the PIRMP can be implemented effectively. The PIRMP will also be reviewed within one month of any pollution incident in order to address any lessons learned from implementing the PIRMP.

7.10 Spill prevention and response

An Emergency Spill Response Plan has been prepared as part of the PIRMP (CEMP Appendix B11) in accordance with the Code of Practice for Water Management (RTA, 1999) and relevant EPA guidelines. The Emergency Spill Response Plan details:

- Measures to avoid spillage of fuels, chemicals and liquids, particularly near and/or into waterways.
- Prompt spill containment and clean-up procedures if any spills occur on land, in surface drains and/or in waterways.
- On-site locations of emergency wet and dry spill equipment/kits.
- Procedures for recording and notifying Roads and Maritime and relevant authorities of spills.
- A clear outline of when the Emergency Spill Response Plan will be implemented and who will be responsible for its implementation.

Spill kits will be located at all ancillary facilities and main Construction work areas. All site personnel (including sub-contractors) will be made aware of the location of spill kits and trained in its use. In the instance of a spill, the Roads and Maritime Environmental Incident Classification and Reporting Procedure will also be implemented in conjunction with the PIRMP (CEMP Appendix B11).

7.11 Flood risk planning

GEJV has prepared a Flood Event Contingency and Emergency Plan to manage potential flood events during Construction of the Project. The Flood Event Contingency and Emergency Plan outlines procedures to reduce the impacts of flooding on Construction, including removing plant/equipment and stabilising exposed areas, as well as the impacts of Construction on flood levels, extents and velocities. The plans consider the likelihood of flooding, evacuation routes, warning times, and potential impacts from the site flooding.
GEJV's Flood Event Contingency and Emergency Plan has been prepared in accordance with the outline provided in Table 7-1.

### Table 7-1 Flood Event Contingency and Emergency Plan outline

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
</table>
| Assessment of flood risk and impact       | Flood risk assessment  
Flood impact assessment  
Flood evacuation routes and procedure, including maps |
| Flood monitoring processes                | Daily monitoring of the BoM Flood Warning Service Program to ascertain if any flood warnings have been issued  
Daily monitoring of the forecast for large rainfall events in the Project area  
Monitoring of work sites and ancillary facilities during flood events  
Methods of monitoring rising water and where possible notification from upstream |
| Preparation of Construction site          | Measures to inform site personnel of predicted flood events and confirm flood emergency procedures  
Measures to ensure work sites, plant and equipment are secure during flooding events  
Measures to ensure no material are stockpiled in flood prone areas or areas of concentrated overland flow  
Measures to ensure dangerous and hazardous goods are stored outside the flood extent and in suitable storage containers  
Preparation of a register of all materials stored in work areas within the flood extent  
Measures to back-up all data and information to a location off-site  
protocol to ensure availability of sandbags to minimise ingress |
| Flood action plan                         | Methods, timeframes and responsibilities for securing, removal, mobilisation to higher ground or protection of all materials safely from work areas during a flood event  
Protocols to minimise the risk of damage to infrastructure and equipment during a large flood or rainfall event  
Warning system to be implemented and training of staff in the warning system  
Evacuation route and procedure for evacuating from site |
| Post-flood action plan                    | Actions to be taken on returning to the Construction site following a flood event, such as:  
inspection of buildings for damage  
inspection of all plant and equipment for damage  
inspection of the stability of stockpiles and erosion and sediment controls  
inspection of power and water systems for damage |
| Communication and notification            | Contact list for the relevant agencies and authorities to be communicated and consulted with during a flood event |

All site personnel will be trained and inducted on emergency procedures to ensure that they are prepared for flood events. This will ensure that site personnel on site are familiar with the evacuation procedure and routes in the event of evacuation being ordered.
7.12 Wet Weather Event Procedure

GEJV will commit to the monitoring and inspections detailed in table 7-2 relating to wet weather events. GEJV will install a weather station to provide real time weather monitoring and the weather history will be maintained on the DMS in soft copy.

Table 7-2 Wet Weather Event Procedure

<table>
<thead>
<tr>
<th>Monitoring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily Weather Forecast</td>
<td>Daily monitoring of BOM website for weather forecasts including hourly monitoring of the rainfall radars in the lead up and during a wet weather event.</td>
</tr>
<tr>
<td>Pre rainfall inspection</td>
<td>Pre rainfall inspection of the entire site to ensure that all erosion/sedimentation and stabilisation controls are in place and in effective working order. This is to occur prior to a forecast rainfall event where it is a &gt;80% probability of a 10mm or greater rainfall event on the BOM website forecast. The pre rainfall inspection includes the relocation of materials that could cause environmental incidents such as potential pollution incidents onto higher ground and away from flood prone areas.</td>
</tr>
<tr>
<td>Inspections during rainfall event</td>
<td>Inspections of the site daily during a prolonged rainfall event to ensure that the all erosion/sedimentation and stabilisation controls functioning effectively and no emergency repairs or maintenance is required. Note that this inspection during rainfall is subject to obtaining safe access to site and should not occur if it will increase the environmental or safety risk, for example mud tracking on public roads.</td>
</tr>
<tr>
<td>Post rainfall inspection</td>
<td>Post rainfall inspection are to occur after a rainfall event &gt;10mm has occurred. These inspections should occur within 24 hours after the rainfall event and should identify any maintenance requirements for the erosion/sedimentation and stabilisation controls. The post rainfall inspections will also identify dewatering requirements onsite including testing and treatment of water captured in construction sediment basins and sumps.</td>
</tr>
</tbody>
</table>

7.13 Flood and work as executed information

GEJV and Roads and Maritime will undertake defects inspections with Liverpool City Council to ensure work as executed is to design specification.

Once defects have been closed out, GEJV will provide work as executed information from a registered surveyor certifying finished ground levels and the dimensions and finished levels of all structures within flood prone land to Roads and Maritime on completion of Construction in accordance with NSW-CoA E7.

Roads and Maritime and/or GEJV will also supply flood reports, models and geographic information system outputs to Liverpool City Council and the SES.

Roads and Maritime will notify Liverpool City Council and the SES in writing that the information is available no later than one month following the completion of Construction. Roads and Maritime will provide the information requested by Liverpool City Council or the
SES no later than six months following the completion of Construction or within another timeframe agreed with Liverpool City Council and the SES.

7.14 Measures to address impacts on water supply

For properties where modelling in the EIS and/or SPIR predicts that the Project will potentially reduce the available stormwater runoff yield to a farm dam, Roads and Maritime will, in consultation with the affected landowner, calculate the nature and extent of impacts on water supply and determine what measures may be implemented to prevent, mitigate or offset a loss in water supply.

GEJV will implement the measures agreed by Roads and Maritime with the potentially affected landowner at no cost to the landowner. The agreed measures will be implemented before and during Construction of any works that may potentially affect the flow of water into the farm dams.

7.15 Contaminated land management

Contaminated land will be managed in accordance with the measures outlined in the Construction Contaminated Land Management Sub Plan (Appendix B8 of the CEMP).

7.16 Site Stabilisation Plan

The PESCPs will identify areas requiring stabilisation and methods of stabilisation required during the Construction process. The PESCP will incorporate a risk assessment for disturbed areas and stockpiles, a monitoring program for stabilised areas and a process for determining if the controls are successful and if additional stabilisation methods / controls are required.

All high risk areas identified in the PESCP will be stabilised within 2 weeks of the area being completed to design levels and all medium areas will be stabilised within 1 month of works being completed. Erosion and sediment controls will remain in place until 70% of the disturbed area beyond the pavement is stabilised or as otherwise agreed with the Roads and Maritime Environmental Manager (or delegate).
8 Compliance management

8.1 Roles and responsibilities

The GEJV Project Team organisational structure and overall environmental roles and responsibilities are outlined in Section 5.1 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Section 6 of this Plan.

8.1.1 Soil Conservationist

GEJV has engaged John Wright from T.R.E.E.S as the Project soil conservationist. John Wright is a Certified Practicing Erosion and Sediment Control Professional (CPESC) for the Project who is listed on the Roads and Maritime list of Registered Contractors for Erosion, Sedimentation and Soil Conservation Consultancy Services. His contact mobile number is 0418 434 516. The role of the Project soil conservationist includes:

- Review the development of this CSWMP including all calculations and proposed erosion and sediment controls.
- Assist with development of PESCPs, including design and location of temporary sediment basins.
- Undertake site inspections as required, but at least monthly and prepare a report detailing findings from these inspections that is to be provided to Roads and Maritime.
- Provide specialised training to relevant site personnel.
- Liaise on a regular basis with any soil conservationist appointed for the Project by Roads and Maritime.

8.2 Communication

Roads and Maritime has prepared a Community Communication Strategy (CCS) in accordance with the requirements of NSW-CoA B1 to document the approach to stakeholder and community communications for the Project. The CCS identifies opportunities and tools for providing information and consulting with the community and stakeholders during the Construction of the Project. GEJV will support the delivery of the CCS with specific measures outlined in the Construction Community Liaison Plan (Appendix B12 of the CEMP).

Soil and water quality management information will be communicated to the community and stakeholders in accordance with the principles and procedures outlined in the CCS.

Further detail about the CCS is provided in Section 5.5.3 of the CEMP.

8.3 Training

All employees, contractors and utility staff working on site will undergo site induction training relating to soil and water management issues prior to the personnel commencing Construction activities. The induction training will address elements related to soil and water management including:

- Existence and requirements of this CSWMP, the OACEMP CSWMP and all plans and procedures prepared under the CSWMP.
- relevant legislation, regulations and EPL conditions
- incident response, management and reporting
- emergency response measures in high rainfall or flood events
- the PIRMP
- mulch and tannin management
- stockpile location criteria
- complaints response and reporting
- roles and responsibilities for soil and water management
- ERSED control installation methodology
- sediment basin construction and management
- working near or in drainage lines and creeks
- water quality management and protection measures
- groundwater issues
- spill response.

Site personnel will undergo refresher training at not less than six monthly intervals. Targeted training in the form of toolbox talks or specific training will also be provided to personnel with a key role in soil and water management. Daily pre-start meetings conducted by the Superintendent will inform the site workforce of any environmental issues relevant to soil and water that could potentially be impacted by, or impact on, the day's activities. Examples of training topics include:

- ERSED control installation methodology.
- Sediment basin operation.
- Sediment basin maintenance.
- Working near or in drainage lines and creeks.
- Emergency response measures in high rainfall events.
- Preparedness for high rainfall events.
- Lessons learnt from incidents and other event e.g. high rainfall/flooding.
- Mulch and tannin management.
- Spill response.
- Stockpile location criteria.
- Identification of potentially contaminated spoil and fill material.

Further details regarding staff induction and training are outlined in Section 5.3 of the CEMP.

### 8.4 Monitoring and inspection

Regular monitoring and inspections will be undertaken in the lead up to, during and following Construction. Monitoring and inspections will be undertaken in accordance with the requirements in Annexure A and will include, but not be limited to:

- At a minimum a weekly inspection will be undertaken by the ESR, this inspection will include monitoring of all aspects of soil and water managements. Records will be maintained of these inspections.
- Construction sediment basin water quality prior to discharge.
- All disturbed areas and revegetated/stabilised areas together with all permanent and temporary erosion and sediment controls works will be inspected as soon as possible after rainfall event of 10mm or more, or after prolonged rainfall events. The effectiveness of the PESCPs and controls to be reviewed after each of these events. Other inspections around wet weather events are identified in the wet weather procedure (section 7.12).
- The CSWMP, PESCPs and Stockpile Management Plan to be updated/reviewed if any control identified or installed is deemed ineffective or defective.
- Check dams, sediment fences including stormwater entry points such as pits and inlets will be inspected at least weekly and defects will be rectified as soon as practicable.
- Sediment will be cleared from check dams and sediment fences on a regular basis to provide at least 60% capacity at all times.
- All ESC’s around stockpiles will be inspected at least weekly and defects rectified as soon as practicable.
- Daily records of rainfall will be kept on site.
• As per the EPL, the licensee (Georgiou) will record all inspections including observations and works undertaken to repair and/or maintain erosion and sediment controls.
• A register of all inspections, checklists and close out of defects to be kept on site
• Appropriate personnel will be made available to accompany Roads and Maritime in all site inspections and to organise rectification of any deficiencies in the timeframes specified in the Inspection Report.
• The Roads and Maritime approved Soil Conservationist will inspect the site on a monthly basis and provide written recommendations on the PESCP drawings and the effectiveness of controls in place. A copy of the report will be provided to Roads and Maritime.

Additional requirements and responsibilities in relation to inspections are documented in Section 6 of the CEMP. Inspections and monitoring specific to wet weather events are identified in the wet weather procedure (section 7.12).

8.5 Weather monitoring
Rainfall at the premises will be measured and recorded in millimetres per 24-hour period at the same time each day from the site compound. An automatic rainfall intensity/weather station will be installed at the site compound area and Georgiou staff will have access to the online data.
Weather monitoring is further outlined in the Construction Water, Soil and Contamination Monitoring Program (Annexure A).

8.6 Incident planning and response
Response to incidents will be undertaken as described in Section 5.6 of the CEMP and in accordance with the Environmental Incident Classification and Reporting Procedure (refer to Appendix A7 of the CEMP).

