Appendix B4

Construction Soil and Water Management Plan

The Northern Road Upgrade –
Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park

October 2018

NSW GOVERNMENT

Document control

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Approval and authorisation

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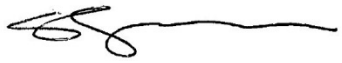		
Suzette Graham	*Jeff Gilham*	*Cameron Weller*
15/10//2018	*15/10//2018*	*15/10//2018*
Roads and Maritime Senior Environment Officer	Roads and Maritime Senior Project Manager	Environmental Representative

Revision history

Revision	Date	Description
0	08/06/2018	Draft for consultation
1	05/09/2018	Updated in response to DP&E, ER and consultation comments Issued for DP&E approval
2	27/09/2018	Final updated
3	15/10//2018	Final updated in response to DP&E comments

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Glossary / Abbreviations

Term	Expanded text
ANZECC	ANZECC Australian and New Zealand Environment and Conservation Council
ARI	Average Recurrence Interval
ARMCANZ	Agriculture and Resources Management Council of Australia and New Zealand
ASS	Acid Sulfate Soil
AWS	Automatic weather station
Blue Book	Managing Urban Stormwater: Soils and Construction (4th Edition) Volume 1 and Volume 2 (Landcom, 2004)
BoM	Bureau of Meteorology
Catchment	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
CCS	Community Communication Strategy
CEMP	Construction Environmental Management Plan
CCLMP	Construction Contaminated Land Management Plan
CMS	Complaints Management System
CoA	Condition of approval
Compliance audit	Verification of how implementation is proceeding with respect to an OACEMP (which incorporates the relevant approval conditions)
CPESC	Certified Practicing Erosion and Sediment Control Professional
CSSI	Critical State Significant Infrastructure
CSWMP	Construction Soil and Water Management Plan
CWEMP	Construction Waste and Energy Management Plan
DEC	Department of Environment and Conservation (NSW) (former)
DECC	Department of Environment and Climate Change (NSW) (former)
DEOH	Defence Establishment Orchard Hills
Department, the	Commonwealth Department of the Environment and Energy
DIPNR	Department of Infrastructure, Planning and Natural Resources
DoEE	Commonwealth Department of the Environment and Energy
DoI	Department of Industry - Water
DP&E	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EMS	Environmental management system

Term	Expanded text
Environmental aspect	Defined by AS/NZS ISO 14001:2015 as an element of an organisation's activities, products or services that can interact with the environment
Environmental impact	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
Environmental incident	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
Environmental objective	Defined by AS/NZS ISO 14001:2015 as an overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve
Environmental Representative (ER)	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
Environmental target	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
EPA	NSW Environment Protection Authority
EP&A Act	*NSW Environmental Planning and Assessment Act 1979*
EPBC Act	*Commonwealth Environmental Protection and Biodiversity Conservation Act 1999*
EPL	NSW Environment Protection Licence under the *Protection of the Environment Operations Act 1997*
ERG	Environmental Review Group
ERSED	Erosion and Sediment
ESCP	Erosion and Sediment Control Plan
EWMS	Environmental Work Method Statement
Federal-CoA	Condition of the Federal Department of the Environment and Energy Approval Decision
GDE	Groundwater dependent ecosystem
Hold Point	A point beyond which a work process must not proceed without express written authorisation from Roads and Maritime
HRC	Health Rivers Commission
LDP	Licenced Discharge Points
m bgl	metres below ground level
MP	Monitoring Program
Non-compliance	Failure to comply with the requirements of the Project approval or any applicable licence, permit or legal requirements
Non-conformance	Failure to conform to the requirements of Project system documentation including this OACEMP or supporting documentation
NRAR	NSW Natural Resources Access Regulator

Term	Expanded text
NSW-CoA	Condition of the NSW DP&E Infrastructure Approval
NSW Infrastructure Approval	The infrastructure approval for the Northern Road Upgrade issued by the New South Wales Government on 30 May 2018
NTU	Turbidity
OACEMP	Overarching Construction Environmental Management Plan
PASS	Potential Acid Sulfate Soil
PESCP	Progressive Erosion and Sediment Control Plan
pH	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
PIRMP	Pollution Incident Response Management Plan
PMF	Probable Maximum Flood
POEO Act	*Protection of Environment Operations Act 1997*
Project, the	The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park
RAP	Remediation Action Plan
REMM	Revised Environmental Management Measure as provided in the Final EIS / SPIR
Roads and Maritime, RMS	NSW Roads and Maritime Services
RTA	Roads and Traffic Authority
RUSLE	Revised Universal Soil Loss Equation
SEARs	Secretary's Environmental Assessment Requirements
Secretary	Secretary of the NSW Department of Planning and Environment, or delegate
SPIR	Submissions and Preferred Infrastructure Report
TNR	The Northern Road
TDS	Total Dissolved Solids
TSS	Total suspended solids
WHS Act	*Work Health and Safety Act 2011*

1 Introduction

1.1 Context

This Construction Soil and Water Management Plan (CSWMP) forms part of the Overarching Construction Environmental Management Plan (OACEMP) for The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park (the Project).

This CSWMP has been prepared to address the requirements of:

- the NSW Minister's Infrastructure Approval dated 30 May 2018 and Federal Minister for the Environment and Energy's Approval dated 15 June 2018
- the 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) (prepared by Jacobs for Roads and Maritime, 2017) as amended by *The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park Submissions and Preferred Infrastructure Report* (SPIR) (prepared by Jacobs for Roads and Maritime, 2017)
- Environment Protection Licence (EPL) conditions
- Roads and Maritime specifications
- all applicable legislation.

This CSWMP has been reviewed by a soil conservationist who is on the Roads and Maritime list of Registered Contractors for Erosion, Sedimentation and Soil Conservation Consultancy Services.

Construction of the Project will be undertaken in three stages:

- Stage 4 - Mersey Road, Bringelly, to Eaton Road, Luddenham
- Stage 5 - Littlefields Road, Luddenham, to Glenmore Parkway, Glenmore Park
- Stage 6 - Littlefields Road, Luddenham to Eaton Road, Luddenham

An overview of the Project, including the extent of the Project stages, is shown on Figure 1-1 and Figure 1-2.

Each stage will be delivered in a separate Construction package that will include all activities needed to complete the stage. Details of the proposed Project staging, including Construction activities and submission of corresponding environmental plans, strategies and protocols, is documented in the Project Staging Report.

The Construction Contractors will develop stage-specific environmental management documentation to address the operational control requirements outlined in the OACEMP that apply to the stages that they are delivering. Stage specific CSWMPs will be updated, tailored and finalised by the Contractors. Roads and Maritime will review the Contractors' CSWMPs for compliance with the approved OACEMP.

It should be noted that the CSWMP is also referred to in the Project environmental documents as:

- Water, soil and contamination CEMP Sub-plan (noting that contamination is addressed in a separate Construction Contaminated Land Management Plan)
- Soil and Water Management Plan
- Soils and Water Management Plan

A full list of alternative and interchangeable sub-plan names is included in Appendix A5 of the OACEMP.

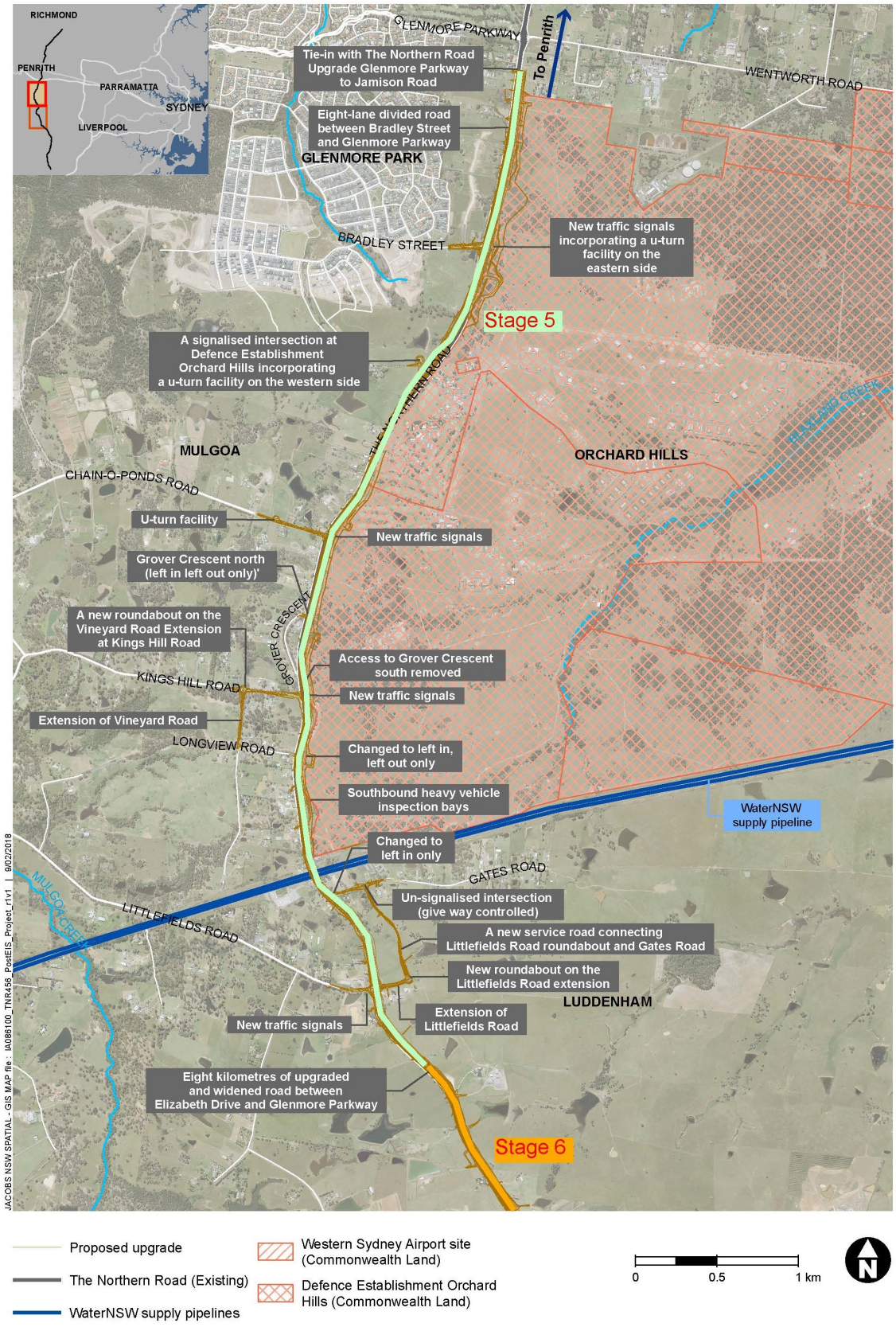

Figure 1-1: Overview of the Project (northern section)

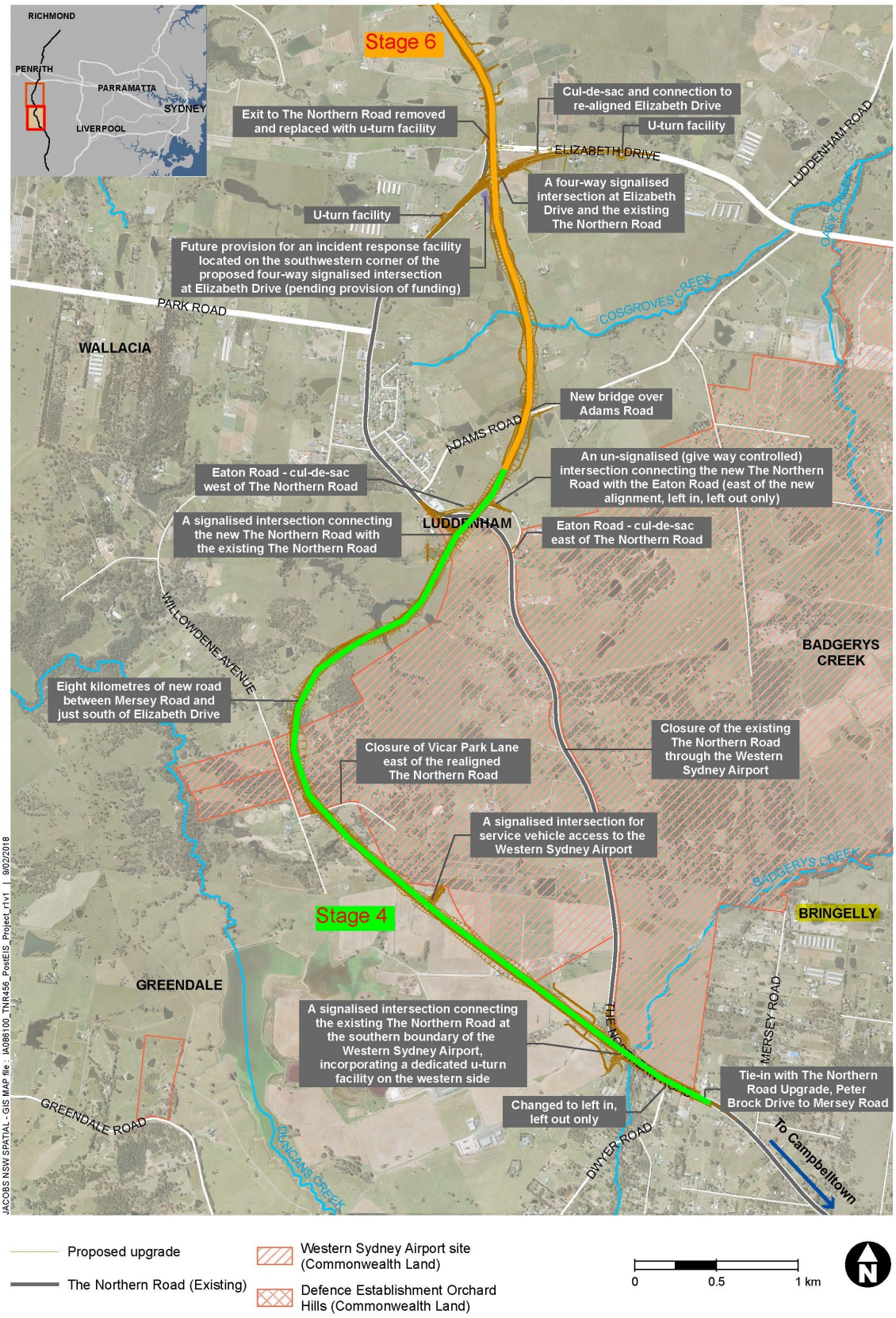

Figure 1-2: Overview of the Project (southern section)

1.2 Background

The EIS assessed soil and water quality impacts from Construction of the Project.

As part of EIS development, a detailed construction soils, water and contamination assessment was prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning and Environment (DP&E) and the Commonwealth EIS Guidelines issued by the Federal Department of the Environment and Energy (DoEE). The soils, water and contamination assessment 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 (REMMs) were provided within the SPIR. Where applicable, the REMMs from the SPIR have been included in this CSWMP.

1.3 Environmental management system overview

The overarching Environmental Management System (EMS) for the Project is described in Section 3 of the OACEMP. The Contractors delivering the Project will have certified EMSs consistent with the overarching EMS described in the OACEMP. The Contractors will develop stage-specific CSWMPs in accordance with the OACEMP and their EMS.

This overarching CSWMP forms part of the environmental management framework for the Project, as described in Section 3.3 of the OACEMP.

The Contractors will be required to develop, as part of their stage-specific CSWMPs, detailed plans and procedures to address specific requirements of the conditions of approval and REMMs identified in this overarching CSWMP. The purpose of these environmental management documents in regard to minimisation and management of impacts on soil and water quality associated with the Project is outlined in Section 6 of this CSWMP.

Templates and guidance information for the environmental documentation to be prepared by the Contractors are provided in the following annexures to this overarching CSWMP:

- Annexure B Construction Water, Soil and Contamination Monitoring Program
- Annexure C Template Sediment Basin Management Plan
- Annexure D Template Stockpile Management Protocol
- Annexure E Template Management of Tannins from Vegetation Mulch Procedure
- Annexure F Concept Erosion and Sediment Control Plans

The Contractors will complete the preparation of the documentation contained in the annexures with stage-specific information and include the updated annexures in their CSWMPs. Where appropriate, the Contractors may provide Roads and Maritime with an alternative equivalent plan or procedure that meets the requirements identified in this CSWMP and the relevant Roads and Maritime specifications. Roads and Maritime will review the Contractors' documentation to confirm consistency with the requirements of this CSWMP and specifications.

Management measures identified in this CSWMP may also be incorporated into the Contractors' site or activity specific Environmental Work Method Statements (EWMS) and Erosion and Sediment Control Plans (ESCP). A template EWMS for use by the Contractors is provided in Appendix A9 of the OACEMP. EWMS will be prepared for:

- activities that involve work in waterways or that pose a risk to receiving water quality, including:
  - construction and operation of sediment basins and/ or buffer swales and connecting drainage for the associated catchment area;
  - construction of culverts, including associated staging, flow diversions, any dewatering, short and long term stabilisation and removal of existing structures
  - vegetation clearing and grubbing
  - activities where construction water may be discharged into natural waterways
  - construction and operation of concrete wash out areas
- topsoil stripping, including temporary stockpiling and disposal of excavated material and protocols for the management of materials containing asbestos
- all works associated with rehabilitation of farm dams including, but not limited to, dewatering and filling
- any other high risk activities identified in the Contractors' environmental risk workshops.

EWMS incorporate appropriate mitigation measures and controls and identify key procedures to be used concurrently with the EWMS. EWMS will be prepared by the Contractor Environmental Site Representatives and reviewed by the Roads and Maritime Environmental Manager (or delegate) and the independent Environmental Representative (ER) prior to the commencement of the construction activities to which they apply. Construction personnel undertaking a task governed by an EWMS will undertake the activity in accordance with the mitigation and management measures identified in the EWMS.

ESCP are designed for use as a practical guide to provide more detailed site-specific erosion and sediment control measures. ESCP will be developed by the Contractor Environmental Site Representatives 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 OACEMP, strategies, procedures, EWMS and ESCP form management guides that clearly identify required environmental management actions for reference by Roads and Maritime and its Contractors.

The review and document control processes for this CSWMP are described in Section 6.7 and 6.8 of the OACEMP.

1.3.1 CSWMP preparation, endorsement and approval

This overarching CSWMP has been prepared to satisfy the NSW and Federal conditions of approval (CoA) in relation to soil and water management during Construction of the Project. This CSWMP includes a Construction Water, Soil and Contamination Monitoring Program (Annexure B) to satisfy the requirements of NSW-CoA C9(c).

This CSWMP and the Construction Water, Soil and Contamination Monitoring Program will be reviewed by the Roads and Maritime Senior Project Manager and the Senior Environment Officer and endorsed by the ER prior to submission to the Secretary of the Department of Planning and Environment (DP&E) for approval in accordance with NSW-CoA C3 and C12.

This CSWMP and the Construction Water, Soil and Contamination Monitoring Program will be submitted to the Secretary for approval no later than one month prior to commencement of Construction of the Project, or as otherwise agreed by the Secretary.

In accordance with NSW-CoA C8 and C13, Construction of the Project will not commence prior to approval by the Secretary of the CSWMP and the Construction Water, Soil and Contamination Monitoring Program, and all relevant water, soil and contamination baseline data for the Project has been collected.

1.4 Consultation

1.4.1 Consultation for preparation of the CSWMP

This CSWMP and the Construction Water, Soil and Contamination Monitoring Program have been developed in consultation with NSW Natural Resources Access Regulator (NRAR) (previously NSW Department of Industry – Water (DoI Water)), NSW Department of Industry – Fisheries (DPI Fisheries) and Penrith City Council and Liverpool City Council as required by NSW-CoA C4(d) and C9(c). The draft CSWMP, including the Monitoring Program, was provided to NRAR, DPI Fisheries, Penrith City Council and Liverpool City Council in June 2018.

In accordance with NSW-CoA A8, where a CoA requires consultation with identified parties, details of the consultation undertaken, matters raised by the parties, and how the matters were considered will be documented in the relevant sub plan. The evidence of the consultation undertaken for the preparation of this CSWMP and the Monitoring Program, including documentation of the engagement with the parties and a summary of issues raised and responses, is provided in Annexure A. Appendix A8 to the OACEMP documents all consultation undertaken for the preparation of the OACEMP..

1.4.2 Ongoing consultation during Construction

Ongoing consultation between Roads and Maritime and its Contractors, 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. The process for the community consultation will be documented in the Community Communication Strategy (CCS).

In accordance with NSW-CoA E8, for property/ies where hydrology modelling undertaken for the EIS and 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, determine what measures may be implemented to prevent, mitigate or offset a loss in water supply, and implement the measures agreed with the landowner at no cost to the landowner. In the event that measures to mitigate the impacts cannot be agreed, Roads and Maritime will engage a suitably qualified and experienced independent person to advise and assist in determining the impact and relevant mitigation measures.