8.7 Auditing
Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this sub plan, Roads and Maritime Specifications, the conditions of approval and other relevant approvals, licenses and guidelines.
Audit requirements are detailed in Section 6.4 of the CEMP.

8.8 Non-conformances
A non-conformance is the failure or refusal to comply with the requirements of project system documentation, including this CSWMP. Any member of the GEJV Project team may raise a non-conformance or improvement opportunity.

When a non-conformance is detected, the process described in Section 6.6 and Appendix A9 of the CEMP will be implemented. The Quality Plan describes the process for managing non-conforming work practices and initiating corrective/preventative actions or system improvements in accordance with the process outlined in Section 6.6.1 of the CEMP.

8.9 Reporting
Reporting requirements and responsibilities are documented in Section 5.1 of the CEMP. GEJV will record all inspections of sediment and erosion controls, including observations and works undertaken to repair and/or maintain soil and water management works. GEJV will maintain accurate records substantiating all Construction activities associated with the Project or relevant to the conditions of approval, including measures taken to implement this CSWMP. Records will be made available to the DP&E and DoEE upon request, within the timeframe nominated in the request.
The sediment basin discharge monitoring results will be provided to Roads and Maritime in the GEJV monthly report.

9 Review and improvement

9.1 Continuous improvement

Continuous improvement of this Plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance.
- Identify environmental risks not already included in the risk register
- Determine the cause or causes of non-conformances and deficiencies.
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies.
- Verify the effectiveness of the corrective and preventative actions.
- Document any changes in procedures resulting from process improvement.
- Make comparisons with objectives and targets.

GEJV is responsible for ensuring Project environmental risks are identified and included in the risk register and appropriate mitigation measures implemented throughout the Construction of the Project as part of the continuous improvement process. The process for ongoing risk identification and management during Construction is outlined in Section 4.3 of the CEMP.

9.2 CSWMP update and amendment

The processes described in Section 6.8 of the CEMP may result in the need to update or revise this Plan. This will occur as needed.

Any revisions to this CSWMP will be in accordance with the process outlined in Section 6.8 of the CEMP.

A copy of the updated Plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 6.7.2 of the CEMP.
Annexure A Construction Water, Soil and Contamination Monitoring Program

1 Purpose

This Construction Water, Soil and Contamination Monitoring Program (MP) has been developed in accordance with the OACEMP and NSW-CoA C9(c). It describes the water, soil and contamination monitoring activities to be undertaken for the Project. The purpose of this MP is to:

- provide procedures to monitor surface discharge water, soil and contaminated land impacts during Construction of the Project
- meet the requirements of the conditions of approval for the Project
- Meet any relevant legal and other requirements and EPL conditions for the Project.

1.1 Baseline data

GEJV acknowledges that baseline water quality data was collected by GHD on behalf of Roads and Maritime during the 12 month Pre-Construction phase, commencing from August 2017. Baseline data was also collected from groundwater monitoring sites from September 2017. A summary of surface water quality and groundwater characteristics within the Project area is outlined in Section 4.2 and 4.3 of this CSWMP. The details of the data will be made available to the Project team during the Construction of the Project.

1.2 EPL conditions

The EPL conditions relevant to the monitoring of soil and water are provided in Table 1.

Table 1: EPL requirements relevant to the management of water, soil and contamination

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Relevant requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Discharges to air and water and applications to land</td>
</tr>
<tr>
<td>P1</td>
<td>Location of monitoring/discharge points and areas</td>
</tr>
<tr>
<td>P1.1</td>
<td>The [outlets to sediment basins referred to in Condition P1.3] are identified in this licence for the purposes of the monitoring and/or the setting of limits...</td>
</tr>
<tr>
<td>P1.2</td>
<td>The [outlets to sediment basins referred to in Condition P1.3] are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point. [Stage specific discharge locations will be identified in the Contractor’s MP]</td>
</tr>
<tr>
<td>P1.3</td>
<td>The sediment basins and discharge points referred to in condition P1.2 are the active basins and discharge points identified and located in the diagram titled &quot;The Northern Road Upgrade Stage 4/5/6 - Scheduled Premises Map and Discharge Point Plan&quot;, and maintained on electronic file [EF18/7382]. [Stage specific premises maps will be provided in the Contractor’s MP]</td>
</tr>
</tbody>
</table>
3 Limit conditions

L2 Concentration limits

L2.1 For each monitoring/discharge point…specified in [Condition L2.4]…, the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in Table 3-2.

L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table/s.

L2.4 Water and/or Land Concentration Limits – [refer Table 3-2 of this MP].
[Stage specific discharge locations will be identified in the Contractor’s MP]

L2.5 Exceeding the limits specified in Condition L2.4 of this licence for pH and total suspended solids (TSS) for discharges from the sediment basins identified by Conditions P1.1, P1.2 and P1.3 is only permitted when the discharge occurs solely as a result of rainfall measured at the premises. The rainfall must exceed rainfall depth value for the corresponding discharge point as described in condition P1.3.

L2.6 If the licensee uses turbidity (NTU) in place of TSS to determine compliance with Condition L2.4, the licensee must develop a statistical correlation which identifies the relationship between NTU and TSS for water quality in the sediment basin/s in order to determine the NTU equivalent of 50 mg/L TSS before its use.

L2.7 The licensee must provide the EPA with a copy of the statistical correlation assessment methodology and results before using NTU in place of TSS.

L2.8 The EPA may make a written request for a copy of the statistical correlation assessment and methodology to determine compliance with condition L2.4 if required.

4 Operating conditions

O4 Processes and management

O4.9 The licensee must ensure that sampling point(s) for water discharged from the sediment basin(s) are provided and maintained in an appropriate condition to permit:

a) the clear identification of each sediment basin and discharge point;

b) the collection of representative samples of the water discharged from the sediment basin(s);

and

c) access to the sampling point(s) at all times by an authorised officer of the EPA.

3 Monitoring and recording conditions

M2 Requirement to monitor concentration of pollutants discharged
Ref. | Relevant requirement
--- | ---
M2.1 | For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1 [Table 3-2]. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns [of Table 3-2].

M2.2 | Water and/ or Land Monitoring Requirements – refer Table 3-2

M2.3 | For the purposes of Condition M2.2 and Table 3-2 thereto, ‘Special Frequency 1’ means:

(a) less than 24 hours prior to a controlled discharge and daily for any continued controlled discharge; and

(b) when rainfall causes a discharge from a basin which has not been emptied within 5 business days of the cessation of a rainfall event.

M3 | Testing methods - concentration limits

M3.1 | Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

---

### 2 Surface Water and Groundwater Quality Monitoring

Roads and Maritime has engaged an independent environmental consultant (GHD) to undertake monitoring of the receiving surface water and groundwater for the Project (refer OACEMP Appendix B4). Ongoing monitoring will be carried out monthly during Construction to detect any changes in water quality compared to baseline conditions that might be attributable to Project activities.

Receiving surface water and groundwater data collected by GHD will be provided to GEJV. GEJV will implement any actions required in response to any exceedances identified in the GHD monitoring results. GEJV will support the surface water and groundwater monitoring as required including by providing GHD with access to monitoring locations where Construction is occurring.

The GEJV monitoring program for water monitoring relates to water discharge from sediment basins and excavations to meet the EPL 21121 requirements.

### 3 Soil and Contamination Monitoring

Soil and potential contamination will be managed in accordance with the measures outlined in the Construction Contaminated Land Management sub plan (Appendix B8 of the CEMP). These measures include pre topsoil contamination monitoring before and during topsoil stripping operations.

If required, additional monitoring for contaminated soil will be provided in Remedial Action Plans (RAPs) when contamination is encountered onsite (refer Section 3.5 of the Construction Contaminated Land Management Plan (Appendix B8 of the CEMP).

Monitoring, testing, classification and disposal of soil are provided in the Construction Waste and Energy Management Plan (CWEMP) (Appendix B7 of the CEMP).
GEJV's Environmental Scientist / Engineer will advise on the requirements for asbestos monitoring. Continuous asbestos fibre monitoring and personal exposure asbestos fibre air monitoring for workers may be carried out during asbestos removal works, if deemed necessary by the Environmental Scientist / Engineer.

4 Unexploded ordinance

As the Northern Road Upgrade between Mersey Road and Eaton Road is not in the vicinity of Defence land it is unlikely that unexploded ordnance UXO will be encountered and no monitoring for UXO will occur.

5 Climate monitoring

GEJV will measure and record rainfall at the main compound in millimetres per 24-hour period at 9 am each day from the time that the site office is established. GEJV will install an automatic weather station (AWS) at the main compound site. The AWS will record hourly rainfall, temperature, relative humidity, wind speed, wind direction and bathometric pressure. Manual rainfall gauges will also be used across the Project to assist with assessment of rainfall data accuracy.

The data collected from the AWS and rainfall gauges will:

- provide a more detailed early understanding of potential rainfall and other adverse weather impacts
- provide a proactive and early inspection and maintenance regime response to erosion and sedimentation and the effects of other adverse climatic conditions before pollution occurs
- trigger weather alarms and messages to relevant site personnel to take action where appropriate
- assess and validate the performance of installed erosion and sediment control measures against the design performance criteria
- provide compliance data for statutory monitoring on-site.

In accordance with normal standard construction practices, weather forecasts will be used to guide work activities undertaken on-site. GEJV will review the weather forecasts at the start of each day and prior to undertaking new work activities that may be affected by rainfall or adverse weather. Where weather forecasts predict conditions that may pose an environmental risk, site environmental controls will be inspected and secured to reduce erosion and sediment control impacts. Contingency planning to prevent spills will also involve monitoring for predicted flood events and the removal of fuels and chemicals from flood prone areas.

Arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather are detailed in the Wet Weather Event Procedure (section 7.12 of the CSWMP).
6 Sediment Basin discharge monitoring

By assessing water quality before discharging offsite changes in water quality will be recognised, causes identified and actions can be taken to immediately rectify and prevent any offsite environmental impact.

GEJV will undertake treatment and water sampling of runoff captured in sediment basins prior to water being discharged from the LDP, in accordance with the EPL requirements.

Water quality parameters to be assessed will include:

- pH. 6.5 to 8.5
- Turbidity NTU reading that equals less than 50 mg/L TSS
- Total suspended solids less than 50 mg/L
- Hydrocarbons (visible sheen)

Site observations including weather, colour, frothing, odour, flow, surfactants, and construction activities will be recorded during sampling. Data will be obtained and stored using regularly serviced and calibrated equipment ensure reliable results.

In the case where water samples need to be analysed for heavy metals, oils and organic pollutants, samples will be collected and sent in accordance to laboratory specifications to a NATA accredited laboratory for analysis.

The monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the EPA Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (EPA, 2004) unless another method has been approved by the EPA in writing before any tests are conducted.

6.1 Procedure

All GEJV personnel responsible for water sampling associated with sediment basin discharges are to be inducted on the existence of this procedure during the Project induction, and in more detail as required in site inductions and regular Toolbox Talks.

Only GEJV personnel or sub-contractors with suitable experience and qualifications will undertake the monitoring outlined in this procedure.

6.1.1 Preparing

The operator must familiarise themselves with the testing equipment before attempting to undertake water quality monitoring. Monitoring shall only be undertaken by the Environment Site Representative (ESR) or a nominated delegate with relevant training and experience. The equipment should be regularly calibrated (using standard solutions) to ensure accuracy. Calibration logs/certificates are to be maintained for auditing purposes.

6.1.2 Collecting Data

After reaching the site, and safely accessing the designated sampling points, place monitoring equipment into the water without disturbing sediment. Alternatively, use an extended sampling bottle which removes the need to directly access water bodies. Readings should settle within a few seconds, but if readings remain inconsistent wait a short period of time until readings stabilise. While waiting, record site data and observations as mentioned above. Once stable, record the data in the water record form.

6.1.2 Discharge Water Quality Criteria

The EPL prescribes water quality parameters to be measured and associated discharge criteria. The water quality discharge criteria for the Project are listed below.
Table 1: Project water quality discharge criteria

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Criteria</th>
<th>Sampling method</th>
<th>Frequency</th>
<th>Analytical method</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH*</td>
<td>6.5 – 8.5</td>
<td>Probe</td>
<td>Special Frequency 1</td>
<td>Field analysis and confirmed as required with laboratory assessment</td>
</tr>
<tr>
<td>Turbidity</td>
<td>TBA</td>
<td>Grab Sample</td>
<td>Special Frequency 1</td>
<td>Turbidity (NTU) can only be used in place of total suspended solids (TSS) where a statistical correlation has been developed which identifies the relationship between NTU and TSS for water quality in the sediment basin/s before its use.</td>
</tr>
<tr>
<td>Total Suspended Solids*</td>
<td>50 mg/L</td>
<td>Grab Sample</td>
<td>Special Frequency 1</td>
<td>Laboratory analysis</td>
</tr>
<tr>
<td>Oil and Grease*</td>
<td>No visible</td>
<td>Visual inspection</td>
<td>Special Frequency 1</td>
<td>Field analysis and confirmed as required with laboratory assessment</td>
</tr>
</tbody>
</table>

For the purposes of EPL Condition M2.2 and the Table above, ‘Special Frequency 1’ means:

a. less than 24 hours prior to a controlled discharge and daily for any continued controlled discharge; and
b. when rainfall causes a discharge from a basin which has not been emptied within 5 business days of the cessation of a rainfall event.