Specific consultation requirements under the EIS and SPIR for management of soil and water identified in the REMMs are provided in Table 1-1.

Table 1-1: Consultation requirements identified in the EIS and SPIR

REMM	Consultation requirements identified in the EIS and SPIR
CI-2	Where relevant, consultation would be undertaken with proponents of other nearby developments to increase the overall awareness of project timeframes and impacts.

2 Purpose and objectives

2.1 Purpose

The purpose of this CSWMP is to describe how impacts on soil and water quality will be managed 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, the Contractors will:

- implement best management practice controls and procedures 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
- implement appropriate measures to address the requirements of the conditions of approval outlined in Table 3-1 and the REMMs detailed in Table 6-1
- implement appropriate measures to comply with all relevant legislation and other requirements as described in Section 3 of this CSWMP.

2.3 Targets

Targets for the management of soil and water impacts during the Project include:

- achieve full compliance with relevant legislative requirements and the conditions of approval
- achieve full compliance with EPL water quality discharge parameters for all planned basin discharges (i.e. those within design capacity)
- manage downstream water quality impacts attributable to the Project and maintain waterway health by avoiding the introduction of nutrients, sediment and chemicals outside of that permitted by the EPL and/or ANZECC guidelines
- provide training on best practice soil and water management to all construction personnel through site inductions
- minimise impacts on, and complaints from, the community and stakeholders.

3 Environmental requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation and regulatory requirements

Legislation and regulations relevant to soil and water quality management include:

- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- Environmental Planning and Assessment Regulation 2000
- *Protection of the Environment Operations Act 1997* (POEO Act)
- *Water Management Act 2000*
- *Fisheries Management Act 1994*
- *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *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 OACEMP.

3.1.2 Guidelines and standards

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

- Roads and Maritime QA Specification G1 – Job Specific Requirements for The Northern Road Upgrade
- Roads and Maritime QA Specification G36 – Environmental Protection (Management System)
- 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
- *NSW Aquifer Interference Policy* (NSW DPI - Office of Water, 2012)
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC and ARMCANZ, 2000)
- *Bunding & Spill Management. Insert to the Environment Protection Manual for Authorised Officers - Technical section "Bu"* (Department of Environment and Conservation (DEC), 1997)
- *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (DEC, 2004)
- *Environmental Best Management Practice Guideline for Concreting Contractors* (DEC, 2004)
- *New South Wales State Emergency Management Plan* (EMPLAN, 2012)

- *Managing Urban Stormwater: Soils and Construction (4th Edition) Volume 1* (Landcom, 2004) (the "Blue Book")
- *Managing Urban Stormwater: Soils and Construction Volume 2A Installation of Services* (Department of Environment and Climate Change NSW (DECCW), 2008)
- *Managing Urban Stormwater: Soils and Construction Volume 2C Unsealed Roads* (DECCW, 2008)
- *Managing Urban Stormwater: Soils and Construction Volume 2D Main Roads* Construction (DECCW, 2008)
- *Roads and salinity* (Department of Infrastructure, Planning and Natural Resources (DIPNR), 2003)
- *The Constructed Wetlands Manual* (Department of Land and Water Conservation NSW (DLWC), 1998)
- *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003)
- *Policy and Guidelines for Fish Friendly Waterway Crossings* (NSW DPI - Fisheries, 2003)
- *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW DPI, 2013)
- *RTA's Water Policy* (Roads and Traffic Authority (RTA), 1997)
- *Code of Practice for Water Management* (RTA, 1999)
- *Procedure for Selecting Treatment Strategies to Control Road Runoff* (RTA, 2003)
- *Guideline for Construction Water Quality Monitoring* (RTA, 2003)
- *Guidelines for the Management of Acid Sulphate materials: Acid Sulphate Soils, Acid Sulphate Rock and Monosulphidic Black Ooze* (RTA, 2005)
- *Technical Guideline – Environmental Management of Construction Site Dewatering* (RTA, 2011)
- *Technical Guideline EMS-TG-010: Stockpile Site Management Guideline* (RTA, 2011)
- *Stockpile Management Guidelines* (Roads and Maritime, 2015)
- *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)
- *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC: 3003(2005)]* (National Occupational Health and Safety Commission, 2005)
- *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 the Construction Contractors during Construction of the Project. A Hold Point is a point beyond which a work process must not proceed without express written authorisation from Roads and Maritime.

3.2 Conditions of approval

This overarching CSWMP provides a consistent approach to address the requirements of both the NSW and Federal approvals in the one document. The Project is located on both NSW and Federal (Stages 4 and 5 only) land. However, the NSW Infrastructure Approval conditions apply to both NSW and Federal land within the Project. The Federal approval conditions also apply to both NSW and Federal land within the Project. The extent of Federal land located in the vicinity of the Project is shown on Figure 1-1 and Figure 1-2.

The State (NSW-CoA) and Federal (Federal-CoA) conditions of approval relevant to this CSWMP and their applicability to each stage of the Project are listed in Table 3-1. A cross reference is also included to indicate where the condition is addressed in this CSWMP or other project management documents.

Table 3-1: Conditions of approval relevant to the CSWMP

CoA no.	Condition requirement	Applicability					Reference
		Stage 4		Stage 5		Stage 6	
		Cth	NSW	Cth	NSW	NSW	
Federal conditions of approval							
Federal-CoA 1	The approval holder must undertake the action, including those parts of the action that occur on Commonwealth Land, in accordance with all conditions in the NSW Infrastructure Approval.	✓	✓	✓	✓	✓	This CSWMP
Federal-CoA 9	Any **mulch** material applied or stockpiled on land that will be inside the **DEOH** boundary fence once the action is completed, or on land that will be within 30 m of the **DEOH** boundary fence once the action is completed, must fulfil the requirements of the **Mulch Exemption** and the **Mulch Order** as if the **mulch** were being applied to an **environmentally sensitive area**.			✓	✓		Annexure D Stockpile Management Protocol
Federal-CoA 11	The person taking the action must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement all management plans required by this approval, and make them available upon request to the Department. Such records may be subject to audit by the Department or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the Department's website. The results of audits may also be publicised through the general media.	✓	✓	✓	✓	✓	Section 7.9
State conditions of approval							
NSW-CoA A8	Where the conditions of this approval require consultation with identified parties, details of the consultation undertaken, matters raised by the parties, and how the matters were considered must accompany the strategies, plans, programs, reviews, audits, protocols and the like submitted to the Secretary.	✓	✓	✓	✓	✓	Section 1.4 Annexure A – Consultation correspondence

CoA no.	Condition requirement	Applicability					Reference
		Stage 4 Cth	Stage 4 NSW	Stage 5 Cth	Stage 5 NSW	Stage 6 NSW	
NSW-CoA C4(d)	The following **CEMP Sub-plans** must be prepared in consultation with the relevant government agencies identified for each **CEMP Sub-plan** and be consistent with the **CEMP** referred to in **Condition C1**:						
	Water, soil and contamination — DoI Water, DPI Fisheries and relevant Councils	✓	✓	✓	✓	✓	Section 1.4 Annexure A – Consultation correspondence
NSW-CoA C5	The **CEMP Sub-plans** must state how:						
	(a) the environmental performance outcomes identified in the documents listed in **Condition A1**, as modified by these conditions, will be achieved;	✓	✓	✓	✓	✓	Section 6
	(b) the mitigation measures identified in the documents listed in **Condition A1** as modified by these conditions will be implemented;	✓	✓	✓	✓	✓	Section 6
	(c) the relevant terms of this approval will be complied with;	✓	✓	✓	✓	✓	Section 6
	(d) the identification of the relevant environmental specific training and induction processes for construction personnel; and	✓	✓	✓	✓	✓	Section 7.4
	(e) issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.	✓	✓	✓	✓		Section 8.1 OACEMP Section 4.3.2 OACEMP Appendix A2

CoA no.	Condition requirement	Applicability					Reference
		Stage 4		Stage 5		Stage 6	
		Cth	NSW	Cth	NSW	NSW	
NSW-CoA C6	The **CEMP Sub-plans** must be developed in consultation with relevant government agencies identified in **Table 3** of **Condition C4.** Where an agency(ies) request(s) is not included, the Proponent must provide the Secretary justification as to why. Details of all information requested by an agency to be included in a **CEMP Sub-plan** as a result of consultation**,** including copies of all correspondence from those agencies, must be provided with the relevant **CEMP Sub-Plan**.	✓	✓	✓	✓	✓	Section 1.4 Annexure A
NSW-CoA C7	Any of the **CEMP Sub-plans** may be submitted to the Secretary along with, or subsequent to, the submission of the **CEMP** but in any event, no later than one (1) month before commencement of construction.	✓	✓	✓	✓	✓	Section 0
NSW-CoA C8	Subject to the provisions in this condition relating to staging Construction must not commence until the **CEMP** and all **CEMP Sub-plans** have been approved by the Secretary. The **CEMP** and **CEMP Sub-plans**, as approved by the Secretary, including any minor amendments approved by the ER must be implemented for the duration of Construction. Unless otherwise agreed by the Secretary where the CSSI is being staged, construction of a stage is not to commence unless the CEMP and the CEMP Sub-plans referred to above cover those stages or the Secretary has approved a specific CEMP and sub-plans for that stage.	✓	✓	✓	✓	✓	Section 0
NSW-CoA C16	Where a relevant **CEMP Sub-plan** exists, the relevant **Construction Monitoring Program** may be incorporated into that **CEMP Sub-plan.**	✓	✓	✓	✓	✓	Annexure B – Construction Water, Soil and Contamination Monitoring Program

CoA no.	Condition requirement	Applicability					Reference
		Stage 4		Stage 5		Stage 6	
		Cth	NSW	Cth	NSW	NSW	
NSW-CoA E7	Flood information including flood reports, models and geographic information system outputs, and work as executed information from a registered surveyor certifying finished ground levels and the dimensions and finished levels of all structures within the flood prone land, must be provided to the relevant Council and the SES. The relevant Council and the SES must be notified in writing that the information is available no later than one month following the completion of Construction. Information requested by the relevant Council or the SES must be provided no later than six months following the completion of Construction or within another timeframe agreed with the relevant Council and the SES.	✓	✓	✓	✓	✓	Section 6.15
NSW-CoA E8	For property/ies where modelling in the documents listed in **Condition A1** predicts that the CSSI will potentially reduce the available stormwater runoff yield to a farm dam, the Proponent must, in consultation with the affected landowner: (a) calculate the nature and extent of impacts on water supply; (b) determine what measures may be implemented to prevent, mitigate or offset a loss in water supply; and (c) implement the measures agreed with the potentially affected landowner at no cost to the landowner. The agreed measures must be implemented before and during Construction of any works that may potentially affect the flow of water into the farm dams. In the event that the Proponent and the relevant property owner cannot agree on the measures to mitigate the impact, the Proponent shall engage a suitably qualified and experienced independent person to advise and assist in determining the impact and relevant mitigation measures.	✓	✓	✓	✓	✓	Section 6.16

CoA no.	Condition requirement	Applicability					Reference
		Stage 4		Stage 5		Stage 6	
		Cth	NSW	Cth	NSW	NSW	
NSW-CoA E45	Erosion and sediment controls must be installed and appropriately maintained to minimise any water pollution. When implementing such controls, any relevant guidance in the *Managing Urban Stormwater* series must be considered.	✓	✓	✓	✓	✓	Section 6.1 Annexure F Contractors' Erosion and Sediment Control Plans
NSW-CoA E71	Where available and practicable, and of appropriate chemical and biological quality, stormwater, recycled water or other water sources shall be used in preference to potable water for the delivery of the CSSI, including dust control.	✓	✓	✓	✓	✓	Section 6.6 Contractors' Dewatering Procedures
NSW-CoA E72	Drainage feature crossings (permanent and temporary watercourse crossings and stream diversions) and drainage swales and depressions must be designed and constructed in accordance with relevant guidelines and designed by a suitably qualified and experienced person in consultation with DPI Fisheries.	✓	✓	✓	✓	✓	Section 6.8

3.3 Environmental Protection Licence conditions

The Project is subject to EPL/s as a Scheduled Activity for 'road construction' and, where the criteria are met, '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 6 and the Construction Water, Soil and Contamination Monitoring Program (refer Annexure B).

The EPL conditions relevant to the management of soil and water are provided in Table 3-2. The EPL conditions relevant to the monitoring of soil and water are provided in Annexure B.

The indicative water quality discharge criteria for Licenced Discharge Points for the Project are listed in Table 3-3. The EPL criteria will be included in the Contractors' stage specific CSWMPs following issue of the EPL/s.

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 7.3 of this CSWMP and Section 5.3 of the OACEMP.

Table 3-2: EPL requirements relevant to the management of soil and water

Ref.	Relevant requirement	Reference
3	**Limit conditions**	
L1	**Pollution of waters**	
L1.1	Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the *Protection of the Environment Operations Act 1997*.	Section 3.1.1
4	**Operating conditions**	
O4	**Processes and management**	
O4.1	The licensee must maximise the diversion of run-on waters from lands upslope and around the site whilst land disturbance activities are being undertaken.	Section 6.1
O4.2	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.	Section 6.1
O4.3	The licensee must minimise the area of the site that is able to generate suspended material when water runs over it.	Section 6.1
O4.4	All soil erosion and sediment controls must be designed (stability, location, type and size), constructed, operated and maintained in accordance with the guideline "Managing Urban Stormwater – Soils and Construction, Volume 2D, Main road construction" (DECC, 2008), to be read and used in conjunction with volume 1 "Managing urban stormwater: soils and construction" (Landcom, 2004).	Section 6.1
O4.5	The licensee must endeavour to maximise the reuse of captured stormwater on the premises.	Section 6.6

Ref.	Relevant requirement	Reference
O4.6	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.	Table 7-1
O4.7	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.	Section 7.9
O4.8	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.	Annexure C Section 2.6
O4.10	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.	Annexure C Section 2.1

Table 3-3: Discharge water quality criteria

Parameter	Units of measure	100 percentile concentration limit	Frequency	Sampling method
Oil and Grease	Visible	No visible	Special Frequency 1	Visual inspection
pH	pH	6.5 –8.5	Special Frequency 1	Probe
Total Suspended Solids	milliequivalents per litre	50 mg/L	Special Frequency 1	Grab Sample

4 Existing environment

The following section summarises the existing soil and water conditions within and adjacent to the Project corridor, based on information contained in the EIS. Baseline surface water and groundwater data is provided in the Water, Soil and Contamination Monitoring Program (Annexure B).

4.1 Topography, geology and soil characteristics

4.1.1 Topography

The Project is located on low lying and gently undulating areas of the Cumberland Plains.

The Project area traverses a north–south oriented ridge characterised by gentle to moderately inclined slopes with narrow to broad crests and drainage lines. The land to the east of the existing The Northern Road is gently undulating and comprises two ridgelines, one located to the west of Luddenham Road and the second within the vicinity of Aldington Road / Mt Vernon Road.

A number of waterways traverse the Project area including the north-easterly flowing Badgerys Creek, Cosgroves Creek and Oaky Creek on the eastern side of the Project, and the north-westerly flowing Duncans Creek, Surveyors Creek and Mulgoa Creek on the western side of the Project. Several farm dams are located within the Project area.

4.1.2 Geology

The Project is located in an area that is generally underlain by Bringelly Shale, Quaternary Alluvium and Cranebrook Formation. Bringelly Shale consists of shale, carbonaceous claystone, laminate and coal in parts, and underlies the crests, slopes and drainage lines of the majority of the Project area. Quaternary Alluvium is present along the low lying areas adjacent to Badgerys Creek and generally consists of fine grained sand, silt, clay. The Cranebrook Formation unit is characterised by pebbles and cobbles of quartz, quartzite, chert, porphyry, granite, hornfels and silcrete and is found adjacent to Surveyors Creek.

The Luddenham Dyke is located in the vicinity of the intersection of The Northern Road and Eaton Road. The dyke consists of olivine basalt carrying analcite which intrudes the Bringelly Shale.

The regional geology is shown on Figure 4-1.

4.1.3 Soil landscapes

The Project area is dominated by three soil landscape groups. The basal geology is overlain by South Creek soils 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. Topography and soils in the Project area are outlined in Table 4-1. Soil landscapes in the Project Area are shown on Figure 4-2.

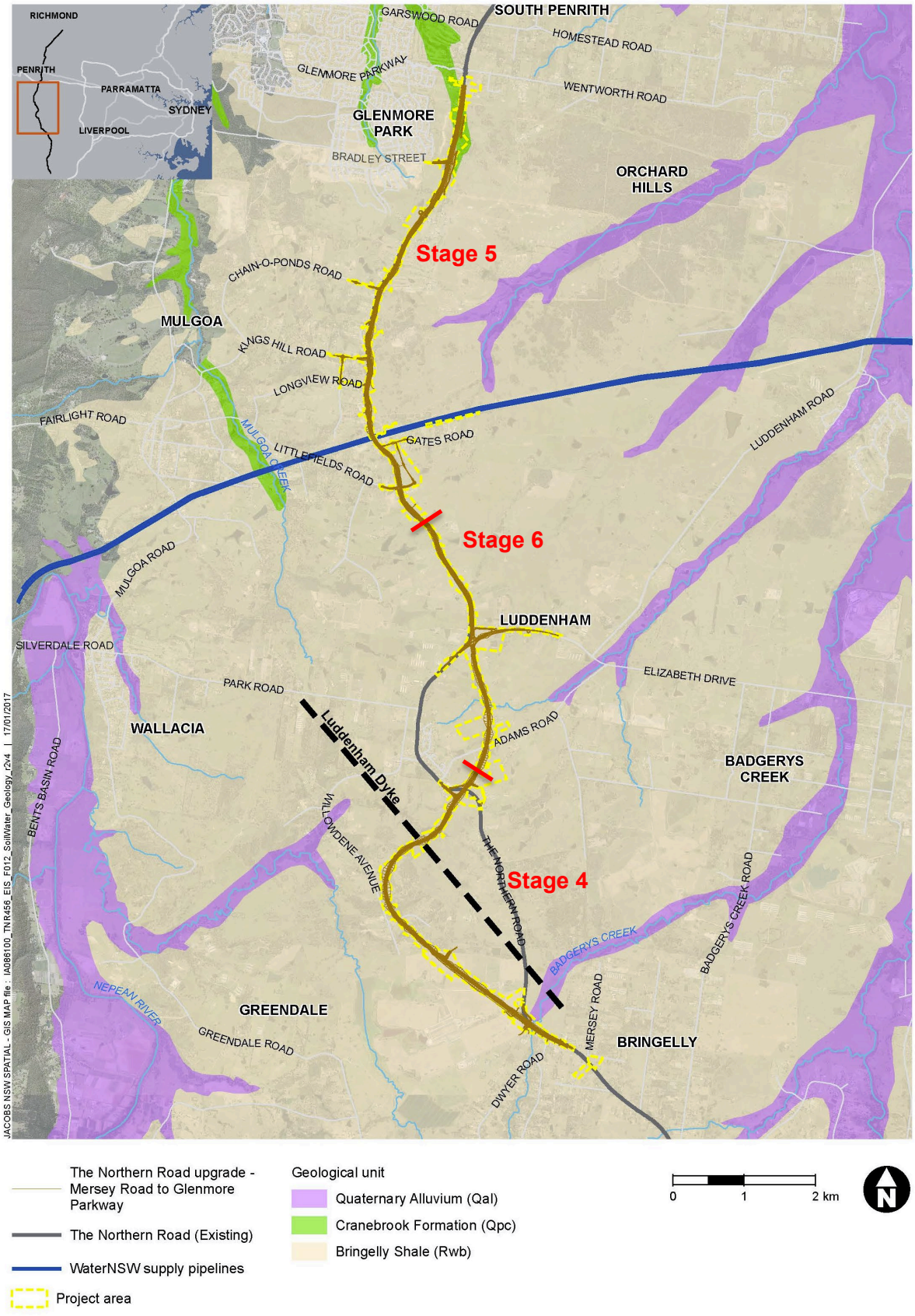

Figure 4-1: Regional geology

Source: EIS (Roads and Maritime, 2017)

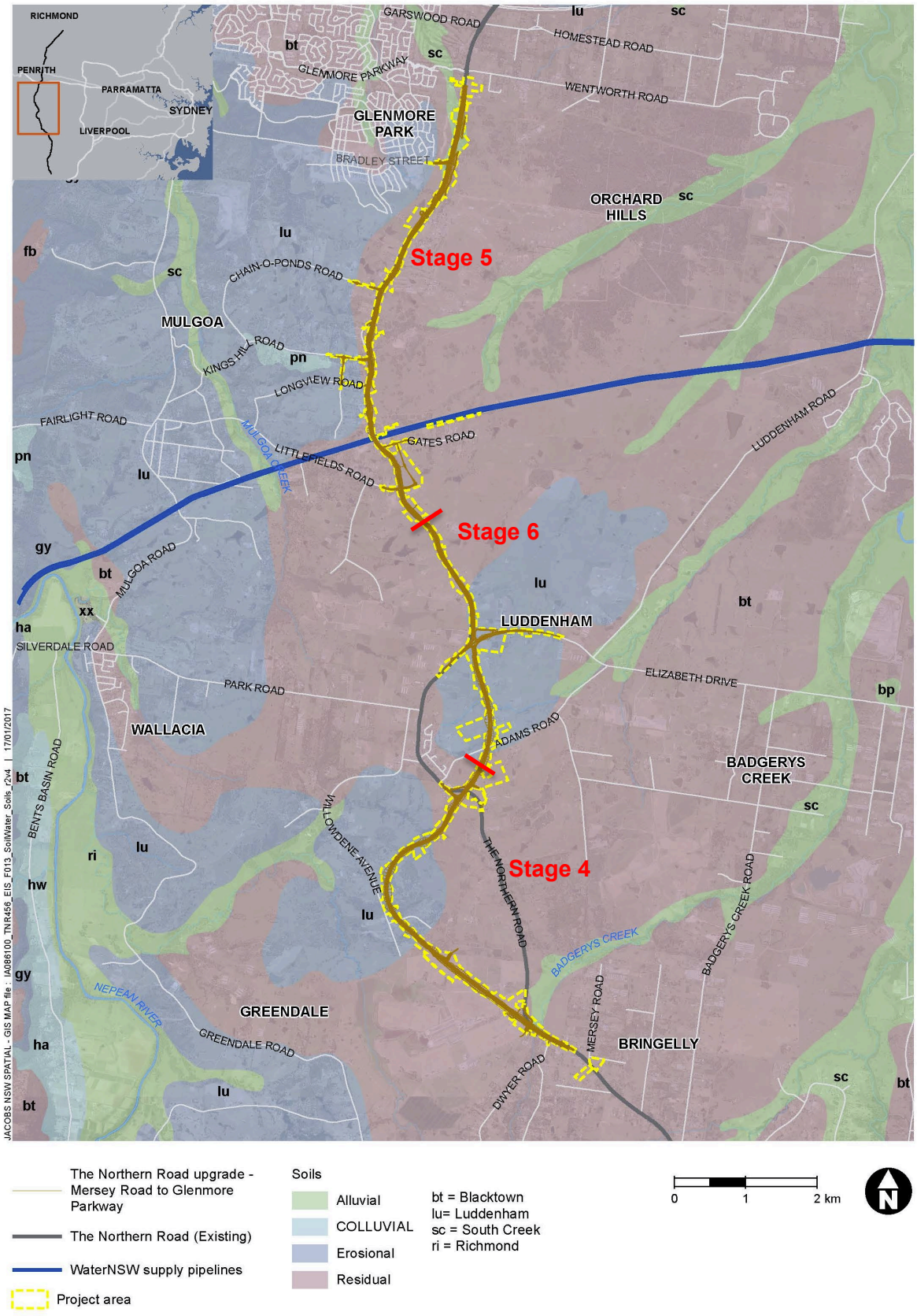

Figure 4-2: Soil landscapes

Source: EIS (Roads and Maritime, 2017)

Table 4-1: Topography and soil in the Project area

Soil unit	Topography	Soil type	Soil characteristics
Luddenham	Elevated	Found on undulating to rolling hills on Wianamatta Shales with slopes 5-20% and local relief 50-80 m, and on narrow ridges, hills and valleys. Shallow podzolic soils and massive clays on crests. Moderately deep red podzolic soils on upper slopes and moderately deep yellow podzolic soils and prairie soils on lower slopes and drainage lines.	Highly erodible Impermeable Highly plastic subsoil Moderately reactive
Blacktown	Elevated	Found on gently undulating rises on Wianamatta Group shales with local reliefs of up to 30 m and slopes < 5%. Shallow to moderately deep soils. Hardsetting mottled texture contrast soils. Red and brown podzolic soils on crests grading to yellow podzolic soils on lower slopes and in drainage lines.	Highly plastic subsoil Moderately reactive Low fertility Poor draining
South Creek	Lowland	Found on floodplains, valley flats and drainage depressions of the channels on the Cumberland Plain. Deep layered sediments over bedrock or relic soils. Structured plastic slays and loams in and adjacent to drainage lines. Red and yellow podzolic soils on terraces.	Moderately erodible Prone to flooding

4.1.4 Soil salinity

Salts present in soil can become dissolved and mobilised in surface water and groundwater, causing a build up of excessive concentrations that can be damaging to plants, soil chemistry and construction materials such as masonry, concrete and bitumen.

Assessment of salinity potential in the Project area undertaken using salinity potential maps of the western Sydney region (DIPNR, 2002) identified that the majority of the Project area has the potential for moderate salinity. Soil sample analysis for durability and aggressivity will be undertaken prior to commencement of Construction to determine the potential impacts of soil salinity on pavement infrastructure.

Soil salinity potential is shown on Figure 4-3.

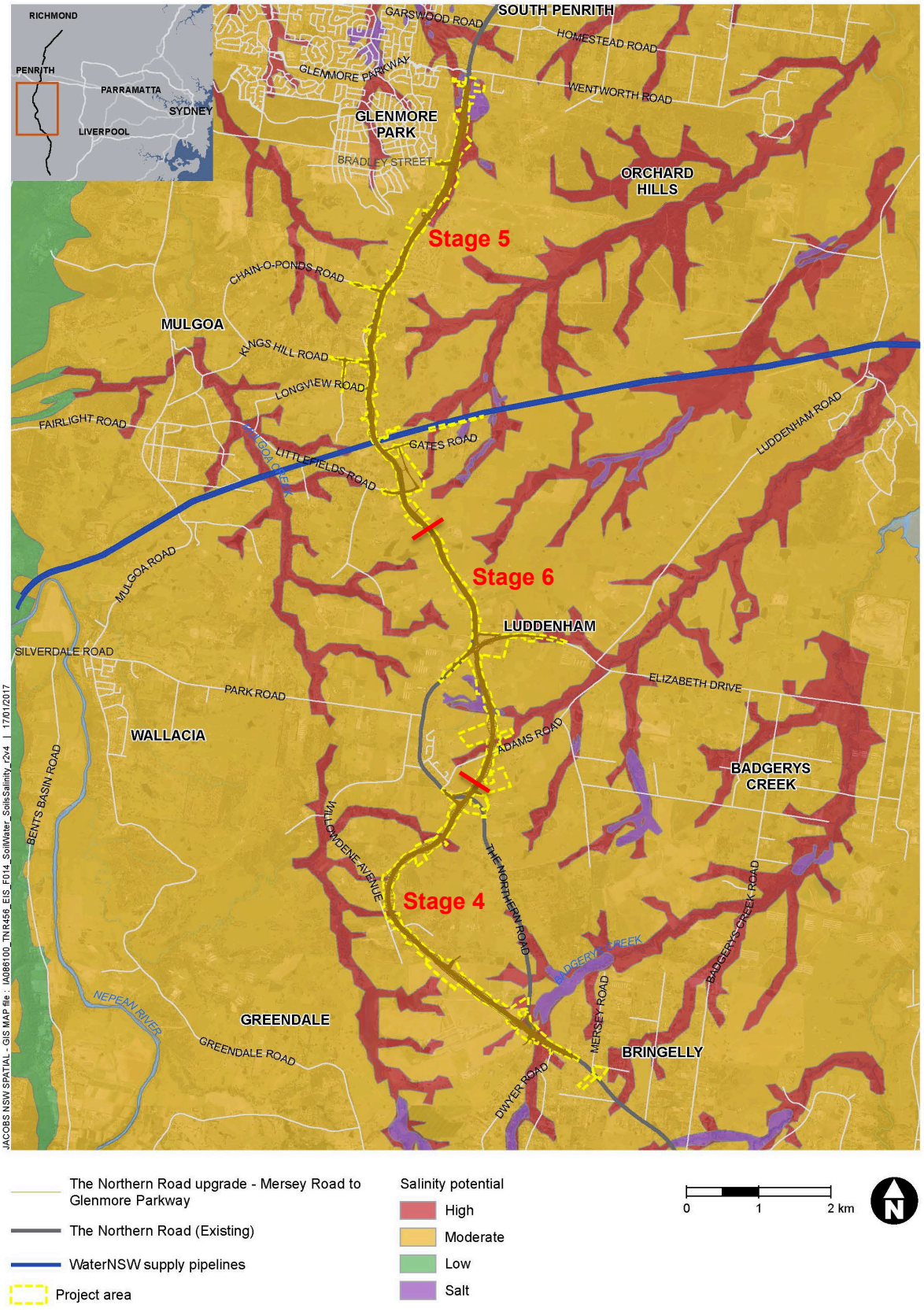

Figure 4-3: Soil salinity potential

Source: EIS (Roads and Maritime, 2017)

4.1.5 Acid sulfate soils

Acid sulfate soils (ASS) are a naturally occurring soil and sediment that contains iron sulfides which can be classified as either actual ASS or potential ASS (PASS). PASS are waterlogged soils rich in iron sulfides that have not been oxidised and are harmless to the environment if kept in this state or under water. Any exposure of PASS to air or the lowering of the water table leads to the formation of sulfuric acid and the development of actual ASS. Soil acidification and dissolved acid runoff can result in detrimental impacts on the health of land and aquatic plants and animals.

Examination of ASS maps available via the Australian Soil Resource Information System (ASRIS, 2015) identified the Project area as having an extremely low probability of occurrence of ASS.

4.2 Surface water

4.2.1 Catchments and waterways in the Project area

The northern portion of the Project lies within the Lower Nepean River Management Zone of the Hawkesbury-Nepean River Catchment, while the southern portion 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. An overview of the catchments within the Project area are shown on Figure 4-4. The major hydrological features in the Project area are shown on Figure 4-5.

The Project traverses a number of waterways, ephemeral drainage lines and their associated catchments:

- Badgerys Creek catchment – a number of minor drainage lines cross The Northern Road, which are ephemeral and only flow in response to rainfall. Several farm dams exist along the drainage lines. Downstream of The Northern Road the Badgerys Creek catchment is located within the Western Sydney Airport site (Commonwealth land)
- Duncans Creek catchment – The Northern Road follows the ridgeline and forms the divide between Duncans Creek catchment and Cosgroves Creek catchment. A series of small and large dams are located along drainage depressions within the catchment
- Cosgroves Creek catchment – draining east to South Creek, land use within this catchment varies between urbanised (Luddenham) to the west and rural development to the east
- Unnamed tributary of South Creek catchment – the catchment is located to the western side of The Northern Road (upslope) and contains several farm dams
- Mulgoa Creek catchment – runoff from the catchment drains west to the Nepean River. Several farm dams exist within the catchment
- Blaxland Creek catchment - the drainage lines that cross The Northern Road in this catchment either directly or indirectly discharge into the Defence Establishment Orchard Hills (DEOH) site located east of The Northern Road
- Surveyors Creek catchment – a large portion of the catchment that contributes runoff to the existing drainage along The Northern Road is generally rural in nature.

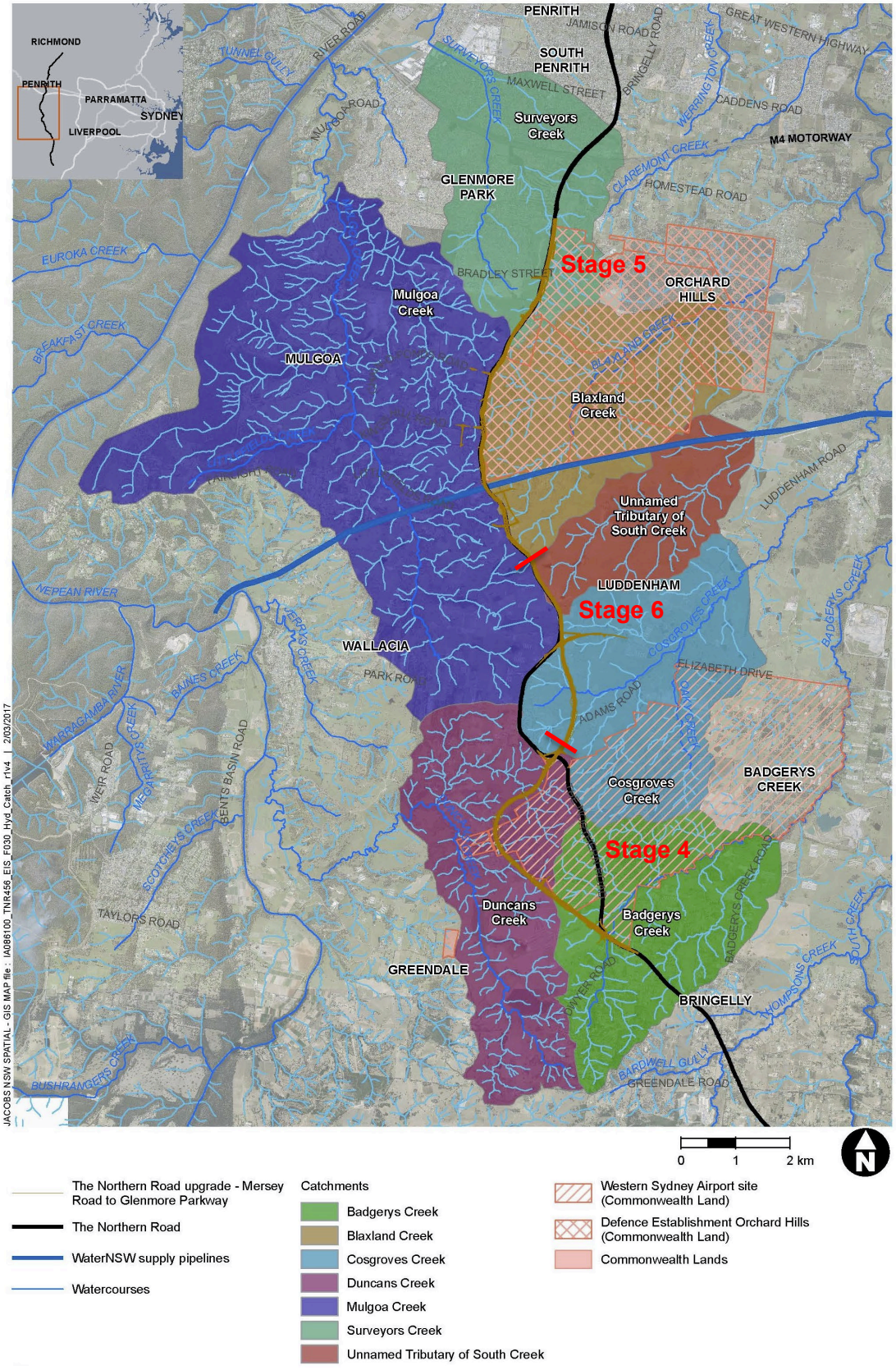

Figure 4-4: Catchments in the Project area

Source: EIS (Roads and Maritime, 2017)

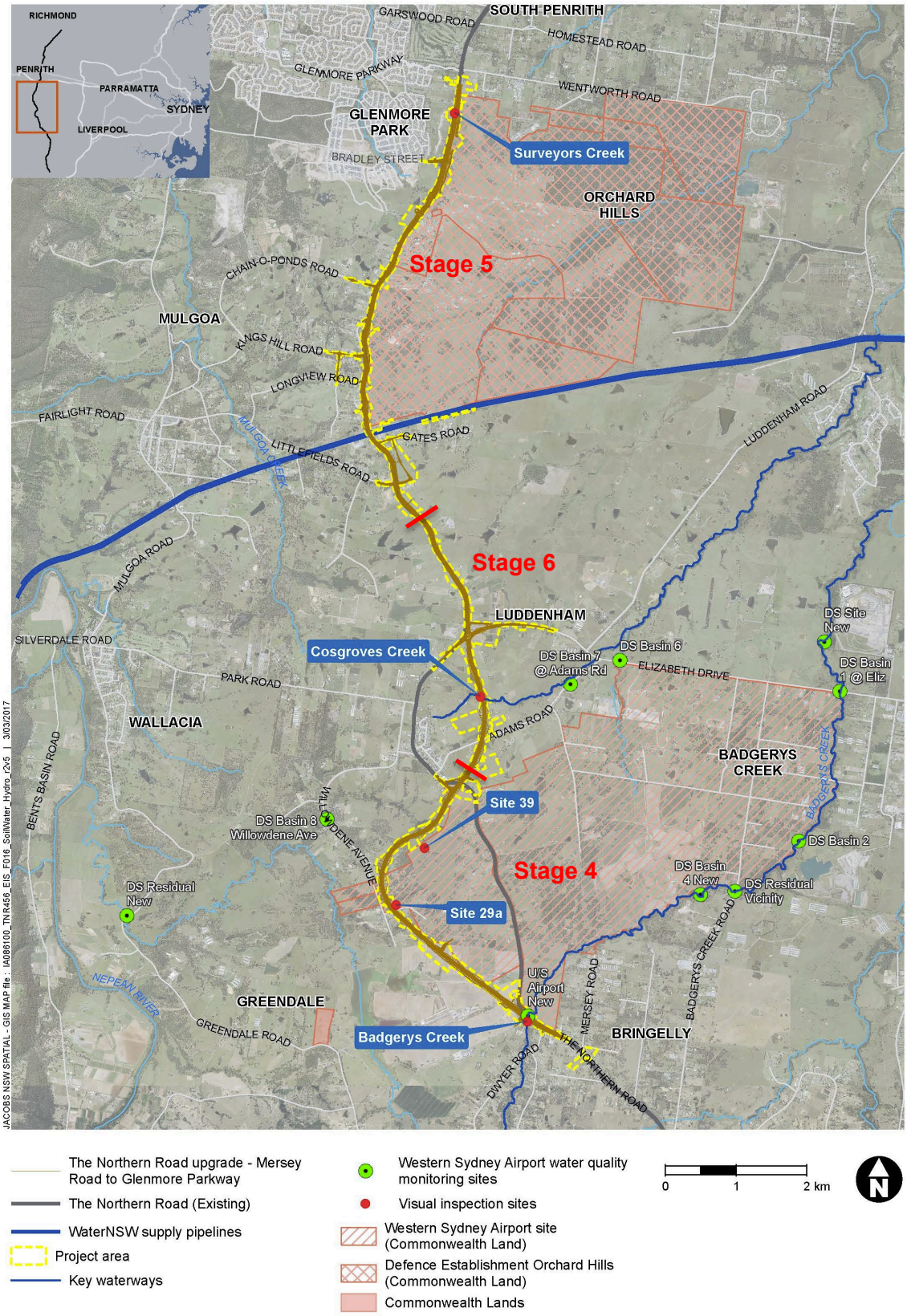

Figure 4-5: Key waterways in the Project area

Source: EIS (Roads and Maritime, 2017)

At the southern extent of the Project, The Northern Road crosses through the Badgerys Creek catchment before following a natural ridgeline that forms the catchment divide between the Cosgroves Creek and Duncans Creek catchments. North of Luddenham, The Northern Road also follows a natural ridgeline that forms the catchment divide between Mulgoa Creek, Duncans Creek, Cosgroves Creek, an unnamed watercourse and Blaxland Creek. The northern extent of the Project is located in the upper reaches of the Surveyors Creek catchment.

The catchments that contribute runoff to the existing transverse drainage of The Northern Road have generally been cleared of native vegetation, with the predominant ground cover being grass.

The Project will directly impact on three waterways: Badgerys Creek, Cosgroves Creek and Site 29a (an intermittent stream) (refer Figure 4-5). Badgerys Creek and Cosgroves Creek are classified as key fish habitat in the vicinity of the Project based on the DPI Fisheries key fish habitat mapping.

4.2.2 Geomorphology and river style

The geomorphology and hydrology of Badgerys Creek and Cosgroves 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 and Cosgroves Creek have 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.

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

4.2.3 Sensitive receiving environments

A sensitive receiving environment is defined as having a high conservation or community value and/or supports ecosystems or human uses of water that are particularly sensitive to pollution or degradation of water quality. The sensitive receiving waterways identified for the Project are:

- Badgerys Creek
- Cosgroves Creek
- 'Site 29a', an intermittent stream
- large dam at 'Site 39', fed by several minor 1st and 2nd order streams
- unnamed tributary of Surveyors Creek

Although Badgerys Creek and Cosgroves Creek are classified as key fish habitat in the vicinity of the Project, based on the DPI Fisheries key fish habitat mapping, the water quality of these waterways is generally poor to moderate and they are unlikely to support protected or threatened fish.

4.2.4 Surface water quality

A visual inspection of the three key waterways that traverse the Project area revealed the waterways to be of poor to moderate water quality condition as outlined in Table 4-2.

Table 4-2: Water quality condition based on a visual site inspection

Site	Water quality condition
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.
Cosgroves Creek	Water quality appeared to be poor, with a thick algae bloom, oily film and frothing present in some of the stagnant pools.
'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 three sites relevant to the Project (Cosgroves Creek, Duncans Creek and Badgerys Creek as shown on Figure 4-5) 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 4-3.