6.1.3 Recording results of sediment basin discharge monitoring

Results of all monitoring of sediment basins prior to discharge will be recorded on the Dewatering Permit. The Dewatering Permits will be saved on the Georgiou Document management System and all monitoring results from these permits will be used to compile the EPL monthly monitoring summary for the Georgiou website.

7 Reporting

7.1 Monthly environmental report

The GEJV Environmental Site Representative will prepare Monthly Environmental Reports for the duration of the Project for incorporation in Project Monthly Reports and submission to the Roads and Maritime Environmental Manager (or delegate) and Roads and Maritime Project Manager for review. Information to be detailed in the reports includes:

- results summary and analysis of the environmental monitoring for soil and contamination
- performance of this MP
- summary of monthly rainfall data and/or significant rainfall and storm events
- summary of any complaints received that are related to water, soils or contamination.

Reporting on receiving surface water and groundwater quality monitoring will be undertaken by GHD on behalf of Roads and Maritime.
7.2 Site discharge, soil and contamination monitoring report

In accordance with NSW-CoA C15, GEJV will prepare Water, Soil and Contamination Monitoring Reports detailing the results of the site discharge, contamination and climate monitoring undertaken in accordance with this MP for inclusion in the six monthly construction compliance reporting required under NSW-CoA A32. Roads and Maritime will submit the reports to the Secretary and relevant regulatory agencies for information. Reports will be prepared six monthly for the duration of Construction of the Project. Reports will include, but not be limited to, the following information:

- the date(s) and time at which the monitoring was undertaken
- the locations and description of monitoring undertaken
- the name of the person who undertook the monitoring
- tabulations of monitoring data
- compliance monitoring results with the criteria identified in Section 6 of this MP
- identification of exceedances of the nominated criteria and descriptions of the causes of these exceedances
- details of any alteration to the MP
- summary of any complaints received regarding water and contamination.

Monitoring records will be:

- kept in a legible form, or in a form that can readily be reduced to a legible form
- kept for at least four years after the monitoring or event to which they relate took place
- produced in a legible form to any authorised officer of the DP&E, DoEE or EPA upon request, within the timeframe nominated in the request.

Monitoring results may be made available on the EPA website.

7.3 Reporting on non-conformances and exceedances

In the event that the criteria identified in Section 6 of this MP are exceeded GEJV will report the exceedance to the Roads and Maritime Project Manager, Environmental Manager (or delegate) and ER within seven days of identification of the exceedance. Details of exceedances will be provided in the Monthly Environmental Report.

Where an exceedance has caused, is causing or is likely to cause, material harm to the environment, the environmental incident notification and reporting procedures detailed in Section 5.6 of the CEMP and the Environmental Incident Classification and Reporting Procedure (refer to Appendix A7 of the CEMP) will apply. The Environmental Site Representative is responsible for reporting on incidents.

GEJV will immediately notify the Roads and Maritime Project Manager, Environmental Manager (or delegate) and the EPA (via the EPA environmental line) of any exceedance that has caused, is causing or is likely to cause, material harm to the environment. Roads and Maritime will notify the Secretary within 24 hours of notification of the event being provided to the EPA, as required by NSW-CoA A43. The notification will include the time, date and details of the incident and identify any non-compliance with the Infrastructure Approval.
GEJV will provide a written report of the event to the EPA within seven days of the date on which the event occurred. The report will identify:

- the cause, time and duration of the event
- the type, volume and concentration of every pollutant discharged as a result of the event
- the name, address and business hours telephone number of the GEJV personnel who witnessed the event
- the name, address and business hours telephone number of other witnesses to the event
- action taken by GEJV in relation to the event, including any follow-up contact with any complainants
- details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event and
- any other relevant matters.

The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by GEJV. GEJV will provide such further details to the EPA within the time specified in the request.

GEJV will also complete an incident form for submission to the Roads and Maritime Project Manager and Environmental Manager (or delegate) within three business days of the occurrence of the event.

Notification of incidents other than those relating to the POEO Act, will be provided to Secretary as soon as practicable and within 24 hours of the incident, in accordance with NSW-CoA A40.

Any notifications made under NSW-CoA 40 or 43 will also be provided to the Minister for DoEE.

7.4 EPL reporting

The GEJV Environmental Site Representative will prepare a summary of site discharge water quality monitoring results, including a statement of compliance with the relevant EPL conditions, and a summary of complaints received related to water quality and contamination issues, for inclusion in the annual EPL return. EPL annual returns will be submitted to the EPA within 60 days of the anniversary of the EPL for the duration of Construction.

7.5 Complaints management and reporting

Recording and reporting of complaints will be undertaken in accordance with the Complaints Management System for the Project (refer Section 5.5.3 of the CEMP).

GEJV will submit a report to the EPA that provides details of all complaints received in relation to Construction activities regulated by GEJV on the telephone complaints line or through any other means by 2:00 pm each business day. The report will:

- be submitted to the email address nominated by the EPA
- include a unique identifier number for each complainant
include date and time as reported by the complainant of the event that is the subject of the complaint

include an outline of the work or activity that is the subject of the complaint

any assessments required by the EPL conditions unless previously provided to the EPA, and details of how the requirements of these conditions have been met.

GEJV is not required to submit a report for any reporting period during which no complaints have been received.

8 Adaptive management

Should soil, water or contamination monitoring results directly attributable to the Project exceed the criteria set out in this MP (or the overarching MP – refer OACEMP Appendix B4 CSWMP), the following steps will be undertaken:

• analysis of the results by GEJV ESR, in consultation with GHD and Roads and Maritime Services, in more detail with a view of determining possible causes for the exceedance, including identifying the Project stage (or stages) responsible for the issue

• site inspection by the GEJV ESR

• advising relevant personnel of the problem

• identifying and agreeing on actions and/or additional mitigation measures to resolve or mitigate the exceedance

• implementing actions to rectify or mitigate the exceedance, including stop work arrangements where necessary or if directed by the ER

• identifying and implementing additional mitigation measures.

Where criteria are exceeded, GEJV (in consultation with GHD and Roads and Maritime Services if applicable) will identify the source of the exceedance and implement any additional measures available to reduce the impacts on the receiving environment. Mitigation measures and preventative / corrective actions will be developed in accordance with Roads and Maritime specifications and the procedure for dealing with non-compliance with environmental management controls outlined in Section 6.6 of the CEMP. GEJV will verify and document the effectiveness of any management measures or preventative / corrective actions implemented to avoid further exceedances.

GEJV will communicate regularly with other high risk construction sites within 500m of the site boundary to ensure plans are co-ordinated and cumulative soil and water quality impacts are minimised. The CCS provides details on the requirements for coordination and communication between the Construction Contractors working on the Project stages.

The timing for any improvement will be agreed between the Project Engineer / Superintendent and Roads and Maritime Project Manager and Environmental Manager (or delegate) based on the level of risk or reoccurrence of the exceedance (e.g. a significant risk will require immediate action).
Annexure B. Sediment Basin Management and Discharge Procedure

Purpose
Eleven sediment basins will be required for the initial Construction stages and another three to be reviewed by John Wright the Project Soil Conservationist during Construction. The purpose of this procedure is to detail the actions to be taken during the construction and maintenance of sediment basins, including the steps to be taken prior to any discharge, and the actions to be taken for water management in the sediment basins. This procedure will ensure that appropriate environmental protection measures are in place relating to sediment basins and construction water management. Implementation of this procedure will ensure that sediment basins are constructed and managed in accordance with relevant legislation, standards and best practice guidelines to minimise the potential impact of dewatering sediment basins and construction water to the local environment.

This Procedure has been developed in accordance with best practice guidelines such as Managing Urban Stormwater Soils and Construction (Landcom, 2004) and Roads and Maritime specifications.

In accordance with the overarching CSWMP, an EWMS is also required for construction and operation of sediment basins and/ or buffer swales and connecting drainage for the associated catchment area. EWMS will be submitted to Roads and Maritime at least twenty one working days prior to the construction of sediment basins and/ or buffer swales and connecting drainage in accordance with G36 cl 3.2 hold point.

Objective
The objectives of this procedure include:

- provide a clear methodology and criteria for water releases from the site
- implement industry standard methods for managing sediment basins and dewatering
- ensure that water discharges from site are compliant with:
  - the Project EPL
  - the OACEMP and this plan (CSWMP)
- Ensure compliance with the environmental requirements of the Project, including all legal requirements and contractual obligations.

Scope
This Plan applies to sediment basin management and maintenance and dewatering of construction water associated with the Project.

Location and construction of sediment basins
Sediment basins are located within the Project area and will be positioned to minimise clearing of threatened or endangered ecological communities. The location of sediment basins and their design detail (volume, length, width and depth) will be provided in the PESCPs. Fencing will be installed around each sediment basin to prevent entry by unauthorised people.

The Soil Conservationist will be consulted when designing basins to ensure the following criteria are met:

• Roads and Maritime Specification – G38 Soil and Water Management (Construction Soil and Water Management Plan)
• The OACEMP.

The ESR will submit design drawings to the Roads and Maritime Environmental Manager (or delegate) at least 14 working days prior to commencement of construction of each sediment basin and connecting drainage. It will include a supporting report that lists design parameters, including confirmation by the Soil Conservationist that sediment basin designs (and restoration and revegetation proposals) conform to the requirements.

GEJV will outline the methods for installation of sediment basins including connecting drainage and other water quality structures in each catchment or sub-catchment together with associated connecting stormwater drainage (temporary/permanent pipes and/or catch drains) and fencing prior to commencement of any Construction activities within the identified catchment for the basin. GEJV will detail how the design will direct runoff from each catchment to the sediment basins via stabilised controls such as catch drains.

All sediment basins and associated drainage will be installed and commissioned prior to the commencement of any clearing or grubbing works within the catchment area of the sediment basin that may cause sediment to leave the site.

Inlets, outlets and spillways will be constructed as soon as possible using rock filled woven galvanised steel mattresses laid on a needle punched, mechanically bonded, non-woven geotextile filter fabric. Rock filled mattresses and the geotextile will comply with Roads and Maritime specification R55 and R63 respectively.

**Water treatment**

The following procedure identifies the methods for treating sediment basin water if it does not meet the discharge criteria set out in the EPL. This include measures for treatment of pH, a flocculation procedure to manage TSS, and methods to remove hydrocarbons, metals or other pollutants. Water quality must meet the criteria set out in the EPL prior to discharge. The Licensed Discharge Points (LDP) in the approved EPL will be identified in the PESCPs.

Where flocculation is necessary to settle suspended sediments in the basins, gypsum will be applied as the flocculating agent to settle the sediments within 24 hours of the conclusion of each rain event causing runoff. An alternative flocculant may be used under approval of the Roads and Maritime Environmental Manager (or delegate) and Roads and Maritime Project Manager. Before applying a flocculating agent, the amount of the agent that is appropriate for the volume to be treated, the sediment type and the prevailing weather conditions will be determined.

All treatment chemicals will be stored in appropriately bunded and covered locations and all requirements of the Material Safety Data Sheets will be followed.

**Procedure**

See below.
Table 1 Sediment Basin Management and Discharge Procedure

<table>
<thead>
<tr>
<th>#</th>
<th>Sequence of Work Activities</th>
<th>Potential Hazards</th>
<th>Risk</th>
<th>Safeguards/Controls</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Provide training to personnel involved in sediment basin management/maintenance</td>
<td>Non-compliance with legislation requirements</td>
<td>Med</td>
<td>Toolbox field operators on the requirements of the EWMS for construction and operation of sediment basins. Provide specific training on basin management to ERSED personnel and persons authorised to discharge basins</td>
<td>Supervisor Project Engineer Site Engineer GEJV ESR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Project Engineer Site Engineer</td>
</tr>
<tr>
<td>2</td>
<td>Inspect sediment basin prior and after each rain event, if no rain evident, at least weekly</td>
<td>Non-compliance with project requirements</td>
<td>Med</td>
<td>Inspect for any maintenance requirements (e.g. any sign of damage/breach in the wall, excessive sediment accumulation)</td>
<td>Project Engineer Site Engineer</td>
</tr>
<tr>
<td>3</td>
<td>Test the quality of the water in the basin</td>
<td>Release of polluted water to the environment</td>
<td>Med</td>
<td>Select a safe, accessible sampling point. Ensure it is not too steep or slippery</td>
<td>GEJV ESR Project Engineer Site Engineer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Take a sample of water from just below the surface;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Less than 24 hours prior to a controlled discharge and daily for any continued controlled discharge and</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• When rainfall causes a discharge from a basin which has not been emptied within 5 business days of the cessation of a rainfall event.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Use the dewatering permit to record:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• The pH of water detained in the basin (measured using a pH probe – calibrated)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• The turbidity of the water (measured using the turbidity probe – calibrated)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• The presence of oil and grease (visual)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Note: turbidity (NTU) can only be used in place of total suspended solids (TSS) where a statistical correlation has been developed which identifies the relationship between NTU and TSS for water quality in the sediment basin/s before its use. The EPL discharge limit is 50mg/L TSS. If using NTU, the EPA must be notified of the method to enable the ongoing verification of the relationship between NTU and TSS</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Remove oil and grease</td>
<td>Release of polluted water to the environment</td>
<td>Low</td>
<td>Using an absorbent spill pad (or boom for larger quantities), remove any visible oil and grease from the surface of the water</td>
<td>GEJV ESR Supervisor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Dispose of the fabric in accordance with the manufacturers recommendations</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>In case of a large spill, allow for the basin to be pumped into a contaminated waste.</td>
<td></td>
</tr>
<tr>
<td>#</td>
<td>Sequence of Work</td>
<td>Activities</td>
<td>Potential Hazards</td>
<td>Risk</td>
<td>Safeguards/Controls</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>5</td>
<td>Flocculate the basin</td>
<td>Release of polluted water to the environment</td>
<td>Med</td>
<td></td>
<td>Removal truck and disposed of at an approved facility</td>
</tr>
</tbody>
</table>

Within 24 hours of the conclusion of each rain event causing runoff, flocculation will be required to meet the following:
- pH must be between 6.5-8.5
- Turbidity = correlation with 50 m/L TSS
- No visible hydrocarbon sheen

Apply gypsum by direct application and spread over the surface.
- Before applying a flocculating agent, the amount of the agent that is appropriate for the volume to be treated, the sediment type and the prevailing weather conditions will be determined.
- General guide for gypsum application is 30-50kg/100m³ of volume, however this will vary depending on the soil type.