Table 4-3: Western Sydney Airport EIS water quality monitoring data (20th – 80th percentile results)

	ANZECC/ ARMCANZ (2000) trigger levels	HRC trigger values	D/S Basin 7 @ Adams Road(Cosgroves Creek)	D/S Basin 8 Willowdene Ave (Duncans Creek)	U/S Airport New (Badgerys Creek)
Physical, chemical and nutrients					
Conductivity (µS/cm)	200-300	-	2,283	2,277	2,250
pH (in situ)	6.5 - 8.5	-	7.5 - 8.0	7.8 - 8.1	7.4 - 7.8
Dissolved Oxygen (% sat)	85-110	-	20 – 54	40 - 59	12 - 30
Turbidity (NTU)	50	-	28	32	462
Suspended Solids (mg/L)	80	-	8	22	163
Ammonia (mg/L)	20	-	32	136	23,000
TN (µg/L)	350	700	1,400	1,780	11,861
TP (µg/L)	25	35	98	126	9,520
Chl-a (µg/L)	3	-	7	15	32
NOx (µg/L)	40	-	32	38	7,592
Metals					
Arsenic (mg/L)	0.0240		0.0018	0.001	0.0092
Cadmium (mg/L)	0.0002		0.00005	0.00005	0.00006
Chromium (mg/L)	0.0010		0.0008	0.0006	0.0032
Copper (mg/L)	0.0014		0.0072	0.0034	0.0704
Lead (mg/L)	0.0034		0.0006	0.0005	0.0032
Mercury (mg/L)	0.0019		0.00005	0.00005	0.00005
Nickel (mg/L)	0.0110		0.0032	0.0022	0.0154
Zinc (mg/L)	0.0080		0.005	0.009	0.124

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

As shown in Table 4-3, 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 the creeks varied but were generally elevated, particularly in Badgerys Creek, which had concentrations of some metals that exceeded the recommended limit for protection of aquatic species. The visual amenity of the creeks was generally poor. The waterways are 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 4-6. These sites are located on Surveyors Creek (sites SV1 and SV2), on Cosgroves Creek (sites CG1, CG2, CG3), other waterways and farm dams (sites SW39US, SW39DS, SW29AUS, SW29ADS, SW5), and on Badgerys Creek (site BG).

Legend

Northern Road Upgrade Construction Stage

- TNR4
- TNR5
- TNR6

Monitoring Sites

- Surface Water
- Groundwater

Surface Water

- Major River
- Perennial Creek
- Intermittent Creek
- Water Pipeline
- Waterbodies
- Approx Project Boundary
- Roads

TNR5 - Littlefields Road to Glenmore Parkway

TNR6 - Eaton Road to Littlefields Road

TNR4 - Mersey Road to Eaton Road

Surveyors Creek
Littlefields Creek
Mulgoa Creek
Warragamba - Prospect Water Pipeline
Jerrys Creek
Badgerys Creek

SV2
BH-G-116
SV1

BH29
CG1
BH28
CG2
BH26
CG3

39DS
BH19
39US
BH12
SW5
BH11
29aDS
29aUS
BH10
BH9
BH5
BG1

DRAFT

Paper Size ISO A3

0 0.25 0.5 0.75 1

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

0

GHD

Roads & Maritime Services
The Northern Road Upgrade
Stage 4, 5 & 6

Surface and Groundwater Monitoring Program Sampling Locations

Project No. 23-16168
Revision No. -
Date 27/03/2018

Figure 4-6

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Print date: 27 Mar 2018 - 17:34

Statistics from the baseline surface water monitoring and Project specific trigger values are provided in Attachment 1 of the MP (Annexure B). General observations on the baseline water quality in the vicinity of the Project are:

- 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 SV1** – This farm dam, on defence lands, associated with Surveyors Creek drainage channel, is quite poor in water quality, largely due to high EC, low DO and elevated nutrient concentrations. The site is also prone to Cyanobacterial growth.
- **Site SV2** – This site, which is on the western side of The Northern Road, is part of the flowing waterway, associated with Surveyors Creek. It recorded a low pH (acidic) in one instance, and was relatively moderate in EC, DO and nutrient concentrations. The site's propensity for Cyanobacterial growth is evident, due to elevated TP. Heavy metals (Cr, Cu and Zn) were also detected at the site, at concentrations, which occasionally exceeded the ANZECC Guidelines.
- **Sites CG1, CG2 and CG3** – These three farm dams, on Adams Road, are associated with the Cosgrove Creek drainage line. They are relatively large, and characterised by high EC and elevated nutrients. While DO levels are moderate (due to wind-driven turbulence and mixing), all three dams also contain the heavy metal pollutant Chromium, while Copper pollution is evident in CG1 and CG2. CG3 is particularly vulnerable to algal proliferation, because of high concentrations of readily-available, reactive P.
- **Sites SW39US and SW39DS** – These two farm dams, located within the Triple A Christmas Tree are also relatively poor in water quality, due to high EC, low DO and elevated nutrients.
- **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** – The southern-most, 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 MP (Annexure B) and compared to the site specific trigger values.

4.3 Groundwater

Three groundwater systems have potential to interact with the Project area:

- Localised perched aquifer systems - located in the shallow weathered shale and clay. Road cuttings may intercept incidental perched aquifers. The aquifer's flow is expected to be minor to negligible.
- Bringelly Shale regional shallow aquifer system - variable depth to the groundwater table across the Project area but expected to be approximately 30 metres below ground level (mbgl). The water quality in this aquifer unit is likely to be of poor quality, low hydraulic conductivity and of limited beneficial use for potable or domestic use.
- Hawkesbury Sandstone deeper semi-confined regional aquifer - at a depth of approximately 100 – 130 mbgl. This aquifer is of better quality than the shallow groundwater table and is more suitable for stock and domestic uses.

The perched and shallow regional aquifers are contained within the Wianamatta Group shales and are characterised by saline groundwater. These aquifers are generally not considered to be beneficial aquifers.

The regional water table has an approximate depth of 35 mbgl. If present, the shallow perched water tables are likely to be located at a depth of 2 - 30 mbgl. The shallow perched water tables are likely to be unconfined.

The deep groundwater system comprises the Hawkesbury Sandstone. Groundwater recharge is expected to primarily occur from rainfall and surface water interaction along the Lapstone Monocline to the west of the Project area. Faults in the area indicate that there may be enhanced connectivity between the shallow and deeper groundwater systems. However, the deep groundwater system is considered to behave as a confined aquifer.

There is limited groundwater use in the Project area due to the geological environment. One groundwater work was identified within the Project area, however data indicates that it is inactive.

There are no active Water Access Licences within 400 m of the Project area.

A review of existing databases and records found no listed high priority groundwater dependent ecosystems (GDEs) located in the Project area. None of the riparian zones in the Project area are considered to be GDEs.

Baseline data has been collected from groundwater monitoring sites from September 2017. Monitoring well locations are shown on Figure 4-6. Statistics from the baseline surface water monitoring and site specific groundwater trigger values are provided in Attachment 2 of the MP (Annexure B). General observations on the baseline water quality in the vicinity of the Project are:

- seasonable variability was demonstrated in groundwater quality parameters, in particular dissolved oxygen and temperature
- redox conditions ranged across the well network from reducing conditions to oxidising conditions
- no light non-aqueous phase liquid (LNAPL) was observed in any of the groundwater monitoring wells

- concentrations of total recoverable hydrocarbons (TRH fractions C16-C34 and C34-C40) were recorded above the laboratory limit of detection in monitoring well BH11.

4.4 Flooding

A description of existing flooding behaviour within the catchments traversed by the Project is provided in the following sections. The catchments are shown on Figure 4-4.

4.4.1 Badgerys Creek catchment

While the Badgerys Creek floodplain is relatively wide in the vicinity of where The Northern Road crosses the main arm of the creek, 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. Lot 94 DP654182 would be surrounded by floodwater during a 2 year ARI event and flood depths in the vicinity of the dwelling would increase to just over 1 m during a Probable Maximum Flood (PMF) event.

Higher hazard flooding conditions are generally confined to the farm dams and the incised reaches of the drainage system for events up to the 100 year ARI.

4.4.2 Duncans Creek catchment

Flooding behaviour in the Duncans Creek catchment is relatively shallow flow occurring along the various drainage lines where they run between the existing farm dams. The Project would impact several farm dams where the depth of ponding would be greater than 1 m.

Dwellings located in Lot 11 DP248069, Lot 104 DP884343 and Lot 105 DP884343 would be impacted by a PMF event.

While 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 confined nature of the floodplain in several areas results in hazardous flooding conditions being present across the full width of the flood affected area (land susceptible to flooding by a PMF event).

4.4.3 Cosgrove Creek catchment

Depths of ponding exceed 1 m in the various farms dams. Flow in the various drainage lines between each water storage is generally relatively shallow for events up to 100 year ARI. There are no existing dwellings that would be impacted by flooding for events up to the PMF.

High hazard flooding is generally confined to the farm dams and the incised reaches of the drainage system which are typically located downstream of the Project corridor for events up to the 100 year ARI.

4.4.4 Unnamed Tributary of South Creek Catchment

Flooding is limited to catchment runoff ponding along the upslope side of the existing Northern Road adjacent to the inlet of the existing transverse (or cross road) drainage structure.

4.4.5 Mulgoa Creek catchment

Flooding in this catchment is limited to runoff ponding along the upslope side of the road. Drainage swales have been constructed along the western side of the road corridor in the vicinity of the Chain-O-Ponds Road intersection, along which several pipes are located where it is crossed by local access driveways.

4.4.6 Blaxland Creek catchment

The section of The Northern Road that runs along the catchment divide between Blaxland Creek and Mulgoa Creek is not affected by mainstream or major overland flow. There is potential for runoff to pond adjacent to the inlet of the existing transverse drainage.

4.4.7 Surveyors Creek Catchment

Details of the existing stormwater drainage system in the DEOH were not available during preparation of the EIS. However it appears that several buildings located near the entrance to the site are subject to flooding during storms as frequent as the 2 year ARI.

Floodwater would surcharge The Northern Road for events larger than the 10 year ARI event, with approximately 200 m of the road adjacent to transverse drainage structure EXD6 inundated to a relatively shallow depth during a 100 year ARI event.

Several residential properties located on the western side of The Northern Road between Bradley Street and Glenmore Parkway would be subject to flooding during a 2 year ARI storm event.

During a PMF event, depths of inundation in the vicinity of several dwellings located on the western side of The Northern Road between Bradley Street and Glenmore Parkway would exceed 1 m.

4.5 Climate

The climate records from the Bureau of Meteorology's (BoM) Badgerys Creek automatic weather station (station number 067108) have been adopted to represent the historic climatic conditions at the Project site due to its proximity to the overall Project area and extent of available data (1995 to present). A summary of the monthly and annual BoM climate records is provided in Table 4-4 below.

Table 4-4: Monthly climate averages for Badgerys Creek AWS (Stn 067108)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years of record
Mean maximum temperature (°C)	30.1	28.8	26.8	23.9	20.7	17.8	17.4	19.2	22.6	24.9	26.4	28.5	23.9	1995-2018
Mean minimum temperature (°C)	17.1	17.1	15.2	11.4	7.7	5.6	4.1	4.7	7.7	10.4	13.5	15.5	10.8	1995-2018
Mean rainfall (mm)	79.4	98.5	81.3	50.9	38.3	61.8	23.6	36.8	32.3	51.4	69.0	57.1	680.9	1995-2018
Mean rain days (>1 mm)	7.0	7.3	7.4	5.9	3.9	5.4	3.9	3.5	4.6	5.5	6.9	6.6	67.9	1995-2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years of record
Mean 9 am wind speed (km/h)	9.4	8.7	8.4	9.8	9.6	9.1	9.6	10.6	11.7	11.8	11.0	9.8	10.0	1995-2010

The annual average maximum and minimum temperatures recorded at the Badgerys Creek weather station are 23.9°C and 10.8°C respectively. On average, January and February are the hottest months, with an average maximum temperature in January of 30.1°C. July is the coolest month, with an average minimum temperature of 4.1°C.

The annual average rainfall recorded at the weather station is 680.9 mm. Although variable throughout the year, the majority of the rainfall is recorded in late summer and early autumn. On average, February is the wettest month with 98.5 mm of rain falling during the month and >7 rain days recorded. July is generally the driest month, recording on average 23.6 mm of rainfall. Wind speeds are slightly higher during the spring months relative to the rest of the year, however on average, wind speeds are <10 km/h.

4.6 Rainfall erosivity factor

The rainfall erosivity factor is a measure of the ability of rainfall to cause erosion (referred to 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.

A number of sediment basins will be required for all three stages of the Project. The Contractors will identify the appropriate Rainfall Erosivity Factors from the Blue Book in the Contractors’ CSWMPs.

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
- construction in any acid sulfate soils
- site access
- culvert and drainage works
- removal / modification of existing built features
- riparian-based construction
- material stockpiles including the treatment of acid sulfate soil and rock
- 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 OACEMP.

5.2 Impacts

Potential impacts on soil and water depend primarily on the nature, extent and magnitude of construction activities and their interaction with the natural environment. Potential impacts attributable to Construction 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)
- disturbance of acid sulfate soils, creating the potential for oxidation of these soils and subsequent generation of acidic runoff
- 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
- a reduction in groundwater levels and flows, and 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.

Some impacts on soil and water attributable to the Project are anticipated. Relevant aspects and the potential for related impacts will be considered by the Contractors in the environmental risk assessment workshops to be conducted during the development of the Contractors' stage specific CEMPs, as described in Section 4.3.1 of the OACEMP.

Further details of impacts resulting from the Construction of the Project are provided in the sections below. Section 6 provides a suite of management measures that will be implemented by the Contractors to avoid or minimise those impacts.

5.2.1 Soil quality

Construction of the Project will require excavation works at cut and fill locations. Construction of culverts will also require a significant amount of earthworks. Stockpiling of excavated material, including spoil, will occur prior to re-use or off-site disposal.

Due to the high erodibility of the soils located within the Project area, there is potential for soil erosion and entrainment of soils in runoff, resulting in adverse impacts on surface water quality and sedimentation of waterways. Contaminants present in soils could reach waterways, leading to increased levels of nutrients, metals or other pollutants and adverse impacts on aquatic health.

5.2.2 Water quality

Erosion and sedimentation

A number of activities associated with Construction of the Project have the potential to cause sediment or contaminants to enter waterways, resulting in adverse impacts on the aquatic environment. The construction activities with the highest risks include:

- earthworks, including stripping of vegetation and topsoil, excavation or filling
- stockpiling of topsoil, vegetation and other construction materials
- transportation of cut or fill materials
- movement of heavy vehicles across exposed earth
- removal of riparian vegetation
- construction in any areas of highly erodible soils.

Increases in velocity in the receiving drainage lines could result in headwater and bank erosion and localised scour.

Loose fill has the potential to be eroded during rainfall events by runoff, thereby increasing the potential for mass movements of soils and sedimentation of local waterways. Mobilisation of sediments, waste materials, stockpiled material and chemicals associated with ancillary facilities during flood or wet weather events may also impact water quality.

Risks associated with construction activities adjacent to waterways include the potential to introduce contaminants or disturb contaminated materials, with adverse impacts on water quality and the health of aquatic life and aquatic ecosystems. A number of farm dams will require dewatering. Any dewatering activity has the potential to mobilise sediments and contaminants and increase the turbidity of receiving waterways.

Soils adjacent to waterways are identified as generally comprising fine sands, silt and clay, which are easily eroded and could cause siltation of the receiving waterways. This may occur during excavation and clearing of vegetation in riparian zones, which also have the potential to destabilise banks or cause tannins to leach into waterways, impacting water quality. Disturbance of riparian beds or banks may also occur during construction of temporary watercourse crossings. The disturbance of soil by machinery required for various construction activities could also increase the potential for soil erosion.

Spills and leaks

Spills and leaks of fuel, oils and other chemicals from construction plant and equipment may result in impacts on water quality of waterways downstream of the works. The incorrect storage of fuel, oils and other chemicals could also result in impacts on water quality.

5.2.3 Flooding behaviour

The earthworks, drainage works and other civil works required for the Project will result in changes to drainage and flooding behaviour in the catchments in which the Project is located.

A flood event may impact on the Project during Construction, however the impact will depend on the stage of construction at the time of the event and the intensity of the rainfall event. 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.

Construction compounds and materials stockpiles may also increase potential runoff to catchments in the Project area. Buildings and structures associated with site compounds may obstruct flows and reduce storage capacity or divert flows into sensitive areas where increased flow velocities can cause scour and erosion. These effects may be exacerbated by large areas of cleared land or exposed soil.

Earthworks or other construction activities may result in existing drainage infrastructure becoming partially blocked or temporarily diverted. Blocking or diverting of local drainage lines may result in local flooding upstream of the construction areas. Diverting drainage lines may also create local areas of flooding and scour.

5.2.4 Contamination

The potential for widespread contamination within the Project area as result of past and present land use activities is generally considered to be low. However, contaminated material may be disturbed through construction activities. Excavation has the greatest potential to disturb contaminated material. This may result in release of contaminants into underlying soils, groundwater or mobilisation to surface water, which could transport contaminants into receiving waterways.

Further detail regarding contaminated land impacts is included in the CCLMP (refer Appendix B8 of the OACEMP)

There is potential for chemical and fuel spills to occur during Construction which may result in localised contamination of soils.

Hazardous materials, including asbestos, may be encountered during the demolition of built structures and could enter waterways if not managed.

5.2.5 Groundwater

Impacts to groundwater levels, flows and connectivity, groundwater chemistry and aquifers due to Construction are expected to be negligible to minor.

There is a minor potential for spills or leaks to allow oil and grease contamination to enter shallow aquifers. Any petroleum hydrocarbon spill from construction machinery has the potential to seep into the shallow groundwater system.

6 Environmental mitigation and management measures

A range of environmental requirements and management measures are identified in the EIS and SPIR, the conditions of approval and relevant Roads and Maritime documents.

Specific measures and requirements to address soil and water quality impacts are provided in Table 6-1.

Table 6-1: Soil and water revised environmental management measures

ID	Measure / requirement	When to implement	Responsibility	Applicability					Reference
				Stage 4		Stage 5		Stage 6	
				Cth	NSW	Cth	NSW	NSW	
SWC-1	A Soil and Water Management Plan (SWMP) would be developed in accordance with the Roads and Maritime specification G38 – Soil and Water Management and the Blue Book – *Soils and Construction – Managing Urban Stormwater Volume 1* (Landcom, 2004) and Volume 2D (DEC, 2008a). The SWMP would include but not be limited to:	Pre-Construction Construction	Contractor Environmental Site Representative / Soil Conservationist	✓	✓	✓	✓	✓	This CSWMP
	• An erosion and sedimentation control plan and maintenance schedule for ongoing maintenance of temporary erosion and sediment controls	Construction	Contractor Environmental Site Representative / Soil Conservationist	✓	✓	✓	✓	✓	Section 6.1 Annexure F Contractors' ESCPs
	• A Sediment Basin Management Plan to guide appropriate management of runoff during construction and operation	Construction	Contractor Environmental Site Representative / Soil Conservationist	✓	✓	✓	✓	✓	Section 6.2 Annexure C Contractors' Sediment Basin Management Plans
	• An incident emergency spill plan which would include measures to avoid spillages of fuels, chemicals and fluids onto any surfaces or into any nearby waterways	Construction	Contractor Environmental Site Representative	✓	✓	✓	✓	✓	Section 6.12 Contractors' Emergency Spill Management Plans

ID	Measure / requirement	When to implement	Responsibility	Applicability					Reference
				Stage 4		Stage 5		Stage 6	
				Cth	NSW	Cth	NSW	NSW	
	• Preparation of a wet weather rain event procedure which includes a process for monitoring potential wet weather and identification of controls to be implemented in the event of wet weather	Construction	Contractor Environmental Site Representative	✓	✓	✓	✓	✓	Sections 6.13, 6.14, Contractors' Flood Event Contingency and Emergency Plans Contractors' Wet Weather Event Procedure
	• Provision of a maintenance schedule for ongoing maintenance of erosion and sedimentation controls	Construction	Contractor Environmental Site Representative / Soil Conservationist	✓	✓	✓	✓	✓	Sections 6.1, 7.5.2 Annexure F Contractors' ESCPs
	• A review process by a soil conservationist and a process for updating the report to address any recommendations	Construction	Contractor Environmental Site Representative / Soil Conservationist	✓	✓	✓	✓	✓	Sections 6.1, 8 Annexure F Contractors' ESCPs
	• A stream and farm dam dewatering plan to be prepared include: ◦ A map showing locations of streams and farm dams to be dewatered and the selected relocation sites ◦ Fisheries Permit and Animal Care and Ethics requirements ◦ Methodology for dewatering streams and dams with consideration to aquatic ecology	Construction	Contractor Environmental Site Representative / Contractor Project Ecologist	✓	✓	✓	✓	✓	Section 6.6 Contractors' Farm Dam Dewatering Plans Appendix B2 – CFFMP

ID	Measure / requirement	When to implement	Responsibility	Applicability					Reference
				Stage 4		Stage 5		Stage 6	
				Cth	NSW	Cth	NSW	NSW	
	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.								
SWC-2	A water quality monitoring program would be developed during detailed design which would outline the pre-construction baseline water quality monitoring to be undertaken, as well as the ongoing construction and operational water quality monitoring requirements. The program would be updated once the construction and operational phase water quality monitoring parameters have been determined (based on the results of the baseline water quality monitoring). The program would include specific monitoring locations, frequency, parameters, and relevant procedures to be implemented. This would include a procedure to be followed in the event that monitoring results during construction or operation indicate an exceedance of the specified criteria, including any stop works requirements, relevant non-conformance, corrective and preventative actions, reporting and review procedures. This would include a requirement to review the effectiveness of control measures and identify any potential additional controls or revised work procedures or management measures that may need to be implemented. It is noted that any sample	Pre-Construction Construction	Roads and Maritime / Contractor Environmental Site Representative	✓	✓	✓	✓	✓	Section 7.5.1 Annexure B

ID	Measure / requirement	When to implement	Responsibility	Applicability					Reference
				Stage 4		Stage 5		Stage 6	
				Cth	NSW	Cth	NSW	NSW	
	locations or access requirements within the DEOH site would be determined in consultation with Department of Defence (DoD).								
SWC-3	The realignment of the tributary of Surveyors Creek would be progressively stabilised to avoid potential scour and sedimentation and permanent stabilisation measures would be implemented as soon as practicable. The permanent stabilisation measures would consist of soft engineering solutions where reasonable and feasible and the realigned creek would mimic a natural creek system of the local area. The riparian corridor along either side of the realigned creek would be rehabilitated in accordance with the Vegetation Management Plan to be developed for the project in accordance with the DPI Water guidelines.	Construction	Contractor Environmental Site Representative / Soil Conservationist / Contractor Project Manager			✓	✓		Urban Design and Landscape Plan (separate document) Vegetation Management Plan (separate document)
SWC-4	Appropriately sized sediment basins would be designed, implemented and managed during construction in accordance with the requirements of the Blue Book. Temporary sediment basins would be located outside of the riparian corridor where possible.	Construction	Contractor Soil Conservationist / Contractor Construction Manager	✓	✓	✓	✓	✓	Section 6.2 Annexure C Annexure F Contractors' ESCPs
SWC-5	Durability and aggressivity samples of soil material would be collected and analysed prior to the construction phase, to determine potential impacts of soil salinity on pavement infrastructure.	Pre-Construction	Roads and Maritime	✓	✓	✓	✓	✓	Annexure B

ID	Measure / requirement	When to implement	Responsibility	Applicability					Reference
				Stage 4		Stage 5		Stage 6	
				Cth	NSW	Cth	NSW	NSW	
SWC-6	Erosion and sediment controls would be implemented before construction starts in accordance with Blue Book requirements: • Sediment basins would be regularly serviced and maintained to comply with water quality and capacity requirements • Clearing of vegetation and site stabilisation of disturbed areas would be undertaken progressively to limit the time disturbed areas are exposed to erosion prices • High risk soil and erosion activities such as earthworks would not be undertaken immediately before or during high rainfall or wind events • Stockpiling of topsoil separately for potential reuse in landscaping and rehabilitation works • Permanent catch drains would be installed behind cut faces to act as diversion drains during the construction phase • Erosion and sediment control measures would be maintained until the works are complete and areas are stabilised by revegetation	Pre-Construction	Contractor Soil Conservationist / Contractor Construction Manager	✓	✓	✓	✓	✓	Section 6.1 Annexure F Contractors' ESCPs Section 6.3 Annexure D Stockpile Management Procedure
SWC-7	A soil conservationist from Roads and Maritime Erosion, Sedimentation and Soil Conservation Consultancy Services would be engaged to review the erosion and sedimentation plans and conduct routine inspections of the construction works.	Pre-Construction	Contractor Construction Project Manager / Contractor Soil Conservationist	✓	✓	✓	✓	✓	Sections 6.1, 7.1.1 Annexure F Contractors' ESCPs

ID	Measure / requirement	When to implement	Responsibility	Applicability					Reference
				Stage 4		Stage 5		Stage 6	
				Cth	NSW	Cth	NSW	NSW	
SWC-8	All fuels, chemicals, and liquids would be stored at least 50 m away from the existing stormwater drainage system and would be stored in an impervious bunded area within the compound site. The refuelling of plant and maintenance machinery would be undertaken at least 50 m from waterways with appropriate spill containment mechanisms in place such as impervious bunding and the provision of spill kits nearby. Vehicle wash downs and/or concrete truck washouts would be undertaken within a designated bunded area of an impervious surface or undertaken off-site. Disposal of dam water would be done in accordance with the stream and farm dam dewatering plan.	Construction	Contractor Construction Manager/ Contractor Environmental Site Representative	✓	✓	✓	✓	✓	Sections 6.6, 6.10 Contractors' Dewatering Procedures Annexure F Contractors' ESCPs
SWC-9	It is not expected that specific controls for groundwater would be required. This is primarily due to the low to very low permeability of Wianamatta Shale and subsequently minor to negligible extent of drawdown and negligible seepage through identified road cuttings. The expected groundwater inflows are anticipated to be in the order of 0.1 L/s/km of cuttings, although probably much less. It is considered prudent that if groundwater is encountered during excavation works the groundwater monitoring plan should be implemented.	Construction	Contractor Environmental Site Representative	✓	✓	✓	✓	✓	Annexure B

ID	Measure / requirement	When to implement	Responsibility	Applicability					Reference
				Stage 4		Stage 5		Stage 6	
				Cth	NSW	Cth	NSW	NSW	
SWC-12	There would be no stockpiling of soil or construction materials within utility easement corridors.	Construction	Contractor Environmental Site Representative / Contractor Superintendent	✓	✓	✓	✓	✓	Section 6.3 Annexure D Contractors' Stockpile Management Protocols
HR-2	Storage of dangerous goods and hazardous materials would occur in accordance with suppliers' instructions and relevant Australian Standards and may include bulk storage tanks, chemical storage cabinets / containers or impervious bunds.	Construction	Contractor Environmental Site Representative /Contractor Superintendent	✓	✓	✓	✓	✓	Section 6.10
HR-3	Storage, handling and use of dangerous goods and hazardous substances would be in accordance with the *Work Health and Safety Act 2011* and the *Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005).*	Construction	Contractor Environmental Site Representative /Contractor Superintendent	✓	✓	✓	✓	✓	Section 6.10
HR-4	Secure, bunded areas would be provided around storage areas for oils, fuels and other hazardous liquids	Construction	Contractor Environmental Site Representative /Contractor Superintendent	✓	✓	✓	✓	✓	Section 6.10
HR-5	Material Safety Data Sheets would be obtained for dangerous goods and hazardous substances stored onsite prior to their arrival.	Construction	Contractor Environmental Site Representative /Contractor Superintendent	✓	✓	✓	✓	✓	Section 6.10

ID	Measure / requirement	When to implement	Responsibility	Applicability					Reference
				Stage 4		Stage 5		Stage 6	
				Cth	NSW	Cth	NSW	NSW	
CI-2	Where relevant, consultation would be undertaken with proponents of other nearby developments to increase the overall awareness of project timeframes and impacts	Construction	Contractor Construction Project Manager	✓	✓	✓	✓	✓	CCS Section 7.2 Contractors' CSWMPs
AQ-3 EPL O3.2	Ensure that all loads are covered when materials are being hauled to and from site	Construction	Contractor Construction Project Manager	✓	✓	✓	✓	✓	Contractors' CSWMPs
EPL O4.11	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	Contractor Construction Project Manager	✓	✓	✓	✓	✓	Contractors' CSWMPs

6.1 Erosion and sediment control

Temporary erosion and sediment control measures will be installed to protect water quality on the Project. Controls and management measures will be designed (stability, location, type and size), constructed, operated and maintained in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) and *Managing Urban Stormwater – Soils and Construction, Volume 2D, Main road construction* (DECC, 2008). The Contractors will provide details of location, design and maintenance of erosion and sediment control measures in the Contractors' ESCPs, as part of the Contractors' CSWMPs.

ESCPs are planning documents that show the site layout and the location of erosion and sediment control structures on site. They cover all construction stages from initial vegetation clearing through to rehabilitation when erosion and sediment control are no longer required and are removed. The purpose of erosion and sediment controls is to:

- control and divert the drainage from all areas that will mobilise suspended solids when stormwater runs over these areas through appropriate erosion and sediment control measures to prevent sediment moving off-site and sediment laden water entering any watercourse, drainage lines, or drain inlets
- minimise the area of the site that is able to generate suspended material when water runs over it
- reduce water velocity and capture sediment on-site
- minimise the amount of material transported from site to surrounding pavement surfaces
- maximise the diversion of run-on waters from lands upslope and around the site whilst land disturbance activities are being undertaken
- divert clean water around the site.

Concept ESCPs have been prepared for each stage of the Project and are included at Annexure F of this overarching CSWMP. The Contractors will prepare stage-specific ESCPs for inclusion in the Contractors' CSWMPs. The Contractors' ESCPs will be prepared by a suitably qualified person and reviewed by a soil conservationist registered with Roads and Maritime Services category S1 or higher. Recommendations made by the soil conservationist will be incorporated into the final ESCP or where not incorporated, the reasons why must be justified.

ESCPs will be developed and implemented by the Contractors prior to commencing activities. The Contractors will progressively modify and revise the ESCPs due to changes in the Construction program, change in work methods, or whenever the work methods and control structures are found to be ineffective or are no longer required. The current ESCPS will be available for inspection and review during the weekly environmental inspections.

The ESCPs will identify all erosion and sediment control risks and describe how these will be addressed during Construction. The ESCP will include details of the following where relevant:

- erosion and sediment control measures required:
    - before clearing and grubbing
    - before removal of topsoil and commencement of earthworks within the catchment area

- how upstream water will be managed and diverted around disturbed areas so it is not polluted by the construction activities
- method of tree removal in intermittent watercourses, leaving grasses and small understorey species undisturbed wherever possible
- scour protection measures for haul roads and access tracks when these are an erosion hazard due to either their steepness, soil erodibility or potential for concentrating runoff flow
- measures for promptly stabilising disturbed areas and temporary drains
- measures to minimise erosion during construction of embankments
- measures to minimise erosion and control sedimentation from stockpiles
- methods of constructing batters to assist the retention of topsoil on the batter slopes
- measures to temporarily trap sediment in median areas at regular intervals
- controls in runoff flow paths to reduce flow velocities and minimise the potential for erosion
- measures for controlling waste water discharge on or around the site from dewatering, surface washing, grit blasting, saw cutting, drilling, washing vehicles and plant and any other activities which add pollutants to water
- measures to be put in place during an extended shut-down of the site or when rainfall above a certain trigger level is predicted
- maintenance of erosion and sediment control structures including measures to restore their capacity
- inspection and auditing program for all erosion and sediment controls to ensure that no disturbed area is left without adequate erosion and sediment controls
- mapping and description of locations of construction sediment retention basins, their catchments and drainage structures directing water to the basins
- measures to be implemented to ensure that the use of operational water quality swales during construction for the temporary diversion of on-site construction water do not reduce their operational effectiveness
- controls to be implemented at entry and exit points to minimise tracking of soil and particulates onto pavement surfaces
- removal of any materials transported onto adjacent road pavement surfaces such as sweeping as soon as practical or at a minimum at the end of each working day
- additional controls to be implemented ahead of forecast rainfall events and ahead of site shutdown of greater than two calendar days
- staged plans for Construction over minor waterways where culverts and/ or bridges will be constructed
- measures to manage contaminated soil and/or water that may be present and/or identified during the implementation of erosion and sediment control measures.

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).

The ESCPS will include drawings showing all controls required to avoid erosion and sedimentation of the site, surrounding areas, watercourses, drainage systems, water bodies and wetlands. The drawings will be regularly updated as the site conditions changes during Construction. The drawings will include Construction boundaries, environmentally sensitive areas and exclusion zones locations of all ancillary activities and/or areas and activities that may impact on water quality, such as:

- access and haulage tracks
- borrow pits
- stockpile and storage areas
- temporary work areas
- materials processing areas
- compound areas
- concrete and asphalt batching areas and location(s) of concrete washouts
- known (or discovered areas) of contamination.

6.2 Sediment basin management

Up to 50 temporary sediment basins will be required throughout the Project area during Construction. In order to minimise the number of sediment basins, and the impact of the construction of these basins on the environment, the criteria of 'Minimum 150 m^3 of annual sediment loss has been adopted, as per the guidelines in *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004).

Sediment basins will be appropriately designed by the Contractors to avoid seepage out of the basins, to ensure sufficient drainage including provision for emergency spillways, to incorporate water quality structures and exclusion fencing and to allow for easy maintenance. Sediment basin design will be consistent with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004). The Contractors will prepare design drawings and an accompanying report for each sediment basin and connecting drainage for review by the soil conservationist prior to submission for approval to the Roads and Maritime Environmental Manager (or delegate) at least 14 working days before commencing construction of a sediment basin. The location of sediment basins and associated drainage and structures will be identified in the Contractors' ESCPs.

The Contractors will prepare and implement a stage-specific Sediment Basin Management Plan prior to commencement of Construction in accordance with the requirements of *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004), Roads and Maritime specifications and the template Sediment Basin Management Plan provided in Annexure C of this CSWMP. The purpose of the Sediment Basin Management Plan is to identify risks relevant to the design and implementation of sediment basins.

The Sediment Basin Management Plan will include, but not be limited to:

- measures to manage the location and construction of sediment basins
- steps to be taken prior to any discharge
- discharge water quality criteria

- actions to be taken for water management
- removal of sediment basins and rehabilitation of disturbed land
- inspection, monitoring and maintenance of sediment basins.

The Contractors' Sediment Basin Management Plans will be reviewed by Roads and Maritime for consistency with the requirements of this overarching CSWMP, the CoA and the REMMS and appended to the Contractors' CSWMPs.

Sediment basins will be inspected at least monthly by a soil conservationist on the Roads and Maritime list of Registered Contractors for Erosion, Sedimentation and Soil Conservation Consultancy Services.

The Contractors will remove the temporary sediment basins at the end of Construction and will rehabilitate and landscape the disturbed land, unless otherwise agreed in consultation with the landowner.

6.3 Stockpile management

The Contractors will prepare and implement a stage-specific Stockpile Management Protocol prior to commencement of Construction in accordance with the requirements of *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004), Roads and Maritime *Stockpile Site Management Guideline, Roads and Maritime* specifications and the template Stockpile Management Protocol provided in Annexure D of this CSWMP. 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 will include, but 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.

The Contractors' Stockpile Management Protocols will be reviewed by Roads and Maritime for consistency with the requirements of this overarching CSWMP, the CoA and the REMMS and appended to the Contractors' CSWMPs.

As this CSWMP contains a Stockpile Management Protocol, any material stockpile area located **within** the Construction footprint will not be considered to be an ancillary facility. Conversely, any stockpile located **outside** of the Construction footprint will be deemed to be an ancillary facility and therefore CoA-NSW A16 will apply, the stockpile will be included in the AFMP and will be subject to approval. The criteria in NSW-CoA A15 will also apply to its location.

Spoil management is addressed in Appendix B7 Construction and Waste and Energy Management Plan.

6.4 Tannin management

The procedure to manage the use and stockpiling of mulch on construction sites, including how the risk of tannin leachate flowing into waterways will be reduced, is included in the template Management of Tannins from Vegetation Mulch Procedure (refer to Annexure E).

6.5 Water extraction management

Water for the Project will not be extracted from waterways. Water for Construction may be sourced from sediment detention basins, stormwater, recycled water or other water sources to avoid the use of potable water, where feasible.

The Contractors' ESCPs will identify the source of water for construction activities. The Contractors will ensure all necessary approvals and licences for water extraction are obtained prior to commencement of Construction.

6.6 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. The Contractors will plan dewatering activities to minimise erosion and pollution of the environment.

The Contractors will prepare a stage-specific Dewatering Procedures for inclusion in the Contractors' CSWMPs. The Contractor's Dewatering Procedure will be developed in accordance with the *Technical Guideline Environmental Management of Construction Site Dewatering* (RTA, 2011). The Contractors 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 Procedure will include provision for re-use of water to be removed for Construction of the Project, where possible. The Contractor will endeavour to maximise the reuse of captured stormwater on the site.

The Contractors' Dewatering Procedure will detail as a minimum:

- a map showing areas that will require dewatering (including farm dams)
- detailed description and justification of all selected dewatering methods (dewatering is to generally occur over a number of days to allow native fauna to relocate)
- description of onsite water reuse requirements
- a map showing proposed discharge locations for any offsite discharge
- details of licences and other water quality requirements for disposals
- design requirements for each offsite discharge location to prevent erosion at the discharge location or in the receiving environment
- water quality objectives relevant to the type of dewatering activity
- description of the water quality treatment techniques to be used
- measures to prevent potential release and potential disposal of exotic aquatic fauna/ flora and pathogens during dewatering into other waterbodies

- water sampling and testing regime to validate water quality prior to and (if required) during dewatering, including to establish appropriate waste disposal methods
- procedures to manage dewatering should construction activities encounter groundwater or contaminated water
- procedures for fauna (including fish) relocation (if required) through the use of a suitably qualified ecologist.

The Contractors will prepare Farm Dam Dewatering Plans as part of the Dewatering Procedures that will include:

- a map showing locations of farm dams to be dewatered
- measures for consulting with property owners regarding dam dewatering
- Fisheries Permits and animal care and ethics requirements
- 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 Farm Dam Dewatering Plan will be 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. The Contractors will also 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 Contractors will keep records of the following and make them available to Roads and Maritime:

- dewatering procedure
- 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 Procedure.

6.7 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 Contractors will schedule work in waterways 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.

The Contractor will prepare EWMS 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).

The EWMS will be prepared in consultation with the Roads and Maritime Environmental Manager (or delegate) and the Environmental Review Group (ERG) if appropriate.

Contractors will forward the draft EWMS to the ER and the Roads and Maritime Environmental Manager (or delegate) for review at least 21 working days prior to commencement of the Works and any Temporary Work referred to in the EWMS. Changes to EWMS must be advised to the ER and the Roads and Maritime Environmental Manager (or delegate) prior to the change being adopted.

A template EWMS consistent with the requirements of Roads and Maritime Specification G36 is provided in Appendix A5 of the OACEMP.

6.8 Temporary waterway crossings

Temporary waterway crossings will be required for the Project. The Contractors will design, construct and maintain temporary waterway crossings consistent with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) and in consultation with DPI Fisheries. Temporary waterway crossings will be designed and constructed to minimise impacts on natural flow regimes and to not present any barriers. The appropriate types of waterway crossings are identified in the Construction Flora and Fauna Management Plan (refer Appendix B2 of the OACEMP).

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 Contractors' ESCPs (refer Section 6.1).

6.9 Contaminated land management

Contaminated land will be managed in accordance with the measures outlined in the CCLMP (Appendix B8 of the OACEMP).

6.10 Refuelling, washdown 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. The Contractors will obtain Material Safety Data Sheets (MSDS) for dangerous goods and hazardous substances prior to their arrival on site. The Contractors 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.

The Contractors 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. The Contractors will implement 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.

6.11 Pollution incident response management

The Contractors will prepare a Pollution Incident Response Management Plan (PIRMP) as part of the Contractors' CSWMPs.. The PIRMP will be prepared prior to commencement of Construction 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.

The Contractors' PIRMPs will include 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 will also set 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.

6.12 Spill prevention and response

The Contractors will prepare stage-specific Emergency Spill Response Plans in accordance with the *Code of Practice for Water Management* (RTA, 1999) and relevant EPA guidelines. The Plan may form part of the PIRMP. The Emergency Spill Response Plans will:

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

The Contractors will ensure emergency spill kits are available on site at all times during Construction. 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.

The Roads and Maritime Environmental Incident Classification and Reporting Procedure will also be implemented (refer to Appendix A7 of the OACEMP) in conjunction with the Contractors' PIRMP and Emergency Spill Response Plan.

6.13 Flood risk planning

The Contractors will prepare Flood Event Contingency and Emergency Plans to manage potential flood events during Construction of the Project. The Flood Event Contingency and Emergency Plans will outline 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 will consider the likelihood of flooding, evacuation routes, warning times, and potential impacts from the site flooding. The Contractors will develop the plans in consultation with emergency services, local Councils and other relevant authorities.

The Contractors' Flood Event Contingency and Emergency Plans will be prepared in accordance with the outline provided in Table 6-2.