Record the quantity of gypsum added to the basin and the time it was added
- Maintain a stock of gypsum and lime on site for use in basin management activities. Bulk flocculants will be covered and positioned within erosion and sediment controls away from areas with the potential for water runoff.

| 6 | Correct the pH | Change in the character of downstream receiving waters | High | If the measure pH was less than 6.5 add lime to the basin
- Approximate guide is 5-10kg/basin, however this will vary from basin to basin, lime to be added providing even coverage over the basin
- Re-test after lime application, giving the pH time to adjust
- Depending on size of basin and quantity of water held this will be after 2 hours
On the dewatering permit, record the quantity of lime added to the basin
Where pH is greater than 8.5, hydrochloric acid (HCL) should be added to the basin. A detailed methodology for application of HCL is provided in this procedure.
NB Personnel to be toolbox on safe use of HCL | Supervisor, Leading hand, Project Engineer, Site Engineer |
<table>
<thead>
<tr>
<th>#</th>
<th>Sequence of Work Activities</th>
<th>Potential Hazards</th>
<th>Risk</th>
<th>Safeguards/Controls</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Allow time for settlement</td>
<td>Release of turbid water to the environment</td>
<td>High</td>
<td>Allow approximately 24 hours for the solids contained in the water to settle. If rain is experienced during this time, it may be necessary to commence the process again starting at point 4 above. The water should appear ‘cleaner’ and less coloured if the settlement process has been effective.</td>
<td>Supervisor Leading hand</td>
</tr>
<tr>
<td>8</td>
<td>Re-test the basin</td>
<td>Release of polluted water to the environment</td>
<td>High</td>
<td>Determine the pH and turbidity levels of the basin. Record the results on the Water Quality Report Form.</td>
<td>GEJV ESR or delegated authority</td>
</tr>
<tr>
<td>9</td>
<td>Release the basin / reuse for dust suppression or watering of vegetation</td>
<td>Release of dirty water to the environment</td>
<td>High</td>
<td>Only the ESR or delegated authority is to authorise discharge. The discharge point will be checked to ensure there will be no scour or erosion when the water is released. Construction water that is to be discharged to land will be within the areas approved in the EPL and identified on a map. If using a siphon, charge siphon pipe and release end cap to draw water from basin to receiving environment. Pumps, if used for discharge, must include an attached float to prevent sediment being picked up during discharge. Turn on the pump and throttle down to allow slower release of water so as not to stir up sediment and cause erosion at the outlet. (only trained personnel to operate basin dewatering pumps) Water discharge from sediment basins will be supervised at all times. Basin dewatering will cease immediately if any negative environmental impact such as flooding, erosion or dirty water discharge is observed. Maintain a register of all basin discharges</td>
<td>Supervisor Leading hand</td>
</tr>
<tr>
<td>10</td>
<td>Undertake maintenance works</td>
<td>Failure of basin resulting in discharge of dirty water to environment</td>
<td>Low</td>
<td>If a maintenance issue is identified (See point 2 above), arrange for immediate rectification of the problem and record on the environmental inspection checklist.</td>
<td>Supervisor Leading hand</td>
</tr>
<tr>
<td>11</td>
<td>Remove accumulated sediment</td>
<td>Reduced capacity Overtopping resulting in discharge of stormwater to environment</td>
<td>Low</td>
<td>If sediment levels within the basin exceed 30% of the total capacity, arrange for removal. Removal will occur using an excavator with long enough reach to be able to excavate from the outside of the basin. Identify a suitable location for disposal of the sediment.</td>
<td>Supervisor Leading hand</td>
</tr>
</tbody>
</table>
### Maintenance of sediment basins

Sediment basins will be cleaned out and/or discharged whenever the accumulated sediment exceeds 60% of the sediment storage capacity. Accumulated sediment will be removed from sediment basins, drop inlets, inlet control banks and traps promptly in such a manner as not to damage the structures. The removed sediment will be disposed of in appropriate locations to avoid the sediment being conveyed back into the Construction area, into watercourses or off site.

GEJV will re-establish the stormwater capacity of sediment basins within five business days following the end of a rainfall event, or sooner if a major rainfall event substantially diminishes residual stormwater capacity. Sediment basin sizes, the design rainfall depths for each basin and basin discharge points will be identified on the scheduled premises map and discharge point plans that will be submitted to the EPA in compliance with the EPL.

Water may be re-used for dust suppression or discharging after appropriate treatment of the water so that it meets EPA requirements. The Contractors will re-use captured stormwater for Construction activities whenever possible.

Flocculants will be routinely added to sediment basins as a treatment measure to flocculate soil particles and reduce turbidity impacts on downstream waterways during discharge.

### Removal of sediment basins

Removal of sediment basins will occur in accordance with the EPL requirements following revegetation or stabilisation of upstream areas. GEJV will restore the area disturbed by sediment basins to its previous condition. The following restoration activities will be undertaken:

- removal of all redundant mattresses from the inlets and spillway/s and burial into the basin area, removed from site, or re-used as scour protection
- spreading and compaction of the embankment material into the basin area
- removal of access roads
- removal and appropriate disposal/reuse of sediment (including potentially contaminated sediment)
- compaction of the disturbed ground to at least the relative density of the material in the adjacent ground
The ESR will progressively update PESCPs to reflect the decommissioning of sediment basins.

**Induction/Training**

The relevant personnel will be trained and inducted on the management of basin discharge and the procedure. Only trained personnel will be authorised to test and discharge water from sediment basins.

The ESR or delegated authority is the only person to issue a ‘dewatering permit’ which allows water to be discharged out of the basin.

See Table 1 for detailed procedures on sediment basin management. A dosing method for lowering pH (where required) is also included in this procedure.

**Roles and responsibilities**

The ESR has overall responsibility for the establishment, management, monitoring and maintenance of erosion and sediment controls for the Project. The Environmental Site Representative is also responsible for ensuring that water quality criteria for discharge of sediment basin water are met prior to discharge. The Environmental Site Representative will ensure this procedure is effectively implemented and that all site personnel are aware of the requirements of this procedure.

The Soil Conservationist will review and conduct inspections of sediment basins and associated infrastructure and controls prior to their installation and throughout their operation.

The Superintendent will be advised of any maintenance or rectification required for sediment basins and will be responsible for ensuring the actions are undertaken.

**Inspection and monitoring**

The Soil Conservationist will undertake inspections of sediment basins and connecting drainage as minimum monthly and will prepare a report detailing findings from these inspections. The inspections will assess stability and potential erosion of the basin wall, spillway and inlet flume. They will also look at available sediment storage zone capacity. Each basin will have surveyed markers to indicate the available storage is not less than 30% of design volume, signage and safety controls. Issues identified in the inspection reports will be actioned and reported to the Roads and Maritime Environmental Manager (or delegate) and Roads and Maritime Project Manager within five working days. The Roads and Maritime Soil Conservationist will also carry out regular inspections of sediment basins.

Sediment basins and connecting drainage will be included in weekly inspections by the ESR. They will also be inspected one working day following a storm event, heavy or violent rainfall event, and prior to discharge.

Sediment basin maintenance would be required when physical damage or potential collapse of any part of the basin is observed. The removal of accumulated sediment will occur when ≥30% of the basin capacity is lost. Where level markers are damaged from sediment basin maintenance, the basins will be resurveyed to ensure design capacity is maintained.
Records

The ESR will maintain records of relevant data, including records of water quality management and water discharge. The ESR will maintain a Sediment Basin Discharge Register that includes accurate details of water sampling, including dates and times of sample collection, the sample collection location and name of the person that carried out the sample collection. Concentration levels of water sample analytes will be tabulated within the register.

A record will be maintained for each sediment basin discharge event on the dewatering permit (Annexure D) that will include water treatment (flocculation or chemical) details, water quality monitoring details and discharge locations and timing from the basin.

The ESR will report on site discharge monitoring results in the EPL monthly monitoring summaries which will be uploaded for public access on the Georgiou website. They will also be included in the Monthly Environmental Report which will be submitted to the Roads and Maritime Environmental Manager (or delegate) and Roads and Maritime Project Manager for review.

Toolbox – Sediment Basin Management and Maintenance

To operate effectively, protect the environment and comply with the site requirements, sediment basins require ongoing management and maintenance.

The management of a sediment basin involves:

- Inspecting the basin as a minimum, weekly during dry weather, one working day following a storm event, heavy or violent rainfall event, and prior to discharge.
- Testing the pH and turbidity.
- Treating the water.
- Testing the quality of the treated water in the basin to ensure the quality meets the criteria specified in EPL 21121.
- Releasing the treated water in a controlled manner.
- Maintenance of a sediment basin refers to:
  - Any repair work undertaken on the walls, spillway etc.
  - The removal of accumulated sediment to maintain capacity.
- The management of sediment basins is controlled under the Project requirements. The quality of water contained in a basin must meet the criteria specified in EPL 21121 before it can be discharged. Non-compliance with the EPL 21121 criteria can lead to fines being imposed on GEJV and individuals by the EPA.
- The sediment basin will be inspected following a rain event that generates runoff OR when greater than 10mm of rain is recorded in any 24 hour period.
- A wet weather inspection will be completed after each rainfall event and include each basin. The environmental inspection checklist is to be completed by the ESR or nominated delegate and will be used to prepare a report to the Roads and Maritime Environmental Manager (or delegate) and Roads and Maritime Project Manager.
- Select a safe, accessible sampling point located near the spillway and take a sample of water from a depth of approximately 30cm.
- Install a marker to identify the 5 day rainfall depth and settlement zone of the basin.
- Water quality parameters are pH, turbidity and a visual inspection for oil and grease.
- If pH is low it must be corrected with Lime prior to discharge.
- If pH is high neutralise with hydrochloric acid.
- If an oil or grease sheen is evident it must be skimmed off prior to discharge.
- If the total suspended solids (TSS) test results exceed 50mg/L the water is too dirty to release without additional flocculation.
- The approved flocculent for this project is gypsum.
• Only authorised personnel are permitted to release any basin and they need to have been toolboxed on the requirements of the EWMS for construction and operation of sediment basins by the ESR.
• If a maintenance issue is identified, arrange for immediate rectification of the problem by alerting the Superintendent.
• Install a 30% marker in the sediment basins for ease of reference

Hydrochloric Acid (HCL) Dosing Method

The following steps detail the procedure to follow when dosing the basins/pits with HCL.

1. Test water in basin/pit with pH meter.
2. If pH between 6.5 and 8.5, take no action.
3. If pH above 8.5, add HCL (32% muriatic acid).
4. Determine the volume of water in basin/pit (in m³, see table below)
5. Determine amount of acid required, by either;
   o Using dosing rate table below; or
   o Adding a known amount of acid (initially 0.04%) to a 10 litre sample of the basin/pit water until the pH reaches acceptable limits. Once the required percentage has been determined, calculate the actual amount of lime or acid to be added by multiplying the volume of water in the basin/pit by the determined percentage;
6. Add the required amount of acid to the basin/pit inlet to allow mixing as runoff flows into and around the basin.
7. Monitor pH level while dosing and record on Water Quality Report form.
8. Stop dosing once pH level drops below 7.

Table 2 HCL Dosing rate to lower PH by approximately 1.5 units

<table>
<thead>
<tr>
<th>ID</th>
<th>Capacity m³</th>
<th>Approx. HCL (L) to lower 1.5pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basin</td>
<td>1200</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>960</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>720</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>360</td>
<td>25</td>
</tr>
</tbody>
</table>

Safety Precautions

The following safety precautions must be taken when using HCL:

1. Suitable PPE must be worn, including at a minimum:
2. gloves;
3. eye protection;
4. dust mask; and
5. long sleeves/trousers
6. Dosing should be carried out by two people that have been toolboxed in this procedure.
7. HCL to be stored in designated secure bunded area.
8. HCL to be included on the Safety Data Sheet Register.
Annexure C. Dewatering of Site Excavations

Purpose
This procedure details the process for dewatering excavations and other water capture points in the Construction areas of the Project.