Table 6-2: Flood Event Contingency and Emergency Plan outline

Step	Description
Assessment of flood risk and impact	• Flood risk assessment • Flood impact assessment • Flood evacuation routes and procedure, including maps

Step	Description
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.

6.14 Wet Weather Event Procedure

Contractors will develop Wet Weather Event Procedures to detail the actions to be taken in the event of forecast of a heavy or violent rainfall, storm event, or flooding event. The Procedure outlines how Contractors will prepare the construction site to minimise the impacts of weather events. Weather monitoring is detailed in the Construction Water, Soil and Contamination Monitoring Program (refer to Annexure B).

The Contractors will outline the procedure to be undertaken in the event of forecast storm events, heavy rainfall or flooding events, including:

- inspection of the site to ensure that all erosion/sedimentation and stabilisation controls are in place and in effective working order
- ceasing all work in the vicinity of flood-prone areas
- collection of all loose materials and wastes
- actions to be taken to prevent any environmental incidents such as potential pollution incidents
- measures to be implemented to protect disturbed ground from erosion
- relocation of materials that could cause harm onto higher ground and away from flood prone areas
- wet weather site shutdown checklist.

6.15 Flood and work as executed information

The Contractor and Roads and Maritime will undertake defects inspections with Council to ensure work as executed is to design specification.

Once defects have been closed out, the Contractor 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 the Contractor will also supply flood reports, models and geographic information system outputs to the relevant Council and the SES

Roads and Maritime will notify the relevant 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 the relevant Council or the SES no later than six months following the completion of Construction or within another timeframe agreed with the relevant Council and the SES.

6.16 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.

The Contractor 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 Compliance management

7.1 Roles and responsibilities

The Project organisational structure and overall roles and environmental responsibilities are outlined in Section 5.1 of the OACEMP. Specific responsibilities for the implementation of soil and water management are detailed in Section 6 of this CSWMP.

7.1.1 Soil Conservationist

The Contractors will engage a suitably experienced external 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.

The Contractors will include details of the role, qualifications, responsibilities and contact details of the Contractor's Soil Conservationist and identify the critical site activities that require the presence of the Soil Conservationist in the Contractors' CSWMPs.

The Contractor's Soil Conservationist will review and advise on the Contractors' CSWMPs and provide specialised training to relevant site personnel. The Contractor's Soil Conservationist will liaise on a regular basis with any soil conservationist appointed for the Project by Roads and Maritime Services.

Roads and Maritime may also engage a suitably qualified CPESC for the Project to provide independent advice to Roads and Maritime.

7.2 Communication

Roads and Maritime will prepare and implement 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 will identify opportunities and tools for providing information and consulting with the community and stakeholders during the Construction of the Project. The Contractors will support the delivery of the CCS.

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 OACEMP.

7.3 Complaints management

Roads and Maritime will develop a Complaints Management System (CMS) to document the overall approach to complaints management for the Project. The Contractors will adopt the requirements of the CMS, including reporting requirements. The CMS will include a Complaints Register which will record the details of all complaints relating to the Project.

Further detail about the CMS is provided in Section 5.5.3 of the OACEMP.

7.4 Training

To ensure that this CSWMP is implemented effectively, all site personnel (including sub-contractors) will undergo site induction training relating to soil and water management issues prior to Construction commencing. The induction training will address elements related to soil and water management, including:

- existence and requirements of this overarching CSWMP, the Contractor's CSWMP and all plans and procedures prepared under the CSWMPs
- 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
- the location of ASS or PASS
- water quality management and protection measures
- groundwater issues
- spill response.

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 or those undertaking an activity with a high risk of environmental impact. Site personnel will undergo refresher training at not less than six monthly intervals. The Contractor's Soil Conservationist will provide assistance in training in regard to erosion and sediment control issues.

The ER will review and approve the induction and training program prior to the commencement of Construction and monitor implementation.

Daily pre-start meetings conducted by the Contractor Foreman 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.

Further details regarding staff induction and training are provided in Section 5.3 of the OACEMP.

7.5 Monitoring and inspection

7.5.1 Monitoring

An overarching Construction Water, Soil and Contamination Monitoring Program has been prepared in accordance with NSW-CoA C9(d) and is provided in Annexure B.

Monitoring will include, but not be limited to:

- monitoring in accordance with the requirements of the Construction Water, Soil and Contamination Monitoring Program (Annexure B)
- construction sediment basin water quality prior to discharge (Annexure B)
- regular visual monitoring of local water quality (ie for plumes of turbidity and hydrocarbon spills/slicks) to identify any potential spills or deficient controls when working in or near waterways
- monitoring and management of spoil, fill and materials stockpile sites including details of how spoil, fill or material will be handled, stockpiled, reused and disposed
- weekly and post rainfall inspections to evaluate the effectiveness of erosion and sediment controls measures in accordance with Section 6.1.1 of the OACEMP
- monitoring of the effectiveness of erosion and sediment control actions and measures during Construction in accordance with the Contractors' ESCPs. The type, timing, frequency, assessment criteria and associated reporting requirements will be detailed in the ESCP.

7.5.2 Inspections

Regular inspections of sensitive areas and activities will occur for the duration of the Project. The Contractor Environmental Site Representatives will carry out weekly site inspections. Roads and Maritime will also conduct independent inspections to confirm the Contractors' compliance with soil and water management requirements.

Weekly and other routine inspections by the Roads and Maritime Environmental Manager (or delegate), ERG representatives and the ER will occur throughout Construction. Detail on the nature and frequency of these inspections are documented in Section 6.1 of the OACEMP.

Roads and Maritime will engage a Soil Conservationist to conduct regular inspections of the Project during Construction. The Contractors will ensure appropriate environmental site personnel are available to induct, guide and accompany the Soil Conservationist on the inspections and to promptly rectify any deficiencies raised. The Contractors will advise the Roads and Maritime Environmental Manager (or delegate) of actions being taken, in accordance with the priorities nominated in the Soil Conservationist's Environmental Inspection Report. The report will state the priority of the rectification works. The Contractors will rectify the actions listed within the inspection report within the following priority timeframes:

- immediate: on day of inspection
- high: within 24 hours of inspection
- medium: within three working days of inspection
- low: within three working days of inspection.

Proposed inspections to be carried out by Contractors that are relevant to soil and water are contained in Table 7-1.

Table 7-1: Soil and water inspections

Inspection	Responsibility	Frequency
Inspect all plant and equipment daily for leakages of fuel, oil or hydraulic fluid. Repair any leaks before using item of plant or equipment. Maintain records of plant inspections	Contractor Environmental Site Representative Contractor Foreman	Daily
Inspect all stockpile sites	Contractor Environmental Site Representative Contractor Foreman	Weekly
Inspection of managed bunded areas, erosion and sediment controls as part of the weekly environmental inspection.	Contractor Environmental Site Representative Contractor Foreman Roads and Maritime Environmental Manager (or delegate)	Weekly
Inspection of all erosion and sediment controls, disturbed areas and revegetated/stabilised areas and undertake any works required to repair and/or maintain these controls	Contractor Environmental Site Representative Contractor Foreman Roads and Maritime Environmental Manager (or delegate)	• at least weekly during standard construction hours • daily during periods of rainfall that causes runoff to occur • prior to any site closure of greater than 24 hours.
Inspection of sediment basins	Soil Conservationist / Contractor Environmental Site Representative	Monthly

7.6 Incident planning and response

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

7.7 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of soil and water quality management measures, compliance with this CSWMP, conditions of approval and other relevant approvals, licenses and guidelines.

Audit requirements are detailed in Section 6.4 of the OACEMP.

7.8 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 Contractors' Project team may raise a non-conformance or improvement opportunity.

Where a non-conformance is detected or monitoring results directly attributable to the Project exceed a target set in the Construction Water, Soil and Contamination Monitoring Program, the process described in the Monitoring Program and Section 6.6 of the OACEMP will be implemented. The Contractor's Quality Plan will describe 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 OACEMP.

7.9 Reporting

Reporting requirements and responsibilities are documented in Section 6.5 of the OACEMP.

The Construction Contractors will report on water, soil and contamination monitoring in accordance with the Construction Water, Soil and Contamination Monitoring Program provided in Annexure B.

The Contractor must record all inspections of sediment and erosion controls, including observations and works undertaken to repair and/or maintain soil and water management works.

The Contractors will be required to 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.

8 Review and improvement

8.1 Continuous improvement

Continuous improvement of this CSWMP 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 soil and water quality management and performance of environmental controls
- 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.

The Contractors will be 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 4.3.2 of the OACEMP.

8.2 Review by the Soil Conservationist

The Contractors CSWMPs will be reviewed by a suitably qualified Soil Conservationist, as outlined in Section 7.1.1. The Contractors will respond to the Soil Conservationist's review and incorporate any recommendations or justify decisions for not incorporating recommendations.

All erosion, sediment and water pollution plans, controls and measures will also be reviewed by the Soil Conservationist prior to installation.

8.3 CSWMP update and amendment

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

Any revisions to this CSWMP will be in accordance with the process outlined in Sections 1.6 and 6.8 of the OACEMP.

A copy of the updated CSWMP and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure (refer to Section 1.5 of the OACEMP).

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Annexure A – Consultation correspondence

1 Introduction

Consultation with relevant stakeholders and Government agencies was undertaken as part of the development of this CSWMP in accordance with the requirements of the Infrastructure Approval. The agencies required to be consulted under the Infrastructure Approval are listed in Table 1-1.

Table 1-1: Consultation requirements under the Infrastructure Approval

NSW CoA	Relevant OACEMP Sub-plan	Agency to be consulted	Reference
C4(d)	Water, soil and contamination Management Sub-Plan	DoI Water, DPI Fisheries, Penrith City Council, Liverpool City Council	This CSWMP
C9(c)	Construction Water, soil and contamination Monitoring Program	DPI, DoI, Penrith City Council, Liverpool City Council	Annexure B of this CSWMP

The consolidated evidence of the consultation undertaken and comments relevant to the preparation of this CSWMP is provided in this annexure. This annexure includes:

- documentation of the engagement with the parties identified in Table 1-1 that occurred prior to submitting the document to the Secretary for approval (Section 2)
- a log of the points of engagement or attempted engagement with the identified parties (Section 2) and a summary of the issues raised by them (Section 3)
- documentation of the follow-up with the identified parties where feedback has not been provided to confirm that they have no feedback or have failed to provide feedback after repeated requests (Section 2)
- an outline of the issues raised by the identified parties, a summary of how they have been addressed and a cross reference to the section of the CSWMP where the issue has been addressed (Section 3)
- a description of the outstanding issues raised by the identified parties and the reasons why they have not been addressed (Section 4)
- copies of all consultation correspondence relevant to this CSWMP (Attachment 1).

2 Documentation and log of the engagement and follow up

Table 2-1: Requests for comment from Roads and Maritime

Organisation	Contact	Date	Correspondence Type	Description
DoI Water (NRAR)	Irene Zinger	26/06/2018	Letter and email	Request from Roads and Maritime for comment on the CSWMP including Water, Soil and Contamination Monitoring Program
DPI Fisheries	Carla Ganassin	26/06/2018	Letter and email	Request from Roads and Maritime for comment on the Water, Soil and Contamination Monitoring Program
Liverpool City Council	Charles Wiafe	26/06/2018	Letter and email	Request from Roads and Maritime for comment on the CSWMP including Water, Soil and Contamination Monitoring Program
		11/07/2018	Follow up phone call, voicemail and email	
		26/07/2018	Follow up phone call and voicemail	
		27/07/2018	Follow up email	
		02/08/2018	Follow up phone call in which LCC agreed to respond by 09/08/2018	
		14/08/2018	Follow up phone call and voicemail	
Penrith City Council	Kristy Johnson	26/06/2018	Letter and email	Request from Roads and Maritime for comment on the CSWMP including Water, Soil and Contamination Monitoring Program
		12/07/2018	Follow up phone call	

Table 2-2: List of responses

Organisation	Contact	Date	Correspondence Type	Description
DPI Fisheries	Carla Ganassin Fisheries Manager Aquatic Ecosystems Unit	3/07/2018	Email	Comment on the CSWMP and Water, Soil and Contamination Monitoring Program
NRAR	Irene Zinger Manager, Water Regulation Branch (East)	08/07/2018	Letter (via email)	Comment on the CSWMP and Water, Soil and Contamination Monitoring Program
Liverpool City Council	-	-	-	No response provided
Penrith City Council	Ari Fernando Major Projects & Design Coordinator	20/7/2018	Email	Comment on the CSWMP and Water, Soil and Contamination Monitoring Program

3 Summary of issues raised and response

Table 3-1: Summary of issues raised and Roads and Maritime responses

Summary of comments	Roads and Maritime response
DoI Water (NRAR)	
Badgerys Creek, Thompsons Creek and Cosgroves Creek require additional surface monitoring points. The catchments have highly fragile river styles that need to be preserved. Each point will require preconstruction monitoring to ensure adequate data is acquired.	Information on River Styles has been included in the background information in Section 4.2.2. Additional monitoring sites have been included in the Surface Water Monitoring Program. Refer Section 4.1.1 of the Water, Soil and Contamination Monitoring Program (Attachment B to this SWMP).
Clarity and confirmation of the Trigger Action Values for Groundwater monitoring will be required prior to commencement of construction, as stated in Appendix B4 of the CEMP.	Section 3.2 of the Water, Soil and Contamination Monitoring Program has been updated to identify default groundwater trigger values. Site specific groundwater trigger values have been provided in Attachment 2 of Annexure B based on the pre-construction baseline monitoring.

Summary of comments	Roads and Maritime response
Any reference to either “Department of Primary Industries” / “DPI Water” or “Department of Industry – Water” / “DoI Water” should be amended to “Natural Resources Access Regulator” or “NRAR”.	OACEMP and sub-plans has been updated to reference “Natural Resources Access Regulator” or “NRAR”.
DPI Fisheries	
DPI Fisheries has no objections to this draft Soil and Water Management Plan.	Noted
Page 24 and 28: Note that key fish habitat within the development footprint is only situated in Cosgrove Creek and Badgerys Creek (see comment on FFMP).	Text in Sections 4.2.1 and **Error! Reference source not found.** has been amended to refer to the key fish habitat mapped on the DPI Fisheries key fish habitat maps.
DPI Fisheries has no objections to this draft Water, Soil and Contamination Monitoring Program.	Noted
Liverpool City Council	
No response provided	
Penrith City Council	
The draft CSWMP is considered to be comprehensive and no further comments.	Noted

4 Outstanding issues

There are no outstanding issues to be resolved arising from the consultation on the CSWMP.

Attachment 1: Copies of Consultation Correspondence

Natural Resources Access Regulator
Locked Bag 5123,
Parramatta NSW 2124
T 1800 633 362
www.industry.nsw.gov.au/nrar

Suzette Graham
Senior Environment Officer
Western Sydney Project Office
Roads and Maritime Services

Our Ref: V15/3875 & OUT18/10443

Via email: suzette.graham@rms.nsw.gov.au

Dear Ms Graham

RE: The Northern Road Upgrade – Draft for Consultation Review of Construction Environmental Management Plan (CEMP).

The Natural Resources Access Regulator (NRAR), previously DoI-Water, has had the opportunity to review Draft for Consultation Construction Environmental Management Plan (CEMP)The Northern Road Upgrade, dated June 2018.

The project proposes to upgrade 16 km of the Northern Road as part of the Western Sydney Infrastructure Plan. The project aims to increase travel flow and access to the Western Sydney Airport; the project will be conducted in three separate stages stretching from Mersey Road, Bringely to Glenmore Parkway, Glenmore Park.

NRAR recommends that the CEMP for the Northern Road be modified to address the following.

- Badgery Creek, Thompsons Creek and Cosgroves Creek require additional surface monitoring points. The catchments have highly fragile river styles that need to be preserved. Each point will require preconstruction monitoring to ensure adequate data is acquired.
- Clarity and confirmation of the Trigger Action Values for Groundwater monitoring will be required prior to commencement of construction, as stated in Appendix B4 of the CEMP.
- Any reference to either “Department of Primary Industries” / “DPI Water” or “Department of Industry – Water” / “DoI Water” should be amended to “Natural Resources Access Regulator” or “NRAR”.

Please contact Annika Lawrence, Water Regulation Officer (Newcastle) on (02) 4904 2516 or annika.lawrence@nrar.nsw.gov.au if you have further enquiries regarding this matter.

Yours sincerely

Irene Zinger
Manager, Water Regulation Branch (East)

08/07/2018

Alison Tourle (Sydney)

Subject: DPI Fisheries comment on TNR (Mersey Rd to Glenmore Parkway) Construction Plans

From: Carla Ganassin [mailto:carla.ganassin@dpi.nsw.gov.au]
Sent: Tuesday, 3 July 2018 5:11 PM
To: GRAHAM Suzette E
Subject: DPI Fisheries comment on TNR (Mersey Rd to Glenmore Parkway) Construction Plans

Dear Suzette,

Thanks you for referring the following draft construction environmental management plans for The Northern Road Upgrade (between Mersey Road, Bringelly to Glenmore Parkway, Glenmore park) to DPI Fisheries for comment in accordance with the pending Conditions of Approval for this project.

DPI Fisheries wishes to provide the following comments on the referred plans. Please use this response to satisfy the approval consultation requirements for these plans.

The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park – June 2018 – Construction Flora and Fauna Management Plan – Version 0

DPI Fisheries has no objections to the draft Flora and Fauna Management Plan.

Regarding section 4.3.2 and Table 4-5, please be aware that the presence of key fish habitat in the first instance should be determined from the key fish habitat maps on DPI Fisheries website. Looking at these maps, the only key fish habitat within the footprint of these works is situated at Cosgrove Creek and Badgerys Creek.

The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park – June 2018 – Construction Soil and Water Management Plan – Version 0

DPI Fisheries has no objections to this draft Soil and Water Management Plan.

Page 24 and 28: Note that key fish habitat within the development footprint is only situated in Cosgrove Creek and Badgerys Creek (see comment above).

Annexure B – Construction Water, Soil and Contamination Monitoring Program

DPI Fisheries has no objections to this draft Water, Soil and Contamination Monitoring Program.

The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park – June 2018 – Construction Contaminated Land Management Plan – Version 0

DPI Fisheries has no objections to this draft Construction Contaminated Land Management Plan.

If you have any questions regarding this response, please call.

Regards,
Carla Ganassin | Fisheries Manager | Aquatic Ecosystems Unit
NSW Department of Primary Industries | Fisheries NSW
Block E, Level 3, 84 Crown Street, Wollongong NSW 2500
SEND MAIL TO: Locked Bag 1 | Nelson Bay NSW 2315
T: 02 4222 8342 | F: 02 4225 9056 | E: carla.ganassin@dpi.nsw.gov.au
W: www.dpi.nsw.gov.au

Alison Tourle (Sydney)

Subject: FW: The Northern Road Upgrade - NSW and Federal Approvals & comments on CEMP Sub Plans

---

From: Ari Fernando [mailto:ari.fernando@penrith.city]
Sent: Friday, 20 July 2018 5:21 PM
To: GRAHAM Suzette E
Cc: TNR4 Correspondence File
Subject: RE: The Northern Road Upgrade - NSW and Federal Approvals & comments on CEMP Sub Plans

Hi Suzette

I have now collated comments received for the sub plans attached and is noted as below.

1. **Construction Traffic Management Plan**

Section 5 - Construction Traffic Management Sub Plan did not recognise Grover's Cr as a local road accessed by both construction and light vehicles and should be included.
Whether programmed night works are undertaken for utility installation is not noted. Our experience is some work will be required.
Where bus stops are relocated for construction, safe crossing points for bus commuters will need to be provided with sufficient lighting for changed locations.

A dilapidation report will be required for the local roads to be accessed/ upgraded.

Minor comment – Section 6.11 (Emergency Services notification – should be Nepean Local Area Command (As Penrith/St Marys have amalgamated).

There should be notations included that Local Roads not be included in any TMP's for State Road traffic detours.

2. **Construction Noise & Vibration Management Plan**

Council's Environmental Health Section has noted that the Draft Noise Mgt Plan is comprehensive.

However, in Section 8 it should be noted that any variation of hours of work or Out of hours work or should have Penrith City Council agreement be noted.

A copy of the final CNVMP should be provided to Council.

3. **Construction Soil & Water Management Plan**

The draft CSWMP is considered to be comprehensive and no further comments.

4. **Water & Soil Contamination Management Plan**

The draft WSCMP is considered to be comprehensive and no further comments.

5. No further comments on Construction Contamination Land Management Plan.

6. I am awaiting some further comments from Aboriginal Liaison Officer with respect to Aboriginal Heritage component of the Construction Heritage Management Plan.

Regards

Ari Fernando
Major Projects & Design Coordinator

E ari.fernando@penrith.city
T +612 4732 7569 | F +612 4732 7958 | M +61409 228 761
PO Box 60, PENRITH NSW 2751
www.visitpenrith.com.au
www.penrithcity.nsw.gov.au

PENRITH CITY COUNCIL

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From: GRAHAM Suzette E [mailto:Suzette.GRAHAM@rms.nsw.gov.au]
Sent: Thursday, 28 June 2018 5:38 PM
To: Ari Fernando <ari.fernando@penrith.city>
Cc: TNR4 Correspondence File <TNR4S@rms.nsw.gov.au>
Subject: The Northern Road Upgrade - NSW and Federal Approvals

Hi Ari,

Here are the NSW and Federal Approvals for The Northern Road Project to assist with the CEMP Sub-plan reviews.

Thanks,

Kind regards,

Suzette Graham
Senior Environment Officer, WSPO
Environment **|** Stakeholder and Community Engagement
M 0476 828 524 **PH:** (02) 8849 2618
www.rms.nsw.gov.au
Every journey matters
Roads and Maritime Services
27 Argyle Street, Parramatta NSW 2150

NSW GOVERNMENT Transport Roads & Maritime Services

NSW GOVERNMENT Transport Roads & Maritime Services

Annexure B – Construction Water, Soil and Contamination Monitoring Program

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Glossary / Abbreviations

Term	Expanded text
ALS	Australian Laboratory Services
ANZECC	ANZECC Australian and New Zealand Environment and Conservation Council
AWS	Automatic weather station
BoM	Bureau of Meteorology
CCS	Community Communication Strategy
CEMP	Construction Environmental Management Plan
CCLMP	Construction Contaminated Land Management Plan
CoA	Condition of approval
CoC	Chain of custody
COPC	Contaminant of potential concern
CSSI	Critical State Significant Infrastructure
CSWMP	Construction Soil and Water Management Plan
CWEMP	Construction Waste and Energy Management Plan
DEC	Department of Environment and Conservation (NSW) (former)
DECC	Department of Environment and Climate Change (NSW) (former)
DEOH	Defence Establishment Orchard Hills
Department, the	Commonwealth Department of the Environment and Energy
DO	Dissolved oxygen
DoEE	Commonwealth Department of the Environment and Energy
DoI	Department of Industry - Water
DP&E	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
EC	Electrical conductivity
EIS	Environmental Impact Statement
EPA	NSW Environment Protection Authority
EPL	NSW Environment Protection Licence under the *Protection of the Environment Operations Act 1997*
ER	Environmental Representative
ERSED	Erosion and Sediment
ESCP	Erosion and Sediment Control Plan
EWMS	Environmental Work Method Statement
Federal-CoA	Condition of the Federal Department of the Environment and Energy Approval Decision
LDP	Licenced discharge point

Term	Expanded text
LNAPL	light non-aqueous phase liquid
MP	Monitoring program
NATA	National Association of Testing Authorities
NOX	Oxides of Nitrogen
NSW-CoA	Condition of the NSW DP&E Infrastructure Approval
NSW Infrastructure Approval	The infrastructure approval for the Northern Road Upgrade issued by the NSW Government on 30 May 2018
NTU	Turbidity
OACEMP	Overarching Construction Environmental Management Plan
OC	Organochlorine
OP	Organo-phosphorus
PAH	Poly-aromatic hydrocarbons
PCB	Polynuclear Biphenyl
pH	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
PID	photo-ionisation detector
POEO Act	*Protection of Environment Operations Act 1997*
Project, the	The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park
RAP	Remediation Action Plan
REMM	Revised Environmental Management Measure as provided in the Final EIS / SPIR
Roads and Maritime, RMS	NSW Roads and Maritime Services
RTA	Roads and Traffic Authority
Secretary	Secretary of the NSW Department of Planning and Environment, or delegate
SPIR	Submissions and Preferred Infrastructure Report
SRP	Soluble Reactive Phosphorus
SWL	Standing water level
TNR	The Northern Road
TDS	Total dissolved solids
TSS	Total suspended solids
UXO	Unexploded ordnance
WQ	Water quality

1 Introduction

1.1 Purpose and scope

This overarching Construction Water, Soil and Contamination Monitoring Program (MP) has been developed in accordance with 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 water, groundwater, 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 any conditions of the Environment Protection Licence (EPL) for the Project.

Roads and Maritime has engaged an independent environmental consultant (GHD) to undertake monitoring of the receiving surface water and groundwater for the Project. The aim of this monitoring is to address the pre-construction, construction and operational monitoring and reporting requirements over a five-year period (2017 - 2022) as follows:

- pre-construction monitoring commenced in September 2017
- construction phase monitoring will span from the third quarter of 2018 (start of construction of Stages 4 and 5) to the end of 2022 (completion of Stage 5)
- post-construction monitoring will be carried out for a period of twelve months commencing from the completion of construction of each stage.

The Construction Contractors will undertake monitoring of the relevant aspects of soil, contamination and unexploded ordnance (UXO), as well as monitoring the discharge from sediment basins in accordance with the EPL. The Construction Contractors will be required to develop a stage specific Water, Soil and Contamination Construction Monitoring Program to address these aspects. The Contractors' MPs will be included in the Contractors' Construction Soil and Water Management Plans (CSWMPs). The Construction Contractors' MPs will not include the monitoring covered by the separate GHD surface and groundwater receiving water monitoring.

1.2 Responsibilities

Site personnel or sub-contractors with suitable experience and qualifications will undertake the monitoring outlined in this MP.

GHD will undertake receiving surface water and groundwater monitoring. Receiving surface water and groundwater data collected by GHD will be provided to the Construction Contractors, who will be responsible for implementing any actions required in response to any exceedances identified in the GHD monitoring results. The Construction Contractors will support the surface water and groundwater monitoring as required including by providing GHD with access to monitoring locations where construction is occurring.

The Construction Contractors' responsibilities under this MP include monitoring of sediment basin discharge (Section 3.3), climate data (Section 3.4), soil contamination and UXO (Section 3.5). The Contractors' Construction Managers are also responsible for ensuring that EPL conditions relevant to the discharge of water are met.

1.3 Approval, review and modification

This MP will be endorsed by the ER and submitted to the Secretary for approval at least one month before commencement of Construction or within another timeframe agreed with the Secretary. Construction will not commence until the Secretary has approved the required MP and the baseline data has been collected. The MP will be implemented for the duration of Construction and for any longer period set out in this MP or specified by the Secretary, whichever is the greater. The duration of the receiving surface water and groundwater monitoring is identified in Section 1.1.

This MP will be reviewed annually by Roads and Maritime in consultation with the Construction Contractors. Minor amendments to this MP may be approved by the ER. Any amendments to the MP will be documented in subsequent revisions of this MP. A copy of the updated MP and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure outlined in the Contractors' CEMPs. Site personnel and sub-contractors with responsibilities relevant to water, soil and contamination monitoring will be informed of any amendments to the MP and training provided where required.

Roads and Maritime will review the Contractors' MPs to confirm consistency with the requirements of this MP and Roads and Maritime specifications.

1.4 Consultation

This MP has been developed in consultation with NRAR (previously DoI Water), DPI Fisheries, Penrith City Council and Liverpool City Council as required by NSW-CoA C4(c).

In accordance with NSW-CoA A8, where a CoA requires consultation with identified parties, details of the consultation undertaken, matters raised by the parties, and how the matters were considered will be documented. The evidence of the consultation undertaken for the preparation of this MP is provided in Annexure A of the CSWMP.

1.5 Conditions of approval

The State (NSW-CoA) and Federal (Federal-CoA) conditions of approval relevant to this MP and their applicability to each stage of the Project are listed in Table 1-1. A cross reference is also included to indicate where the condition is addressed in this MP or other project management documents.

Table 1-1: Conditions of approval relevant to the Construction Water, Soil and Contamination Monitoring Program

CoA no.	Condition requirement	Applicability					Reference
		Stage 4 Cth	Stage 4 NSW	Stage 5 Cth	Stage 5 NSW	Stage 6 NSW	
NSW-CoA C9(c)	The following **Construction Monitoring Programs** must be prepared in consultation with the relevant government agencies identified for each **Construction Monitoring Program** to compare actual performance of construction of the CSSI against performance predicted performance.						This MP Section 1.4 Annexure A of App B4 CSWMP
	Water, soil and contamination: DPI, DoI and relevant Councils	✓	✓	✓	✓	✓	
NSW-CoA C10	Each Construction Monitoring Program must provide:	✓	✓	✓	✓	✓	
	(a) details of baseline data available	✓	✓	✓	✓	✓	Sections 3.1,3.2, 4 Annexures 1 and 2
	(b) details of baseline data to be obtained and when	✓	✓	✓	✓	✓	Sections 3.1,3.2, 4 Annexures 1 and 2
	(c) details of all monitoring of the project to be undertaken	✓	✓	✓	✓	✓	Section 3
	(d) the parameters of the project to be monitored	✓	✓	✓	✓	✓	Section 3
	(e) the frequency of monitoring to be undertaken	✓	✓	✓	✓	✓	Section 3
	(f) the location of monitoring	✓	✓	✓	✓	✓	Section 3
	(g) the reporting of monitoring results	✓	✓	✓	✓	✓	Section 5
	(h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory and	✓	✓	✓	✓	✓	Section 6
	(i) any consultation to be undertaken in relation to the monitoring programs.	✓	✓	✓	✓	✓	Section 1.4 Annexure A of App B4 CSWMP

CoA no.	Condition requirement	Applicability					Reference
		Stage 4		Stage 5		Stage 6	
		Cth	NSW	Cth	NSW	NSW	
NSW-CoA C11	The **Construction Monitoring Programs** must be developed in consultation with relevant government agencies as identified in **Condition C9** of this approval and must include, to the written satisfaction of the Secretary, information requested by an agency to be included in a **Construction Monitoring Programs** during such consultation. Details of all information requested by an agency including copies of all correspondence from those agencies, must be provided with the relevant **Construction Monitoring Program**.	✓	✓	✓	✓	✓	Section 1.4 Annexure A of App B4 CSWMP
NSW-CoA C12	The **Construction Monitoring Programs** must be endorsed by the ER and then submitted to the Secretary for approval at least one (1) month before commencement of Construction or within another timeframe agreed with the Secretary.	✓	✓	✓	✓	✓	Section 1.3
NSW-CoA C13	Construction must not commence until the Secretary has approved all of the required **Construction Monitoring Programs**, and all relevant baseline data for the specific construction activity has been collected.	✓	✓	✓	✓	✓	Section 1.3 Section 4 Annexures 1 and 2
NSW-CoA C14	The **Construction Monitoring Programs**, as approved by the Secretary including any minor amendments approved by the ER, must be implemented for the duration of Construction and for any longer period set out in the monitoring program or specified by the Secretary, whichever is the greater.	✓	✓	✓	✓	✓	Section 1.3
NSW-CoA C15	The results of the **Construction Monitoring Programs** must be submitted to the Secretary, and relevant regulatory agencies, for information in the form of a **Construction Monitoring Report** at the frequency identified in the relevant **Construction Monitoring Program**.	✓	✓	✓	✓	✓	Section 5

1.6 Environmental Protection Licence conditions

The Project is subject to EPL/s as a Scheduled Activity for 'road construction' and, where the criteria are met, '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 6 of the CSWMP and this MP.

The EPL conditions relevant to the monitoring of soil and water are provided in Table 1-2.

The indicative water quality discharge criteria for Licenced Discharge Points for the Project are listed in Table 2-4. The EPL criteria will be included in the Contractors' stage specific CSWMPs following issue of the EPL/s.

Table 1-2: EPL requirements relevant to the management of water, soil and contamination

Ref.	Relevant requirement	Reference
2	**Discharges to air and water and applications to land**	
P1	**Location of monitoring/discharge points and areas**	
P1.1	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...	Noted Section 3.3
P1.2	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]*	Noted Section 3.3
P1.3	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 "The Northern Road Upgrade Stage 4/5/6 -Scheduled Premises Map and Discharge Point Plan", and maintained on electronic file [*EF18/7382*]. *[Stage specific premises maps will be provided in the Contractor's MP]*	Noted Section 3.3
P1.4	The licensee must notify the EPA in writing, at least 48 hours prior to a basin discharge point becoming active or inactive. The notification must include an updated Temporary Sediment Basin Discharge Point Schedule. Note: Sediment basins are only considered active whilst accepting water directly from active construction areas.	Section 3.3
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 2-4].	Section 2.3
L2.2	Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.	Section 2.3

Ref.	Relevant requirement	Reference
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.	Section 2.3
L2.4	Water and/or Land Concentration Limits – [*refer Table 2-4 of this MP*]. *[Stage specific discharge locations will be identified in the Contractor's MP]*	Sections 2.3, 3.3
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	Section 2.3
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.	Section 2.3
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.	Section 2.3
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.	Section 2.3
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) 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.	Section 3.3
3	**Monitoring and recording conditions**	
M2	**Requirement to monitor concentration of pollutants discharged**	
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 [of Table 2-4]. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns [of Table 2-4].	Sections 2.3, 3.3
M2.2	Water and/ or Land Monitoring Requirements – refer [Table 2-4]	

Ref.	Relevant requirement	Reference
M2.3	For the purposes of Condition M2.2 and [Table 2-4] 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.	Section 3.3
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.	Section 3.3

2 Monitoring criteria

2.1 Receiving surface water

The Australian and New Zealand Environment Conservation Council (ANZECC) Guidelines 2000 set out a range of water quality criteria for assessment of the suitability of water for protection of ecosystem health, recreational amenity, drinking water, irrigation and stock water use and potential toxic effects on aquatic fauna.

The ANZECC Guidelines provide default 'trigger values' for common water quality characteristics for ecosystem protection for which there is minimal risk of ecosystem harm. The default values are used in the absence of local data for a particular watercourse.

The Guideline trigger values are the concentrations (or loads) of the key performance indicators, below which there is a low risk that adverse biological effects will occur. The physical and chemical trigger values are not designed to be used as threshold values at which an environmental problem is inferred if they are exceeded.

For the flowing water creeks within the Project area, the default trigger values for south-eastern Australian (NSW coastal rivers) lowland river slightly disturbed ecosystems apply. The trigger values for freshwater lakes apply to standing pools, farm dams, ponds and wetlands within the Project area. The relevant ANZECC trigger values for the parameters monitored for the Project are identified in Table 2-1 (physical and chemical stressors) and Table 2-2 (metals).

Table 2-1: Default ANZECC trigger values in aquatic ecosystems

Analyte	Units	Significance	ANZECC default trigger value	
			Lowland rivers	Freshwater lakes
pH		Extremes of pH can be directly toxic to biota, and can modify the effect of other stressors (e.g. release metals).	6.5 – 8.5	6.5 - 8.0
Electrical Conductivity (EC) @ 25°C	µS/cm	Levels typically elevated during periods of low flow and if affected by saline groundwater inputs. Changes in EC can alter the ecosystem composition and abundance of species.	200 – 300	20 - 30
Dissolved Oxygen (DO)	% saturation	Low DO can stress many aquatic organisms, and change redox conditions leading to the release of toxicants and nutrients from sediment.	85 - 110	90 - 110
Turbidity	NTU	High turbidity is typical of disturbed catchments and during high flow events. Not toxic, but can affect ecosystems and biota	50	20

Analyte	Units	Significance	ANZECC default trigger value	
			Lowland rivers	Freshwater lakes
Ammonium Nitrogen	mg/L	Indicative of wastewater or fertiliser inputs. Toxic to aquatic life; can directly affect ecosystems and biota through excessive algal growth and cyanobacterial blooms.	0.02	0.01
Oxides of Nitrogen (NO_X)	mg/L	Indicative of contamination by wastewater or fertiliser, stimulates phytoplankton; can directly affect ecosystems through excessive algal growth and cyanobacterial blooms.	0.04	0.01
Total Nitrogen as N	mg/L	Indicative of wastewater or fertiliser inputs. Includes ammonia, NOx-N and other nitrogenous compounds, can be indicative of inputs from wastewater and other diffuse sources. Can directly affect ecosystems and biota through excessive algal growth and cyanobacterial blooms.	0.35	0.35
Total Phosphorus as P	mg/L	Indicative of wastewater or fertiliser inputs. Key nutrient determinant for growth, can stimulate growth and is frequently the limiting nutrient for algal growth.	0.025	0.01
Chlorophyll *a*	µg/L	A surrogate of the phytoplankton biomass, and a measure of the effect of nutrient interaction with other parameters.	3	5
Total Suspended Solids (TSS)	mg/L	Reduces light penetration of water, and can affect some forms of aquatic life. May indirectly affect the effect of stressors such as temperature and DO.	No ANZECC trigger value US EPA Guideline = 80	

Table 2-2: Default ANZECC trigger values for metals in aquatic ecosystems

Parameter	Freshwater trigger values (95% species protection) (mg/L)
Arsenic	0.024
Cadmium	0.0002
Chromium	0.001
Copper	0.0014
Nickel	0.011
Lead	0.0034
Zinc	0.008

Pre-construction surface water baseline monitoring (further described in Section 4.1) for the waterbodies and waterways impacted by Construction within the Project area has enabled the identification of site specific trigger values for each monitored location for the parameters listed in Table 2-1 and Table 2-2. The site specific surface water trigger values are provided in Attachment 1 of this MP. The surface water monitoring locations are identified in Section 3.1 and shown on Figure 3-1.

Data collected during the construction and operational phases of the Project will be compared to the site specific trigger values derived from the baseline data to assist in determining whether construction and operation is impacting receiving surface waters.

2.2 Groundwater

Concentrations of contaminants of potential concern (COPC) within groundwater will be assessed against the NEPC (2013) *National Environment Protection (Assessment of Site Contamination) Measure* (NEPM) assessment criteria for groundwater health screening levels (HSLs) for petroleum hydrocarbons, and groundwater investigation levels (GILs) for metals, organic, and inorganic compounds (refer Table 2-3).

Table 2-3: Fresh waters[A] groundwater investigation levels

Substance	GIL (µg/L)	Substance	GIL (µg/L)
Metals and Metalloids		**Polycyclic Aromatic Hydrocarbons (PAHs)**	
Aluminium, Al pH>6.5	55	Naphthalene	16
Arsenic	24 as As(III) 13 as As(V)	Benzo[a]pyrene	-
Boron	370[C]	**Phenols**	
Cadmium H	0.2	Phenol	320
Chromium, Cr (VI)	1[C]	2-Chlorophenol	340[C]
Copper H	1.4	4-Chlorophenol	220
Lead H	3.4	2,4-Dichlorophenol	120
Manganese	1900[C]	2,4,6-Trichlorophenol	3[D]
Mercury (Total)	0.06[D]	2,3,4,6-Tetrachlorophenol	10[D]
Nickel H	11	Pentachlorophenol	3.6[D]
Selenium (Total)	5[D]	2,4-Dinitrophenol	45
Silver	0.05	**Phthalates**	
Zinc H	8[C]	Dimethylphthalate	3700
Non-metallic Inorganics		Diethylphthalate	1000
Ammonia[E] (as NH_3-N at pH 8)	900[C]	Dibutylphthalate	10[D]
Cyanide (as un-ionised Cn)	7	Di(2-ethylhexyl) phthalate	-
Hydrogen sulphide (un-ionised H_2S measured as S)	1	**Pesticides**	
Nitrate (as NO_3)	refer to guideline	Atrazine	13

Substance	GIL (µg/L)	Substance	GIL (µg/L)
Nitrite (as NO_2)	refer to guideline	Carbofuran	0.06
Nitrogen	refer to guideline	Chlordane	0.03[D]
Phosphorus	refer to guideline	Chlorpyrifos	0.01[D]
Organic alcohols/other organics		2,4-D [2,4-dichlorophenoxy acetic acid]	280
Ethanol	1400	DDT	0.006[D]
Anilines		Diazinon	0.01
Aniline	8	Dimethoate	0.15
2,4-Dichloroaniline	7	Diquat	1.4
3,4-Dichloroaniline	3	Endosulfan	0.03[D]
Chlorinated Alkanes		Endrin	0.01[D]
1,1,2-Trichloroethane	6500	Fenitrothion	0.2
Hexachloroethane	29[D]	Glyphosate	370
Chlorinated Benzenes		Heptachlor	0.01[D]
1,2- Dichlorobenzene	160	Lindane (γ-HCH)	0.2
1,3- Dichlorobenzene	260	Malathion	0.05
1,4- Dichlorobenzene	60	Methomyl	3.5
1,2,3- Trichlorobenzene	3[D]	Molinate	3.4
1,2,4- Trichlorobenzene	85[D]	Parathion	0.004[C]
1,3,5-Trichlorobenzene	-	Simazine	3.2
Polychlorinated Biphenyls (PCBs)		2,4,5-T	36
Aroclor 1242	0.3[D]	Tebuthiuron	2.2
Aroclor 1254	0.01[D]	Thiobencarb	2.8
Monocyclic Aromatic Hydrocarbons		Thiram	0.01
Benzene	950	Toxafene	0.1[D]
Xylenes	350 (as o- xylene) 200 (as p- xylene)	Trifluralin	2.6[D]
		Surfactants	
		Linear alkylbenzene sulfonates (LAS)	280
		Alcohol ethoxylated sulfate (AES)	650
		Alcohol ethoxylated surfactants (AE)	140

Notes:

A *Investigation levels apply to typical slightly-moderately disturbed systems. See ANZECC & ARMCANZ (2000) for guidance on applying these levels to different ecosystem conditions.*

B *Investigation levels are taken from the health values of the Australian Drinking Water Guidelines (NHMRC 2011).*

C *Figure may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance.*

D *Chemical for which possible bioaccumulation and secondary poisoning effects should be considered, refer to ANZECC & ARMCANZ (2000) for further guidance.*

E *For changes in GIL with pH refer to ANZECC & ARMCANZ (2000) for further guidance. H Values have been calculated using a hardness of 30 mg/L $CaCO_3$ refer to ANZECC & ARMCANZ (2000) for further guidance on recalculating for site-specific hardness.*

Pre-construction groundwater baseline monitoring (further described in Section 4.2) has enabled the identification of site specific trigger values for each monitored location identified in Section 3.2.1 and shown on Figure 3-1. The site specific groundwater trigger values are provided in Attachment 2 of this MP.