Scope
The dewatering of water capture points and general low points (including excavations on the alignment) is required to maintain capacity. This procedure does not specifically cover the dewatering of licensed discharge points from either permanent or temporary sediment basins. These are dealt with in the Sediment Basin Management and Discharge Procedure (Annexure B).

Induction/Training
All GEJV personnel are to be inducted on the existence of this procedure during the Project induction, and in more detail as required in site inductions and regular Toolbox Talks.

Procedure
Identifying Dewatering Points
This procedure relates to all water capture points not identified as discharge locations. This includes locations such as below ground excavations where groundwater or stormwater has been captured, or above groundwater capture points (e.g. depressions on the alignment).

Assessing Contamination
Potential contamination could be from numerous sources. The most likely sources will be Total Suspended Solids (TSS), oil and grease, pH, metals (in Acid Sulphate Soil (ASS) areas).
Where the main water source is from stormwater, TSS and oil and grease would be considered likely pollutants. Where groundwater is the main water source, influence from ASS in the form of pH and metals must be considered as potential pollutants.

Treating Contaminated Water
The treatment of contaminated water would be in accordance with the Sediment Basin Management and Discharge Procedure (Annexure B).
Where TSS treatment is required, transfer to the treatment basin shall occur first as solids will be stirred up during transport/pumping.
Dewatering

Any dewatering that results in offsite discharge must be from a licenced discharge point on the EPL. The water will be pumped/carted to the sediment basin (licenced discharge point) for treatment and offsite discharge in accordance with the Sediment Basin Management and Discharge Procedure (Annexure B). Alternatively it will be removed by water trucks and used for onsite dust suppression or fill conditioning, or removed from the site as liquid waste.
## Annexure D. Dewatering Permit

### A. General Information

<table>
<thead>
<tr>
<th>SEDIMENT BASIN NUMBER:</th>
<th>Checklist Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTHER DISCHARGE POINT (trench / excavation):</td>
<td>DATE:</td>
</tr>
<tr>
<td>Name of Operator:</td>
<td>Hours since last rain event:</td>
</tr>
<tr>
<td>last rainfall event (mm):</td>
<td></td>
</tr>
</tbody>
</table>

### B. Dewatering Requirements

<table>
<thead>
<tr>
<th>Can the water be reused on site for dust suppression or fill conditioning?</th>
<th>Comments &amp; any action required</th>
</tr>
</thead>
<tbody>
<tr>
<td>If answered NO to the relevant testing requirements complete Section D</td>
<td></td>
</tr>
</tbody>
</table>

| Does the water require direct discharge to ground as a concentrated flow or to a water course? | If yes, answer all 4 questions below |
|-----------------------------------------------------------------------------------------------|

### C. Testing Requirements (PER to carry out)

<table>
<thead>
<tr>
<th>1. Is the pH reading of the basin between 6.5-8.5pH?</th>
<th>Y/N</th>
<th>Result / Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Is the TSS reading of the basin less than 50mg/L?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. No signs of Oil/hydrocarbon sheen?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. If dewatering via a pump, has the inlet been floated to draw upon the clean surface waters?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- If answered YES to all the relevant testing requirements go to Section E for sign off
- If answered NO to the relevant testing requirements complete Section D

### D. TREATMENT

If answered NO to the relevant testing requirements

Follow with treatment and record the following details below

<table>
<thead>
<tr>
<th>Treatment Details</th>
<th>Volumes used (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What chemicals were used for treatment?</td>
<td>Gypsum or other Roads and Maritime approved Floc ________ L</td>
</tr>
<tr>
<td></td>
<td>hydrochloric acid ________ L</td>
</tr>
<tr>
<td></td>
<td>Ag Lime ________ L</td>
</tr>
</tbody>
</table>

### POST TREATMENT

After treatment has occurred and the basin been left to compensate for 24 -48hrs

Return to Section C and retest. If the test results pass complete section E for SIGN OFF.

### E. SIGN OFF

ESR (or delegated authority) to give approval for team to commence dewatering of basin / or extraction of water from unlicensed excavation and continually check/ monitor to ensure the conditions or water quality does not change.

ESR or delegated authority

Name: ...........................................  Signature: ...........................................  Date: ...............
Annexure E. Dam Dewatering Procedure

Purpose

Farm dams have been identified that require full or partial dewatering in order to construct the Project. This procedure outlines how dewatering activities will be managed to ensure that they meet the requirements of the CoA, EPL, management measures provided in the OACEMP, all relevant legislation and Roads and Maritime specifications. In addition to this procedure and EWMS has been developed for dewatering activities in accordance with RMS G36 cl 3.2.

Contract References

- NSW Environment Protection Authority EPL 21121
- Roads and Maritime Specification G1 Job Specific Requirements
- Roads and Maritime Specification R44 Earthworks
- Roads and Maritime G38 Soil and Water Management
- Roads and Maritime G36 Environment Protection

Hold Point

Specification G1 Clause 22.3 Dewatering activities

- At least 5 working days prior to the proposed date for commencement of Construction submit the procedure for all identified dewatering activities.

Specification G36 Clause 3.2.4 EWMS

- At least 21 working days prior to the proposed commencement of farm dewatering an EWMS must be submitted.

Dewatering Options

There are three possible options from the dewatering of the farm dams. They are listed below in order of preference:

1. Offer water required to be removed from dams on private property to the property owner in the first instance, this would involve transfer of the water to another farm dam with similar parameters. This keeps the water in the area and will supplement the farmer’s water and assist their water reserves in the current drought. The water quality would need to be equal or better than the receiving dam water in terms of NTU (TSS), and would need to be within 6.5 - 8.5 pH.
2. Reuse the water on site for Construction purposes for dust suppression and fill conditioning, thus reducing the Project reliance on potable water.
3. The least preferred option is to discharge the water off-site, after meeting the EPL discharge parameters. This option will require the discharge point to be licensed on the EPL and must be confirmed with the EPA.
Timing for dewatering

The Project program will identify the timing for dewatering the dams. Dewatering will need to occur before the commencement of bulk earthworks across the site to allow for connectivity between the cuts and fills. The removal of unsuitable and backfill should be done in a timely manner so the dams do not require another dewatering following rainfall.

Locations of Farm Dams

Table 1 provides the location chainage for the farm dams. The erosion and sediment control plan (PESCP) will include the locations of the farm dams to be dewatered with reference to the drawings identified in Table 1 and the location maps at the end of this procedure.

Table 1 Chainage of farm dams identified for dewatering (Reference G-001 Job Specification Table G1.2 - Existing Dams)

<table>
<thead>
<tr>
<th>Dam Number</th>
<th>Chainage</th>
<th>Approximate Surface Area m²</th>
<th>Fill</th>
<th>Road Embankment Height (m)</th>
<th>Dam Survey Drawing Reference</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>500</td>
<td>363</td>
<td>Total</td>
<td>0.0</td>
<td>17136Td&amp;I Dam1 (2).pdf</td>
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<tr>
<td>2</td>
<td>925</td>
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<td>Total</td>
<td>5.6</td>
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<tr>
<td>3</td>
<td>1225</td>
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<td>Total</td>
<td>2.3</td>
<td>17136Td&amp;I Dam3.pdf</td>
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<tr>
<td>4</td>
<td>1300</td>
<td>300</td>
<td>Total</td>
<td>1.8</td>
<td>17136Td&amp;I Dam4.pdf</td>
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<tr>
<td>5</td>
<td>2875</td>
<td></td>
<td>Partial</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>3325</td>
<td></td>
<td>Partial</td>
<td>-0.7</td>
<td>17136Td&amp;I Dam12.pdf</td>
</tr>
<tr>
<td>7</td>
<td>3625</td>
<td>800</td>
<td>Total</td>
<td>3.6</td>
<td>17136Td&amp;I Dam13.pdf</td>
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<tr>
<td>8</td>
<td>3750</td>
<td>1800</td>
<td>Total (including dam wall)</td>
<td>7.0</td>
<td>17136Td&amp;I Dam14 &amp; 15.pdf</td>
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<td>9</td>
<td>3800</td>
<td>800</td>
<td>Total</td>
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<td>17136Td&amp;I Dam16.pdf</td>
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<td>Partial</td>
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<td>Partial</td>
<td>5.4</td>
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<tr>
<td>12</td>
<td>5100</td>
<td>7400</td>
<td>Total (including dam wall)</td>
<td>8.5</td>
<td>17136Td&amp;I Dam19.pdf</td>
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</table>
Induction / Training

As per the CSWMP Annexure A - Construction Water, Soil and Contamination Monitoring Program all GEJV personnel responsible for water sampling and dewatering are to be inducted on the existence of this procedure during the Project induction, and in more detail as required in site inductions and regular Toolbox Talks.

Only the Environment Site Representative (ESR) or trained and approved staff will undertake monitoring and discharge activities.

Discharge Criteria

The EPA has issued an Environment Protection Licence (EPL 21121). The limits for discharge from LDPs are outlined in Table 2 below. If water is re-used onsite for dust suppression or applying moisture to condition fill, the discharge criteria does not apply.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Criteria</th>
<th>Sampling method</th>
<th>Analytical method</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6.5 –8.5</td>
<td>Probe</td>
<td>Field analysis and confirmed as required with laboratory assessment</td>
</tr>
<tr>
<td>Turbidity</td>
<td>TBA following correlation with TSS results</td>
<td>Grab Sample</td>
<td>Field analysis and confirmed as required with laboratory assessment, regularly updating correlations and having a factor of conservatism.</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>50 mg/L</td>
<td>Grab Sample</td>
<td>Laboratory analysis</td>
</tr>
<tr>
<td>Oil and Grease*</td>
<td>No visible</td>
<td>Visual inspection</td>
<td>Field analysis and confirmed as required with laboratory assessment</td>
</tr>
</tbody>
</table>

Assessing Contamination

Potential contamination could be from numerous sources. The most likely sources will be Total Suspended Solids (TSS), oil and grease, pH, metals (in Potential Acid Sulphate Soil (PASS) areas). The risk of PASS has been identified as low in the EIS.

Where the main water source is from stormwater, TSS and oil and grease would be considered likely pollutants. As the dams are receiving runoff from agricultural lands, there is also the likelihood that nutrients like phosphorous and nitrogen are at elevated levels.

Treating Contaminated Water

The treatment of contaminated water would be done by following the Sediment Basin Management and Discharge Procedure (Annexure B) and Table 1 Sediment Basin Management and Discharge Procedure provides the methods for discharge.
Where TSS treatment is required, transfer to the treatment basin shall occur first as solids will be stirred up during transport/pumping. Flocculation will also have the effect of lowering elevated nutrient levels in the dam water.

**Discharge Methods**

An approval to discharge through a *dewatering permit* is required to be authorised by the Environment Site Representative (ESR), this will include the method of pumping and the area for the receiving water. The ESR is to ensure that scouring will not occur to the receiving area and monitoring will take place during pumping. If scouring is observed the pumping will cease and the method will be revised.

Pump intakes will require screens to ensure native aquatic fauna are not harmed during the pumping process or pest species are not transferred during the pumping operations.

The pumping will cease when the water levels are reduced to 0.5m (i.e. below gumboot height) to allow safe access for the aquatic ecologist to commence aquatic fauna rescue.

The methods for discharge

1) Pump into a water cart using a flexi-drive pump or similar for reuse of water onsite.
2) Pump to neighbouring dam with a pump appropriate for the distance and receiving dam. This will be designed on a case by case basis and the pump methods will be approved by the Senior Project Engineer (SPE) for Earthworks and the ESR. Watercarts may be used for transfer to receiving dams. Note: this form of dewatering is subject to landholder consent and Roads and Maritime approval.
3) Syphon for low pressure dewatering to land when moving water to another dam directly downslope. Note: this form of dewatering is subject to landholder consent and Roads and Maritime approval.
4) Water may be pumped to an onsite sediment basin for dispersal on site for flocculation for reuse or offsite discharge, ensure there is no predicted rainfall and water to be removed prior to predicted rainfall.

**Aquatic Fauna capture**

The dam will be dewatered to a level that will allow safe access by the Aquatic Ecologist to conduct rescue of aquatic fauna. Dewatering will generally occur over a number of days to allow native fauna to relocate. The methodology followed by the aquatic ecologists is below, a work method statement will be submitted by the aquatic ecologist prior to dewatering activities for review and approval.

- Initial survey of the dams - Field observations and potential hazard identification.
- Trapping of native fauna - The use of floating traps to remove native turtles from the dams prior to dewatering
- Manual searching - Enter the dewatered dams on foot and search the silt manually for remaining fauna
- Surrounding vegetation - Manual searching of suitable cover; hollows, fallen timber, burrows, discarded tin etc.

Prior to aquatic fauna rescue the aquatic ecologist will provide to GEJV a more comprehensive EWMS providing greater details on how the rescue will be undertaken.

**Relocation of fauna**

The ecology team will nominate a suitable release site based on species and quantity of captured aquatic fauna. All details of aquatic fauna captured and relocated will be recorded in
a report after dam dewatering has occurred. Consent of the landholder will be required prior to the relocation into a dam or waterway outside of the Project boundary.

**Management of pest species and pathogens**

Gambusia holbrooki (Mosquito Fish) and other exotic aquatic life may inhabit the dams. Any pest non-native species will be euthanized, using methods advised by the aquatic ecologist.

Pathogens have not been identified in dams in the Project area. However, to minimise the spread of pathogens, all personnel undertaking in-water work will ensure that decontamination processes are followed in accordance with relevant guidelines. Equipment that comes in contact with dam water or potentially contaminated sediments, such as boots and vehicle tyres, will be cleaned with an appropriate cleaning solution and/or disinfectant. Disposable gloves will be worn when handling aquatic flora and fauna.

**Inspections and monitoring**

The following inspections and monitoring will occur during dam dewatering;

- Offsite dewatering activities will be supervised at all times by a person delegated by the ESR.
- The aquatic ecologist will conduct all aquatic fauna capture and relocation.
- The ESR will conduct daily inspections during all dam dewatering activities.

**Records**

The ESR will maintain the following records;

- Dewatering procedures
- date and time for each discharge at each location
- water quality test results for each discharge
- personnel approving the dewatering activities
- evidence of discharge monitoring, or risk assessment and mitigation measures used to eliminate the risks of pollution or erosion
- Any other EPA licence requirements where issued.
Location maps for dams to be dewatered

Figure 1 – Dam 1 (chainage 500)
Figure 2 – Dam 2 (chainage 925)

Figure 3 – Dam 3 (chainage 1225) and Dam 4 (chainage 1300)
Figure 4 – Dam 5 (chainage 2875)

Figure 5 – Dam 6 (chainage 3325)
Figure 6 – Dam 7 (chainage 3625), Dam 8 (chainage 3750; includes dam wall) and Dam 9 (chainage 3800)
Figure 7 – Dam 10 (chainage 4450)
Figure 8 – Dam 11 (chainage 4700)
Figure 9 – Dam 12 (chainage 5100)
Annexure F. Stockpile Management Protocol

Purpose

This Stockpile Management Protocol has been prepared to ensure that stockpiles are appropriately designed, established, operated and decommissioned to minimise impacts to the environment during Construction of the Project. This Protocol outlines the locational criteria used to guide the placement of temporary stockpiles and provides both standard and site-specific mitigation measures to be implemented to minimise impacts on the environment.

This Protocol has been developed in accordance with:

- Stockpile Management Guidelines (Roads and Maritime, 2015)
- Roads and Maritime specifications.

Scope

This protocol is relevant to the planning, placement and management of all stockpiles on or related to the Project. Stockpile sites may typically be required to store material including, but not limited to temporary storage of:

- excavated or delivered materials to be used in fill embankments and other design features
- excavated material unsuitable for reuse on the Project
- excess concrete, pavement, rock, soils and aggregate stored for potential reuse in the Project or prior to removal from site
- imported sands, soils, aggregates, recycled concrete products, topsoils, rock and engineered fills for use in the Project
- Topsoil, mulch, timber for landscaping and revegetation works.

Temporary stockpiles will be removed for re-use within the Project or disposed of off-site.

Stockpiles that are within the Construction footprint and are in place for less than 30 days are not subject to this Protocol. Stockpiles located outside of the Construction footprint are deemed to be ancillary facilities. The stockpile will be detailed in the Ancillary Facilities Management Plan and subject to approval by the Secretary.

Potential contaminated soil or other material will be managed in accordance with the Unexpected Discovery of Contaminated Land Procedure (refer Appendix B8 of the CEMP).

The process for managing spoil, including details of how excavated material will be managed on-site is detailed within the Spoil Management Strategy (Annexure G of this CSWMP). Where material is taken off-site (such as to a landfill facility), appropriate approvals will be confirmed and/or obtained under the EP&A Act 1979 and POEO Act 1997 (refer to the Construction Waste and Energy Management Plan (Appendix B7 of the CEMP)).
Stockpile location criteria

Stockpiles on the Project will be located according to the following criteria:

- outside of the tree protection zone of trees or native vegetation identified for retention
- on land that does not require the removal of threatened species, Endangered Ecological Communities or roosting habitat for listed threatened fauna species or native vegetation clearing beyond what is already required for the Project
- at least 50 m from likely areas of concentrated water flows
- At least 10 m from waterways that are classified as Class 1 and Class 2 from the DPI Fisheries guideline “Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings”
- so that any slump of the stockpile will not affect erosion and sediment control measures or infringe specified minimum clearance requirements
- to ensure no cross contamination of contaminated materials with non-contaminated materials
- in areas of low heritage conservation significance (including identified Aboriginal cultural value) and not impact on heritage sites beyond those already impacted by the Project
- a suitable distance from sensitive noise and vibration receivers to minimise disruption
- so that the appropriate erosion and sediment control measures can be installed and will operate effectively
- readily accessible via the Project or road network
- to minimise the need for heavy vehicles to travel on local roads
- on relatively level land
- on land above 20 year ARI flood levels
- within an identified Construction compound
- outside of utility easement corridors
- Within the approved EPL boundary.

All proposed stockpiles will be assessed in accordance with the criteria listed above.

Stockpile location approval

Prior to the establishment of any stockpile on Site as part of the Project, GEJV will detail how the stockpile site meets each of the criteria above. Before establishing a new stockpile site, GEJV will consider whether any existing stockpile site in the vicinity can be used. GEJV will undertake an advanced contamination assessment prior to disturbance of any land being or intended to be used for the location of stockpiles. The proposed locations and maximum dimensions of the proposed stockpiles will be detailed on the relevant PESCP and submitted to the Roads and Maritime Environmental Manager (or delegate) and the Roads and Maritime Project Manager for concurrence at least 10 working days before stockpiling is due to commence.

Stockpile sites will be clearly signposted to identify their locations on the Construction site.

Stockpile management

The type of environmental controls required for stockpile management will depend on the location, surrounding environment and material being stored at the stockpile site. The environmental controls for a particular stockpile site may change during Construction depending on the type of material being stored at any particular time. The mitigation measures will be implemented prior to establishment of stockpiles by the Superintendent in consultation with the ESR. Any change in use will be reflected where required in the PESCP and the Stockpile Register.
Site-specific mitigation measures, where they are necessary to further reduce impacts, will be detailed in the PESCP. Mitigation measures for each stockpile site will include as a minimum:

- an Erosion and Sediment Control Plan including:
  - delineation of the perimeter of the stockpile with a bund, fencing or barrier
  - erosion and sedimentation controls to be erected between the stockpile site and any drainage lines or down-slope areas
  - temporary sediment basins
  - covers, or other erosion protections for stockpiles that will be in place for more than 20 days as well as any temporary stockpiles that are susceptible to wind or water erosion, within 5 days of forming each stockpile
  - diversion of stockpile run-off through sediment traps and into pits and the stormwater drainage system
  - water diversion bunds

- keep stockpile heights to no greater than 2 m and slopes to no steeper than 2:1
- dust management measures (including for vehicle movements associated with stockpiling activities) will be implemented in accordance with the requirements of the Construction Air Quality Management Plan
- monitoring of odours and odour control measures
- notification of residents within 200 m of stockpiles, the potential impact from constructing the stockpile (including visual and odour impacts) and proposed mitigation measures. If residents are dissatisfied with the proposed mitigation measures, the stockpile location or associated mitigation measures will be reviewed
- exit points from stockpile areas will be stabilised and include rumble pads to prevent mud tracking
- provide large, clearly legible signs placed and maintained on each stockpile, stating contents and date of stockpiling
- progressively rehabilitate stockpile sites in accordance with Roads and Maritime Specification R178
- avoid locating stockpile weed contaminated topsoil or other contaminated materials adjacent to areas of native vegetation.

**Mulch stockpiles**

Mulch will be stockpiled and composted prior to use in order to reduce the effects of nitrogen drawdown and in order to leach tannins. Minimum stockpiling times vary depending on species from which the mulch is derived (typically six months). Mulch stockpiles will be monitored and turned over as required to avoid spontaneous combustion.

Mulch stockpiles will not be located close to creeks or tributaries and will be bunded or positioned to drain into a sediment basin. Mulch stockpiles in high tannin generating vegetation will:

- mulch stockpiles should be established on elevated ground where possible
- be located 50 m from waterways, for mulch stockpiles that will be in place for duration of more than 1 month
- be located 20 m from waterways, for mulch stockpiles that will be in place for duration of less than 1 month
- Be fully bunded to ensure up-gradient water is prevented from entering the stockpile site, and to capture tannin impacted water. Bunds will be impervious and 300 mm high at a minimum. All bunded stockpiles that are in place for a period longer than one month will include a lined discharge point for overflow in extreme rainfall events
be managed in accordance with all other requirements specified in the Management of Tannins from Vegetation Mulch Procedure (refer Annexure H of this CSWMP).

Topsoil stockpiles

GEJV will comply with the following measures in regard to topsoil stockpiles:

- prior to stockpiling topsoil, the ESR will carry out a survey in accordance with Roads and Maritime Specification G71 to determine the surface levels at each stockpile area
- stripped topsoil will be sieved and any lumps of clay, weeds and other deleterious material will be removed prior to adding to any stockpile
- topsoil that is not contaminated by noxious weeds will be kept in stockpiles for later spreading on fill batters and other areas. Other material may also be stockpiled but kept separated from the topsoil stockpiles
- topsoil stockpiles will:
  - be free from weeds, subsoil, other excavated materials, contaminated materials (including asbestos), refuse, clay lumps and stones, timber or other rubbish
  - be managed to ensure no growth of weeds
  - be trimmed to a regular shape to facilitate measuring with a height not exceeding 2 m and batter slopes not steeper than 2:1
  - have their batters track rolled or stabilised by other means
  - seeded in accordance with Roads and Maritime Specification R178, to encourage vegetation cover
  - be less than 1,000 m³ each.

GEJV will carry out tests on the stockpiled topsoil using a NATA accredited testing laboratory to ascertain its suitability for use in revegetation works and to determine soil chemistry revegetation constraints, soil amelioration and spreading requirements. GEJV will use only stockpiled topsoil suitable for use in revegetation works as topsoil. Topsoil handling and stockpile contamination risk will be managed to ensure the success of the vegetation.

Sand Stockpiles

If sand is required to be imported and stockpiled in the corridor for Construction purposes, the following will be implemented:

- it will be located 50 m from waterways on high ground
- divert surface water runoff away from sand stockpile
- erosion and sedimentation controls will be erected between the stockpile site and any drainage lines or down-slope areas

Stockpile Register

Approved stockpile locations will be included on PESCPs or relevant site plans. The GEJV ESR will maintain a record of stockpile locations in the Stockpile Register provided in this Protocol. The Stockpile Register will also include the purpose of the stockpile, the type and quantity of material contained, timing for establishment and removal. The ESR is responsible for developing and maintaining the register and it will be provided to Roads and Maritime when requested.
## GEJV Stockpile Register

<table>
<thead>
<tr>
<th>Date / dates Stockpile Established</th>
<th>Location Chainage L or R</th>
<th>Material Type (i.e. Topsoil, Spoil, mulch &amp; Contaminated Land)</th>
<th>Approx Volume m³</th>
<th>ERSED Plan Reference</th>
<th>Stabilisation if greater than 20 days</th>
<th>Date/dates Removed</th>
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</thead>
<tbody>
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</tbody>
</table>
Decommissioning of stockpile sites

Decommissioning of stockpile sites after use will be conducted to reinstate the stockpile site to its previous natural condition. Stockpile sites will be progressively rehabilitated in accordance with Roads and Maritime Specification R178. Decommissioning and rehabilitation of stockpile sites will involve the following activities:

- clearing all stockpile material from the site and recycling or disposing of it at a licensed facility
- stabilising the site by planting and/or landscaping the site
- removing control measures such as erosion and sedimentation devices once the stabilisation has occurred
- undertaking an inspection of the site
- notifying the Roads and Maritime Environmental Manager (or delegate) that the stockpile site has been removed
- updating records in the Stockpile Register.

**Inspection, monitoring and reporting**

Compliance with this Protocol will be tracked through weekly environmental inspections of stockpile sites by the ESR. Inspections will monitor the effectiveness of the control measures and ensure the environmental impacts of stockpiles are minimised. The checklist of items to be inspected will include general condition of surrounding environment, erosion and sedimentation control devices, pits and catch drains, bunding, fencing, stockpile height and condition (evidence of weeds, odour, litter etc).

Identified non-compliances will be reported to the Roads and Maritime Environmental Manager (or delegate) and the appropriate management measures will be put in place to ensure ongoing compliance.

**Induction / training**

Personnel involved in planning or managing stockpiles will be trained in the requirements of this Protocol. Training will also include inductions, toolbox talks, pre-starts and targeted training as required.

**Roles and responsibilities**

The Environmental Site Representative (ESR) has overall responsibility for the establishment, management, monitoring and maintenance of stockpiles. The ESR will ensure this Protocol is effectively implemented and that all site personnel are aware of the requirements of this Protocol.

The Soil Conservationist will advise on the location and management of stockpiles during Construction.

The Superintendent will be advised of any maintenance or rectification works required for stockpiles and will be responsible for ensuring the actions are undertaken.

**Review**

This Protocol will be reviewed by the ESR as a minimum annually as a part of the CEMP review.

The processes described in Section 6.8 of the CEMP may result in the need to update or revise this protocol. This will occur as needed.
Annexure G. Spoil Management Strategy
# Contents

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1.2 Scope  

2 Induction and Training  

3 Aspects and Impacts  
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3.2 Impacts  

4 Spoil and Fill Information  
4.1 Material types  
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4.3 Virgin Excavated Natural Material (VENM)  
4.4 Excavated Natural Material (ENM)  

5 Spoil Reuse  
5.1 Soil  
5.2 Other spoil materials  

6 On-site Spoil Management  

7 Spoil Disposal  

8 Spoil Transport  
8.1 Spoil management hierarchy  

9 Record Keeping
1. Introduction

1.1 Purpose

This Strategy details the requirements for the planning, locations, types and handling of spoil and fill on the Project. The objectives of this procedure are to:

- Identify spoil and fill issues potentially arising from the Project.
- Present processes for spoil and fill material handling, transportation and movement, stockpiling, reuse and disposal to protect the environment and maximise the reuse of earthen materials generated on site.
- Identify and describe measures to be implemented relating to spoil and fill activities that may impact on air quality, sedimentation, contamination, noise and local amenity.

1.2 Scope

Spoil is defined as being surplus excavated material.

This Strategy addresses and details the following issues:

- Excavation, handling, haulage, disposal and reuse methodology, in accordance with the Stockpile Management Protocol (Annexure F);
- Processes and procedures that will be used for the management of spoil, including those for Virgin Excavated Natural Material (VENM), Excavated Natural Material (ENM), contaminated and unsuitable material;
- Measures that will be implemented to both reduce spoil quantities and maximise the beneficial reuse of spoil that will be generated during the performance of the works;
- Nominated quantities for reuse of spoil within the Construction site, for beneficial reuse of spoil off site and for spoil disposal; and
- Processes and procedures for the management of the environmental and impacts of spoil transfer and reuse.

2. Induction and Training

All GEJV personnel are to be inducted on the existence of this Strategy during the Project induction, and in more detail as required in site inductions and regular Toolbox Talks.

3. Aspects and Impacts

3.1 Aspects

The key aspects of the Project that could result in the generation and management of spoil and fill materials are:

- Clearing of vegetation;
- Stripping of topsoil;
- Excavation of earthen material;
- Import and transport of earthen material;
• Storage/stockpiling of spoil, topsoil and mulch;
• Reuse of spoil, topsoil and mulch
• Excavated road materials (e.g. asphalt, concrete)
• Establishment of ancillary facilities and compounds
• Sediment basin construction
• Disposal of sediment.

3.2 Potential Impacts
The potential spoil and fill impacts that may occur during Construction include:
• Water pollution due to sediment runoff from spoil excavation and excess spoil storage.
• Weed infestation from dispersion of seeds.
• Air pollution due to dust generated from stockpiles.
• Flora and fauna impacts due to sediment runoff from spoil excavation.
• Water, soil and air pollution from inappropriate storage, handling and disposal of spoil.
• Mud-tracking during haulage operations.
• Impact on traffic due to spoil transport
• Noise and vibration
• Odour
• Potential to encounter and/or transfer contaminated material
• Generate non-reusable waste
• Visual impacts.

4. Spoil Types
Although the Project would require the importation of fill material, the excess spoil would be generated including from the following sources:
• Soils – This includes topsoil and natural B horizon soils (i.e. soils between the topsoil and underlying bedrock).
• Fill material – This includes imported soils and other material that has been used for infilling (e.g. old concrete, wood).
• Natural rock – This material would be generated from excavation of bedrock if required
• Road construction material – This would include material generated from the demolition of the existing roads such as asphalt, geotechnically stabilised road sub-base and base material.

4.1 Spoil Classification
Spoil generated during the Construction of the Project will firstly (preferably before excavation) be assessed against the requirements for Virgin Excavated Natural Material (VENM) detailed within the Protection of the Environment Operations Act 1997 (POEO Act).
If the material is not deemed to be VENM an assessment of the suitability of any current general resource recovery exemptions issued under the Protection of the Environment Operations (Waste) Regulation 2014 will be undertaken. Current general resource recovery exemptions that may apply to the Project are:

- The excavated natural material exemption 2014
- The excavated public road material exemption 2014

Spoil that cannot be re-used under any of the exemptions stated above, or classified as VENM will require waste classification in accordance with the *Waste Classification Guidelines: Part 1 Classifying Waste* (EPA, 2014) prior to offsite disposal at an appropriately licensed facility.

### 4.2 Virgin Excavated Natural Material (VENM)

Natural rock or soils produced from excavation work is expected to be classified as VENM and will be classified in accordance with the *Waste Classification Guidelines: Part 1 Classifying Waste* (EPA 2014). Virgin excavated natural material means natural material (such as clay, gravel, sand, soil or rock fines):

- That has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial, mining or agricultural activities
- That does not contain sulfidic ores or soils, or any other waste, and includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a public notice published in the NSW Government Gazette.

The GEJV ESR will consider the following four questions when classifying material as VENM:

- Are manufactured chemicals or process residues present?
- Are sulfidic ores or soil present?
- Are naturally occurring asbestos soils present?
- Is there any other waste present?

If material meets the definition of VENM it can be reused on or offsite without prior testing. However, if there is any doubt as to whether the material is VENM, GEJV will sample and test the material as per the excavated natural material resource recovery exemption to confirm that the material is free of contaminants.

### 4.3 Excavated Natural Material (ENM)

If spoil is unable to be classified as VENM it will be sampled, and tested to determine whether it meets the excavated natural material (ENM) classification criteria in accordance with the *Protection of the Environment Operations (Waste) Regulation 2014* (the Regulation) current general resource recovery exemption, the excavated natural material exemption 2014:
Excavated natural material (ENM) means naturally occurring rock or soil (including but not limited to materials such as sandstone, shale, clay and soil) that has:

a) Been excavated from the ground, and

b) Contains at least 98% by weight natural material, and

c) Does not meet the definition of Virgin Excavated Natural Material in the Act

ENM does not include material that has been processed or contains acid sulphate soils or potentially acid sulphate soils.

All other wastes shall be managed in accordance with the Construction Waste and Energy Management Sub Plan (CWEMP) (Appendix B7 of the CEMP).

Other spoil types are referenced in Annexure F - Stockpile Management Protocol.

4.4 Volumes of Spoil

The below table highlights the volumes expected to be encountered over the duration of the Project.

Table 1 Spoil Volumes

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Expected volume (Approx)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VENM / ENM (cut to fill surplus)</td>
<td>26,000 m³</td>
</tr>
<tr>
<td>Mulch</td>
<td>2870 m³</td>
</tr>
<tr>
<td>Topsoil (to be reused at this stage)</td>
<td>101,750 m³</td>
</tr>
<tr>
<td>Topsoil (deemed to be excess at this stage)</td>
<td>30,000 m³</td>
</tr>
<tr>
<td>Contaminated Material</td>
<td>10,000 m³</td>
</tr>
</tbody>
</table>

5. Spoil Reuse

5.1 Soil

Stockpiling of topsoil will be undertaken separately to maximise recycling / reuse potential in landscaping and rehabilitation works. Where topsoil is deemed surplus to requirements then it will be removed off site for reuse on other projects or sent to recycling facilities.

5.2 Other Spoil Materials

All other excess spoil materials would be likely to be geotechnically unsuitable for road construction or unsuitable for landscaping. If this material cannot be reused in fill embankments it would likely be classified as General Solid Waste (non-putrescible) and would be disposed of at an appropriately licensed landfill.
6. Management Measures

The management of stockpiles will be in accordance with Annexure F Stockpile Management Protocol in this CSWMP.

Dust and erosion and sediment control measures will be implemented as required to minimise air and water quality impacts as per the Construction Air Quality Management Sub Plan (CAQMP) (refer Appendix B6 of this CEMP) and this CSWMP.

Management measures to minimise impacts to flora and fauna are detailed in the Construction Flora and Fauna Management Sub Plan (CFFMP) (refer Appendix B2 of this CEMP).

7. Spoil Disposal

Given the limited area with regard to stockpiling excavated material on site and the predicted geotechnically unsuitable nature of some of the materials, it is necessary to identify measures for spoil disposal.

Waste (and spoil) disposal will to be in accordance with the Protection of the Environment Operations Act 1997 and the Waste Avoidance and Resource Recovery Act 2001. Wastes that are unable to be reused or recycled will be disposed of offsite to an EPA approved waste management facility following classification. Details of waste types, volumes and destinations are recorded in the CWEMP (Appendix B7 of the CEMP).

Prior to transporting wastes to a place that is not owned by Roads and Maritime and is not a licensed waste facility, GEJV must submit to the Roads and Maritime Environmental Manager (or delegate) a completed and signed notice under Section 143(3A) of the POEO Act (“s.143 Notice”). This includes waste transported for reuse, recycling, and disposal or stockpiling. Waste in this context means any surplus material and includes spoil, Virgin Excavated Natural Material (“VENM”), Excavated Natural Material (“ENM”), crushed rock, reclaimed asphalt pavement, mulched vegetation, waste concrete, etc. All proposed waste re-use options must comply with the POEO Act and associated regulations.

Further details, including the steps to be taken to obtain the “s.143 Notice” from the landholder, and the template (or proforma) letter to the landholder, can be found in Roads and Maritime Environment Technical Direction ETD 2015/020 “Legal offsite disposal of Roads and Maritime Services waste”.

This process is a hold point under Roads and Maritime specification G36, cl 4.11.4. The hold point submission requirement is the completed and signed original copy of “s.143 Notice” received from the landholder receiving the waste with evidence that the Waste Site has the appropriate planning consent.

Approved waste management facilities located in the vicinity of the Project include (but are not limited to) those detailed in Annexure A of the CWEMP. Prior to disposing of waste at a facility, the license details of the facility will be confirmed to ensure compliance.

8. Spoil Transport

Spoil will be transported by registered road trucks. Spoil haulage routes will be as those assessed in the EIS to minimise impacts to sensitive receivers, the travelling public, and the local community whilst meeting compliance with road traffic rules in relation to vehicle length and weight limits. Refer to the Construction Traffic Management Plan (CTMP) (Appendix B1 of this CEMP) for details of haulage routes.
Heavy vehicle movements to and from and within (where applicable) the Project will be via The Northern Road and the M4 Western Motorway, as well as via Elizabeth Drive and the M7 Motorway. The Project will minimise the impact of haulage movement noise on local roads by restricting spoil haulage on local roads, however there are some instances where the Project has identified a need for heavy vehicles, including spoil haulage trucks, to utilise local roads in the vicinity of the Project. These routes may include Eaton Road, Willowdene Avenue and Vicar Park Lane. The use of local roads will be restricted to those assessed in the EIS and as detailed in the CTMP.

In accordance with the spoil management hierarchy, GEJV will work with local councils to identify spoil reuse opportunities where feasible.

The Project aims to maximise haulage movements during standard construction hours, thereby minimising potential noise impacts from night time spoil activities Out Of Hours Works (OOHW) activities. GEJV will program its night time spoil haulage on public roads with the aim to minimise any increase in road traffic noise levels by maximising haulage during day and evening periods. Mitigation measures described in the Out of Hours Works Procedure found in Annexure B of the Construction Noise and Vibration Management Sub Plan (refer Appendix B3 of this CEMP) are also be implemented.

### 8.1 Spoil Management Hierarchy

The management of spoil generated from the Project will be guided by the hierarchy detailed in Table 2 below.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Control Measure</th>
<th>Implementation Example</th>
<th>Potential to implement on Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Avoid and reduce spoil generation</td>
<td>▪ Reduce the amount of spoil being generated through design and construction methodology.</td>
<td>Limited</td>
</tr>
</tbody>
</table>
| 2    | Reuse within Project | ▪ Reuse in the Project to fill embankments and mounds within short haulage distance of source.  
▪ Restoration of any pre-existing contaminated sites within the Project boundaries.  
▪ Reuse as a feed product in Construction materials (e.g. concrete). | Preferred but dependant on area available for stockpiling |
| 3    | Reuse for environmental works | ▪ Reuse in revegetation and rehabilitation projects  
▪ Rising water table/salinity remediation works  
▪ Reuse in flood mitigation works | Preferred as stockpiling on site is restricted |
<p>| 4    | Reuse on other development projects | ▪ Reuse for fill embankments and mounds on projects within an economic transport distance from site. | Preferred as stockpiling on site is restricted |</p>
<table>
<thead>
<tr>
<th>Rank</th>
<th>Control Measure</th>
<th>Implementation Example</th>
<th>Potential to implement on Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Reuse for land restoration</td>
<td>▪ Reuse for land reclamation or remediation works&lt;br&gt;▪ Reuse to fill disused facilities, e.g. mines and quarries, to enable ecological rehabilitation or other ecologically beneficial end use.</td>
<td>Preferred as stockpiling on site is restricted</td>
</tr>
<tr>
<td>6</td>
<td>Reuse for landfill management</td>
<td>▪ Reuse to cap completed landfill cells&lt;br&gt;▪ Reuse in daily covering of landfill waste</td>
<td>Limited</td>
</tr>
<tr>
<td>7</td>
<td>Dispose offsite as waste</td>
<td>▪ Disposal of excess spoil as waste at an approved facility licensed to receive that material</td>
<td>Potential but not preferred</td>
</tr>
</tbody>
</table>

9. Record keeping and Reporting
Records of imported or exported material will be kept including, tips sheets, purchasing or other imported fill records and any documentation required to dispose material off site as detailed in the CWEMP.

Records will be kept up to date by Engineers and the GEJV ESR. Any Section 143 certificates will be completed and retained for any material to be disposed of or stored temporarily outside the Project boundary. All offsite disposal of spoil at an appropriately licensed facility will be recorded in the Annexure A of the CWEMP.

All reporting will be completed in accordance with section 8.9 of this CSWMP.

10. Corrective Actions
All corrective actions will be managed in accordance with the GEJV CEMP section 6.6.
Annexure H Roads and Maritime Environmental Direction 25: Management of Tannins from Vegetation Mulch
ENVIRONMENTAL DIRECTION
Management of Tannins from Vegetation Mulch

JANUARY 2012
ABOUT THIS RELEASE

<table>
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<td>Environment Branch (Environmental Policy)</td>
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<td>Final draft</td>
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<td>2</td>
<td>January 2012</td>
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1 PURPOSE

The purpose of this environmental direction is to set RMS’s minimum management measures to minimise the generation and discharge of tannins from vegetation mulch on Roads and Maritime Services (RMS) construction projects. Additional background information on tannins and the use of mulch on construction sites is included in section 3 of this direction.

2 MANAGEMENT MEASURES

The primary focus must be to minimise tannin generation on construction sites.

2.1 General mulch management measures

These general mulch management measures are to be followed for all RMS construction projects.

2.1.1 Planning and works staging

The first step in planning and works staging is to identify the amount of mulch to be generated. With this information, a strategy can be prepared to manage mulch on site. Staging of chipping, tub grinding and/or mulching activities should be planned to reduce the volume of mulch to be managed at any one time. The volume of excess mulch can then be assessed and plans made to dispose of this off site.

Other general considerations at the planning and works staging phase are as follows:

- Mulch stockpile sites should be established with appropriate controls in place before the main site clearing activities commence. Limited clearing may be required earlier for establishment of stockpile areas and access.
- Stage the mulching of cleared vegetation to ensure that mulch can be progressively moved to elevated, or otherwise suitable, stockpile locations. It is preferred that mulch should be transferred to a stockpile or reused on the day of mulching.
- Plan to efficiently reuse mulch in progressive works to reduce the time that mulch is concentrated in stockpile locations.
- Excess mulch can be managed by community giveaway. This takes considerable time and mulch needs to be suitably located and managed as this occurs. The conditions for community giveaway of mulch are included as Appendix 3.
- Any other form of bulk offsite mulch disposal (eg to Council parkland or a development site) must be assessed to ensure waste management provisions are adhered to for off site disposal.

2.1.2 Stockpile location and management

- Mulch stockpile sites should be established on elevated ground where possible.
- Stockpile sites with a duration of not more than 1 month should be constructed not less than 20 metres from a watercourse, including floodplains.
- Stockpile sites with a duration of more than 1 month should be constructed not less than 50 metres from a watercourse, including floodplains.
- Mulch stockpiles should be designed and constructed to divert upgradient water to prevent it from entering the stockpile site.
2.1.3 Management measures for the use of mulch on site

- Do not use mulch for surface cover or sedimentation controls in any low lying areas of the site that remain consistently wet. Alternative controls such as geofabric (for surface protection) or sediment fence will be required in these areas.
- Do not spread surface mulch in thicker than 100mm layers. Mixing mulch with topsoil is encouraged for batters to prevent loss of topsoil during initial stabilisation. It should be noted that mulch will generally cause nitrogen draw down which may inhibit plant growth, unless mulch has been composted first.
- Care is to be taken to ensure that excessive mulch is not applied for sedimentation controls such as perimeter bunds or catch dams.

2.1.4 Monitoring and response

- Monitor the site for generation of tannins. Tannin impacts can be readily identified visually as dark coloured ponded water. Site staff should be trained to identify and report potential impacts to the site project management or environment staff.
- Review management practices where required to prevent the generation of tannins in identified problem areas.

2.2 Mulch management methods for high risk sites

2.2.1 High risk sites

High risk sites, where additional management measures may be required, include:
- where large quantities of mulch will be generated and stockpiled.
- where high tannin generating vegetation types are to be mulched (see 3.1).
- where the receiving environment is identified as sensitive (eg Marine Park, threatened aquatic species habitat).
- where tannins have been observed to be generated or discharged from an operating site with standard management controls.

2.2.2 Stockpile management measures for high risk sites

- Mulch stockpiles for high tannin generating vegetation types should incorporate an impermeable bund to capture stockpile leachate or tannin impacted water. Impervious bunds must be a minimum of 300 mm high, preferably higher to capture tannin impacted water. All bunded stockpiles that are in place for a period longer than one month must include a lined discharge point for overflow in extreme rainfall events.
- Stockpiles established on sloping sites must be designed to provide temporary stormwater containment equivalent to a 300 mm minimum height bund on a flat site.
- Tannin impacted water should be pumped out of bunded stockpiles within 5 days of the end of a rainfall event to maintain the storage capacity. This water should be used for on site purposes including dust suppression and landscape watering. These activities must be managed to prevent any pooling or runoff of tannin impacted water.
- Bunded stockpiles must be inspected within 24 hours of cessation of any rainfall event greater than 10mm to ensure tannin impacted water does not overflow.

2.3 Site management procedures

Site management procedures must be prepared for all sites where tannins are identified as a potential issue. Site management procedures should be based on the management measures provided in this Environmental Direction.
3 BACKGROUND

3.1 Tannin generation from vegetation mulch

See Plates 1 – 3 in Appendix 1.

Tannins are naturally occurring plant compounds. Tannin generation from vegetation mulch is likely to be highest from low-lying coastal floodplain areas. The species of vegetation (e.g. *Melaleuca*) will have a major impact on the likelihood of tannin generation.

Tannin generation is generally highest from mulched vegetation that is stockpiled in areas that are subject to inundation. Placement in wet areas will result in accelerated leaching of tannins into water, concentration of tannins in pooled water, and greater impacts on water quality.

3.2 Tannin impacts on water quality

See Plates 4 – 5 in Appendix 1.

The main concern with the discharge of water that is high in tannins is that it may increase the biological oxygen demand (BOD) of the receiving environment. Increases in BOD may result in a decrease in available dissolved oxygen. A lack of dissolved oxygen is identified as the main cause of about 80 percent of fish kills in NSW rivers and estuaries.

Tannin impacts may result in dark coloured water discharge from construction sites. This impact can be obvious and may raise the concern of the community and other stakeholders including regulatory authorities. Once discharged to the environment, tannins may reduce visibility and light penetration and change the pH of receiving waters. These impacts may affect aquatic ecosystems in receiving environments.

Tannins cannot be readily treated with standard construction site water quality controls. Once water on site is impacted with tannins it is not possible to treat effectively with currently approved floculants. Minimisation of tannin generation in the first place is the management strategy that must be applied.

3.3 Use of mulch on construction sites

See Plates 10 – 16 in Appendix 2.

The RMS Biodiversity Guidelines provide guidance on the benefits of reusing various sizes of vegetation for different purposes. Mulch is a readily available and cheap source of material for temporary site stabilisation and sedimentation control. The re-use of mulch reduces the need to transport this material off-site and reduces handling and disposal costs for construction contracts.

Unprotected mulch sedimentation controls should not be placed in concentrated flow lines where mulch may be washed away. Mulch may be protected by wrapping it with geofabric or other materials to provide a stable control. All temporary catch dams constructed from mulch must have a stable outlet to minimise the washing away of mulch in high rainfall events, and the possible failure of the control.
4 ADDITIONAL RESOURCES

- RTA Biodiversity Guidelines- Protecting and Managing Biodiversity on RTA Projects, 2011
- Pacific Highway Mulch Protocol 2011
5 APPENDICES
Appendix 1: Plates showing tannin generation & water quality impacts

**Plate 1**: Melaleuca vegetation community – mulch from this vegetation type will generally produce high amounts of tannins.

**Plate 2**: Vegetation mulching activity – mulch should be progressively moved into prepared stockpile areas.
Plate 3: Tannin generation from recently felled and partially mulched vegetation in an area subject to localised inundation. Mulched vegetation should be progressively moved to prepared stockpiles to manage tannin impacted water.

Plate 4: Tannin impact in stormwater at the discharge point from a road construction site. The discharge of impacted water may be obvious to community and other stakeholders.
Plate 5: Tannins in a drainage line generated from very thickly applied mulch on the batter above. Note that the sedimentation fence is not effective in treating the tannins.
Appendix 2: Plates showing the use of mulch for erosion & sedimentation controls

Plate 6: Mulched vegetation stockpiled in a low-lying area subject to inundation. This is not an appropriate stockpile location and may increase the generation of tannins from stockpiled mulch.

Plate 7: Mulch being placed as batter erosion control. Mulch should not be applied in layers more than 100 mm thick for surface stabilisation.
Plate 8: Site showing recent application of a mulch/topsoil mix on batters (40% mulch to 60% topsoil). Mulch mixes are used to provide temporary stabilisation to prevent the loss of topsoil from batters in heavy rainfall events. Mulch use is also shown as a mounded sedimentation control to prevent sediment entering the median drain.

Plate 9: A mulch/topsoil mix used to provide temporary batter stabilisation and to assist cover crop establishment.
Plate 10: Successful establishment of cover crops on batters where mulch has been used with topsoil to assist temporary stabilisation.

Plate 11: Geofabric wrapped mulch bunds used for sedimentation control
Plate 12: Mulch used as a bund for a temporary sedimentation catch dam. Mulch is effective as it can provide both containment and filtering of site water. Mulch should not be used as a control in areas of concentrated flow where it may be washed away. Any mulch containment control should have a defined and lined outlet that allows discharge from the control without washing mulch away. Note that this control does not have a defined discharge outlet which should be installed to prevent failure of the control in heavy rainfall events.
Appendix 3: Minimum requirements for community mulch giveaways

The purpose of community mulch giveaways is to provide mulch for residential landscaping purposes.

The activities of a community mulch giveaway are permissible under the Protection of the Environment Operations (Waste) Regulation 2005 – General Exemption Under Part 6, Clause 51 and 51A (the Raw Mulch Exemption 2008). However, the activities remain subject to other relevant environmental regulations within the Act and Regulations. The Raw Mulch Exemption 2008 is subject to the following conditions:

• The raw mulch can only be applied to land for the purposes of filtration or as a soil amendment material or used either singularly or in any combination as input material(s) to a composting process.
• The consumer must land apply the raw mulch within a reasonable period of time.

Further information can be found at: www.environment.nsw.gov.au/resources/waste/ex08mulch.pdf

It is the mulch generators responsibility to ensure that the mulch is reused in an environmentally responsible manner.

A safe work method statement (SWMS) must be prepared that identifies potential OHS risks and all prevention and mitigation measures. The SWMS must apply to both the community and site workers involved in the mulch giveaway.

Each member of the community who participates in the mulch giveaway must read and understand a site specific information sheet. A template information sheet is attached as Appendix 4.

The site occupier must maintain written records for each load of mulch that is taken away and to ensure that each community participant understands the conditions of the community mulch giveaway information sheet. A suggested template to record this information is attached as Appendix 5.
Appendix 4: Community mulch giveaway information sheet

The following community mulch giveaway information sheet must be populated with site specific information.
# Community Mulch Giveaway
## Information Sheet

### Details of Mulch Supply

<table>
<thead>
<tr>
<th>Site Occupier</th>
<th>&lt;insert name of contractor / alliance etc&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Name</td>
<td>&lt;insert project name&gt;</td>
</tr>
<tr>
<td>Location</td>
<td>&lt;insert location of mulch stockpile&gt;</td>
</tr>
<tr>
<td>Mulch stockpile access directions</td>
<td>&lt;insert adequate directions for community members to find the stockpile location&gt;</td>
</tr>
</tbody>
</table>

### Background
- This information sheet supports the non-commercial giveaway of mulch for local residents.
- The product is raw vegetation mulch from <insert project location / name>.

### Conditions
- Any one individual may only take a maximum of 5 trailer loads from this project.
- The mulch may only be used for residential landscaping purposes.
- Mulch must not be placed in or immediately adjacent to waterways.
- The raw mulch can only be applied to land for the purposes of filtration or as a soil amendment material or used either singularly or in any combination as input material(s) to a composting process.
- The consumer must apply the raw mulch to land within a reasonable period of time.

### Community Safety Requirements
- <add in any safety requirements or mitigation measures from the SWMS that apply to the community>
- <add in any safety requirements or mitigation measures from the SWMS that apply to the community>
- <add in any safety requirements or mitigation measures from the SWMS that apply to the community>
- <add in any safety requirements or mitigation measures from the SWMS that apply to the community>
Appendix 5: Records template for community mulch giveaway

The records in the following suggested template must be kept as a minimum.
<table>
<thead>
<tr>
<th>Date</th>
<th>Car Registration</th>
<th>I have read and understand the ‘Community Mulch Giveaway Information Sheet’</th>
<th>Name</th>
<th>Signature</th>
</tr>
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<tbody>
<tr>
<td></td>
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I have read and understand the ‘Community Mulch Giveaway Information Sheet’.