The trigger values in Attachment 2 include dissolved oxygen, electrical conductivity, pH, temperature, ammonia, nickel, zinc, total kjedahl nitrogen, total nitrogen, total phosphorus. Other monitored parameters will be compared to the criteria listed in Table 2-3 above.

Data collected during the construction and operational phases of the Project will be compared to the site specific trigger values derived from baseline data to assist in determining whether construction and operation is impacting groundwater.

2.3 Site discharge

A separate Environment Protection Licence (EPL) will be obtained for each Project stage. The EPL prescribes the water quality parameters for the purposes of the monitoring and the setting of limits for discharges of pollutants to water for each Project stage. It will also detail the monitoring and analytical requirements.

Licenced Discharge Points (LDP), which are the locations approved by the EPA for discharge to the environment, will be identified in the EPLs and shown on the Premises Maps which will be included in the Contractor's MPs. The indicative water quality discharge criteria which may apply to the LDPs are listed in Table 2-4. The approved LDPs and discharge criteria will be confirmed in the Construction Contractor's MPs, once the EPLs have been obtained from the EPA.

Table 2-4: Discharge water quality criteria

Parameter	Units of measure	100 percentile concentration limit	Frequency	Sampling method
Oil and grease	Visible	No visible	Special Frequency 1	Visual inspection
pH	pH	6.5 –8.5	Special Frequency 1	Probe
Total Suspended Solids	milliequivalents per litre	50 mg/L	Special Frequency 1	Grab Sample

Sampling of water to be discharged will be carried out at special frequency 1:

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

The concentration of a pollutant discharged at each LDP shown on the Premises Map must not exceed the concentration limits specified for that pollutant in Table 2-4. Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

Exceeding the limits specified in Table 2-4 for pH and total suspended solids (TSS) for discharges from the sediment basins identified on the Premises Maps 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. The design rainfall at each location is shown on the Premises Maps.

The Construction Contractor may use turbidity (NTU) in place of TSS to determine compliance with the TSS limits in the EPL, providing the Contractor develops 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. The Contractor will provide the EPA with a copy of the statistical correlation assessment methodology and results before using NTU in place of TSS. The EPA may make a written request for a copy of the statistical correlation assessment and methodology to determine compliance with EPL condition L2.4 if required. This information will be documented in the Construction Contractor's MP.

The EPL does not authorise the pollution of waters by any pollutant other than those specified in Table 2-4.

2.4 Soil and contamination criteria

If required, criteria for contaminated soil will be provided in Remedial Action Plans (RAPs) (refer Section 3.5 and the Construction Contaminated Land Management Plan (CCLMP) (Appendix B8 of the OACEMP)).

Criteria for the classification and disposal of soil are provided in the Construction Waste and Energy Management Plan (CWEMP) (Appendix B7 of the OACEMP).

3 Monitoring methodology and procedures

3.1 Receiving surface water quality

3.1.1 Routine sampling

Ten surface water sites across the Project area have been sampled by GHD on a monthly basis since September 2017 to establish baseline conditions for the receiving waters in the vicinity of the Project. The sites were selected on the basis of having persistent water flow and at locations upstream and downstream of receiving waterways that might be impacted by the construction activities. Refer Section 3.1.3 for further description of the surface water monitoring sites.

Ongoing monitoring of the sites 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. Further discussion on baseline conditions is provided in Section 4.1 and Annexure 1.

3.1.2 Wet weather sampling

In addition to routine sampling, wet weather sampling is being undertaken by GHD during the pre-construction and construction phases in accordance with the *Guideline for Construction Water Quality Monitoring* (RTA 2004). Data from wet weather samples will demonstrate the variability in pollutant concentrations at each of the sample sites under wet weather conditions. During Construction, this data will assist in providing an assessment of the impacts of the road construction on adjacent waterways and also the effectiveness of construction mitigation measures.

The monitoring program is designed to capture at least two wet weather sampling events in each calendar year during the five year program with at least one month between each wet weather sampling event (ie only one wet weather event sampled per month).

A wet weather trigger value of >30 mm rainfall in a 24 hour period as recorded at the Bureau of Meteorology (BoM) Stations at Badgerys Creek and Orchard Hills was adopted for the first six months of the pre-Construction monitoring. This trigger was subsequently revised to >24 mm to provide more sampling events.

The analysis of wet weather samples is the same as the routine monthly sampling, to allow a direct comparison to samples collected during dry weather.

3.1.3 Sampling locations

The Project surface water monitoring sites are listed in Table 3-1 and their locations shown on Figure 3-1.

Legend

Northern Road Upgrade Construction Stage

- TNR4
- TNR5
- TNR6

Monitoring Sites

- Surface Water
- Groundwater

Surface Water

- Major River
- Perennial Creek
- Intermittent Creek
- Water Pipeline
- Waterbodies
- Approx Project Boundary
- Roads

TNR5 - Littlefields Road to Glenmore Parkway

TNR6 - Eaton Road to Littlefields Road

TNR4 - Mersey Road to Eaton Road

Surveyors Creek

Littlefields Creek

Mulgoa Creek

Warragamba - Prospect Water Pipeline

Jerrys Creek

Badgerys Creek

SV2

BH-G-116

SV1

BH29

CG1

BH28

CG2

BH26

CG3

39DS

BH19

39US

BH12

SW5

BH11

29aDS

29aUS

BH10

BH9

BH5

BG1

DRAFT

Paper Size ISO A3

0 0.25 0.5 0.75 1

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

O

GHD

Roads & Maritime Services
The Northern Road Upgrade
Stage 4, 5 & 6

Surface and Groundwater Monitoring Program Sampling Locations

Project No. 23-16168
Revision No. -
Date 27/03/2018

Figure 3-1

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Table 3-1: Surface water monitoring locations

Site ID	Latitude	Longitude	Project Stage	Description
SW39US	-33.892	150.691	TNR 4	Farm Dam at Triple A Christmas Tree Farm, upstream of Project Area
SW39DS	-33.889	150.690	TNR 4	Farm Dam at Triple A Christmas Tree Farm, downstream of Project Area
SW29AUS	-33.899	150.686	TNR 4	Unnamed waterway, pool within Commonwealth Land at 420 Willowdene Avenue, upstream of Project Area
SW29ADS	-33.899	150.684	TNR 4	Unnamed waterway, Commonwealth Land, at 420 Willowdene Ave, upstream of Project Area
SW5	-33.894	150.680	TNR 4	Farm dam at property on 350 Willowdene Avenue, downstream of Project Area
BG	-33.914	150.706	TNR 4	Badgerys Creek, downstream of Northern Road
SV1	-33.807	150.697	TNR5	Surveyors Creek upstream - dam within DEOH
SV2	-33.798	150.698	TNR5	Surveyors Creek - creek downstream 2035-2057 The Old Northern Road, Glenmore Park
CG1	-33.886	150.701	TNR 6	Cosgroves Creek - farm dam at 140 Adams Road, Luddenham
CG2	-33.890	150.702	TNR 6	Cosgroves Creek - farm dam at 90 Adams Road, Luddenham
CG3	-33.880	150.700	TNR6	Cosgroves Creek - farm dam at 45 Adams Road, Luddenham

The additional surface water quality monitoring locations on Cosgroves Creek and Badgerys Creeks listed in Table 3-3 will be installed prior to Construction pending access agreements with landowners. The ER will approve additional monitoring points or changes to monitoring points if required.

Table 3-2: Additional surface water monitoring locations (location tbc)

Site ID	Latitude	Longitude	Project Stage	Description
TBA	-33.9125	150.705	TNR 4	Badgerys Creek Approximately 260 m north of BG1 and located on a different branch of the creek. It can be expected to be heavily affected by agricultural runoff. Access from outside 1675 The Northern Road

Site ID	Latitude	Longitude	Project Stage	Description
TBA	-33.899	150.738	TNR 4	Badgerys Creek downstream of the Project At the bridge over the creek on Badgerys Creek Road, approximately 4 km downstream of BG1 with numerous peri-urban developments along its extent, which could be expected to influence water quality
TBA	-33.872	150.714	TN6	Cosgroves Creek downstream of existing CG1 to CG3. This part of the creek is ephemeral, and has been dry for the last several months

3.1.4 Sampling methodology

Field data and laboratory analysis data are managed by GHD using the ESdat water quality data management software. In situ water quality data, site information and site photographs are obtained using a GPS enabled mobile device connected to GHD's secure Cloud service provider, which is synchronised to the GHD network.

Water quality sampling is conducted in accordance with GHD's standard Operating Procedures for surface water quality sampling, which complies with:

- the *ANZECC Guidelines*
- *Approved Methods for the Sampling and Interpretation of Results of Water Pollutants* (EPA, 2004) and
- *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*.

In situ water quality parameters are recorded and grab samples collected from each site for laboratory analysis.

In situ water quality measurement

In situ field measurements of water quality are taken at all sites during each monthly site visit. Physico-chemical measurements are taken using a fully calibrated multi-parameter water quality meter for:

- temperature (°C)
- pH (pH units)
- Electrical Conductivity (µS/cm)
- Dissolved Oxygen (mg/L and % saturation) and
- Turbidity (NTU).

Relevant site descriptions and notes are taken for each site and visual observations made of:

- visual oil and grease

- occurrence of algal scum
- streamflow
- water clarity
- water colour, odour and any other notable observations.

Photos are taken to record the visual appearance of each water quality sample site at the time of sampling. Where appropriate, photos of the stream bank are also taken to provide a record of bank stability, geomorphology and riparian vegetation condition.

Surface Water Sampling

Grab samples are collected near the in situ monitoring point to ensure representative sampling. At each site, several sub-samples are taken from 100 - 200 mm depth below the surface using a long-handled sampling pole and bottle. The sub-samples are combined in a bucket to form a 'composite' sample from which the sample bottles for analyses are filled. The bucket and the sampling bottle are washed between sampling sites to prevent cross contamination.

Water quality samples are transported in ice in an esky to Australian Laboratory Services (ALS) in Smithfield, a National Association of Testing Authorities (NATA) accredited laboratory, under Chain of Custody (CoC) requirements. Samples are analysed for the following:

- **microbiological public health indicator:** Thermotolerant Coliforms
- **water quality indicators:**
  - TSS (sediment runoff indicator)
  - nutrients (NH_3, NO_2, NO_3, TKN, TN, TP, SRP (Soluble Reactive Phosphorus) - (nutrient indicators that are attributable to runoff impacts)
  - Chlorophyll-a (algal indicator; algae proliferate in water if enriched by nutrients)
  - oil and grease (associated with runoff from construction activities related to roads)
- **major urban pollutants**: including ultra-trace Polynuclear Biphenyls (PCBs); organochlorine (OC) and organo-phosphorus (OP) pesticides; fumigants; halogenated aliphatic and aromatic compounds; BTEX (Benzene, Toluene, Xylene, Naphthalene); phenols and poly-aromatic hydrocarbons (PAHs). These pollutants are associated with runoff from construction activities in relation to roads and certain landscapes
- **heavy metals:** Aluminium (Al), Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Iron (Fe), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Silver (Ag)and Zinc (Zn). These metals are associated with runoff from construction activities from certain peri-urban landscapes such as the Project area.

3.2 Groundwater

3.2.1 Sampling locations

Monthly groundwater monitoring is being undertaken by GHD at the locations shown on Figure 3-1 and listed in Table 3-3.

Table 3-3: Groundwater monitoring well locations

Bore ID	Easting	Northing	Project stage
BH-G-116	286734.9	6257227.7	TNR5
BH26	287178.9	6248786.9	TNR6
BH28	287267.2	6248823.6	
BH29	287238.9	6248903.5	
BH5	287159.9	6245434.9	TNR4
BH9	286519.8	6248995.5	
BH10	285985.1	6246431.9	
BH11	285841.4	6246801.9	
BH12	286036.7	6247333.8	
BH19	286547.9	6247623.8	
GW5	285658.9	6247101.4	

3.2.2 Sampling methodology

The primary objective of the groundwater sampling is to obtain a sample with minimal alteration in water chemistry. The collected sample should represent the physical, chemical and biological characteristics of groundwater in the target hydrostratigraphic unit as closely as possible. The specific procedures adopted for the Project are detailed further in this section.

Technical guidance

All groundwater wells within the monitoring programme are sampled in accordance with:

- *Australian Standard 5667:1998 Water Quality – Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples (AS 5667.1:1998)*
- *Australian Standard 5667:1998 Water Quality – Sampling, Part 11: Guidance on the Sampling of Groundwaters (AS 566.11:1998)* and
- *GHD standard operating procedure for groundwater well sampling* (GHD, 2015).

Gauging

All monitoring wells are positively identified using the maps developed through GIS analysis conducted by GHD for the Project.

The well cap is removed and a photo-ionisation detector (PID) used to measure the concentration of volatiles within the casing. This also allows time for the groundwater level to stabilise before any measurements are made.

An interface probe is used to measure the standing water level in metres below top of casing (m TOC) and to determine whether light non-aqueous phase liquid (LNAPL) is present in the well. Measurements are taken to the nearest millimetre.

The depth to the bottom of the well is also measured to determine the amount of water in the casing.

Purging

A micropurge Q10 bladder-pump unit with CO_2 gas controller is used to purge and sample the wells. This pump was chosen as it enables fine control of the gas pressure, pump cycles per minute, recharge and discharge rates and is also applicable to the variety of well depths within the groundwater monitoring program.

The monitoring wells are constructed with a three metre casing from the bottom of the well.

The pump is lowered to approximately 1.5 m above the bottom of the well to ensure the pump inlet is within the screened interval.

A low-flow sampling methodology is employed which requires the standing water level to be kept as steady as possible (i.e. drawdown is minimised). This is controlled by changing the controls on the Q10 control unit.

Water is extracted from the well via low-density polyethylene tubing and pumped through a flow cell containing water quality probes.

Water quality (WQ) parameters including pH, electrical conductivity (EC), dissolved oxygen (DO), temperature and oxidation-reduction potential (eH) and standing water level (SWL) are measured and recorded at regular intervals (e.g. every 2 to 5 minutes).

Descriptions of the visual and olfactory characteristics including colour, turbidity, odour and sheen are recorded with SWL and WQ measurements.

Water quality parameters are considered stable once three consecutive readings are obtained within the following ranges:

- 0.05 for pH
- ± 3% for EC
- ± 10% for DO
- ± 0.2°C for temperature
- ± 10 mV for Eh.

Sampling

Samples are collected once the parameters have stabilised. Samples are collected in laboratory supplied containers made of the appropriate material and suitably preserved for the required analytes, according to well-established analytical standards.

All sample containers are clearly labelled with:

- sample ID
- job number
- sampler name
- date and time.

All samples are placed in an insulated storage container (esky) containing ice for transport to the ALS laboratory, along with a chain of custody form describing the sample identification details and required analysis.

Exceptions to this methodology include when WQ parameters do not stabilise over a long period of time (for example, greater than one hour of purging) and samples are collected prior to stabilisation.

Another exception is when a well is low-yielding and has poor recovery, in which case the SWL may not stabilise and samples may need to be collected to ensure collection of a sample prior to the well pumping dry.

In each of these cases, comprehensive field notes detail the rationale for collecting samples when stabilisation of WQ parameters and/or SWL are not attained.

Analytical suite

All samples are analysed by a NATA accredited laboratory for the contaminant of potential concern (COPC) identified for the Project which are:

- major cations and anions and total dissolved solids
- total suspended solids
- nutrients (including NH_3, NO_2, NO_3, total potassium, soluble reactive phosphorous)
- total recoverable hydrocarbons (TRH)
- benzene, toluene, ethylbenzene, xylenes, naphthalene (BTEXN)
- polycyclic aromatic hydrocarbons (PAH)
- phenols
- metals.

3.3 Site discharge

The Construction Contractors 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. The locations of the LDPs will be identified in the stage specific Premises Maps, Contractors' MPs and Erosion and Sediment Control Plans.

For each monitoring/discharge point identified on the Premises Map, the Contractor will monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1 of Table 2-4. The Contractor will use the sampling method, units of measure, and sample at the frequency, specified in the other columns of Table 2-4. The Contractor will undertake the sampling in accordance with *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.

The Contractor will notify the EPA in writing, at least 48 hours prior to a basin discharge point becoming active or inactive. The notification must include an updated Temporary Sediment Basin Discharge Point Schedule. Sediment basins are only considered active whilst accepting water directly from active construction areas.

The Contractor will 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
- the collection of representative samples of the water discharged from the sediment basin(s) and
- access to the sampling point(s) at all times by an authorised officer of the EPA.

3.4 Climate monitoring

The Construction Contractors will measure and record rainfall at the construction sites in millimetres per 24-hour period at 9 am each day from the time that the site office is established. The Contractors will install automatic weather stations (AWS) and manual rainfall gauges at representative locations throughout the Project area. 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.

The AWS will conform to Bureau of Meteorology *Observation Specification No. 2013.1* and Roads and Maritime Specification R272 – Automatic Weather Stations for the design and location of such devices. AWS will be sited within a secured compound area fully protected by fencing, likely to be at major site compounds, and any instrumentation, communication or power cabling contained within conduits buried to a depth of at least 100 mm.

Prior to establishment of AWS, the Construction Contractors will prepare a report identifying suitable locations for AWS and other weather gauges in consultation with a suitably qualified person with experience installing and operating AWS, and any relevant stakeholders. The Roads and Maritime Environmental Manager (or delegate) will review the proposed locations for climate monitoring devices for consistency with the Roads and Maritime specification and this MP. The locations of the Contractors' AWS will be shown on the Contractors' Erosion and Sediment Control Plans.

Data from the AWS will be accessible via SMS alarms or queries to a mobile phone and be fully downloadable. SMS queries and alarms will be sent to the Roads and Maritime Environmental Manager (or delegate) and Roads and Maritime Project Manager, as necessary. Data will be accessible at all times by the Roads and Maritime Environmental Manager (or delegate) and Roads and Maritime Project Manager. Data will be downloaded to the Roads and Maritime online weather station page to allow live views of weather data by authorised users.

In accordance with normal standard construction practices, weather forecasts will be used to guide work activities undertaken on-site. The Contractors 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 will be provided in the Wet Weather Event Procedure (refer to Sections 6.13 and 6.14 of the CSWMP) to be prepared by the Contractors.

3.5 Contamination

3.5.1 Contaminated land

Contaminated land will be managed and monitored by the Construction Contractors in accordance with 6.1.1 of the CCLMP (Appendix B8 of the OACEMP). The Contractors will undertake further investigations of the Areas of Environmental Interest (AEIs) identified in Table 4-1 of the CCLMP as having a moderate risk of exposure of contaminated material prior to the commencement of construction, including sampling of soil to the depth of proposed excavations. If the investigations conclude that the specified land is contaminated such that it is and will remain unsuitable for the Project even after completion of all physical works required to construct the Project, then:

- a Remediation Action Plan (RAP) will be prepared for the specified land by a suitably qualified and experienced person and in accordance with all guidelines under the *Contaminated Land Management Act* (NSW)
- the RAP will be approved in writing by a NSW EPA Accredited Site Auditor and the approval will state that the land can be made suitable for the Project if the works described in the RAP are carried out and
- the specified land will be remediated in accordance with the approved RAP.

The RAP will specify the requirements for monitoring.

3.5.2 Asbestos

Asbestos will be managed and monitored in accordance with the overarching Asbestos Management Plan included at Annexure C of the CCLMP and the Contractor's Asbestos Management Plan.

The Contractor's consultant 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 Contractor's consultant Environmental Scientist / Engineer.

Monitoring will be undertaken in accordance with *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC: 3003(2005)] (*National Occupational Health and Safety Commission, 2005) and *How to Safely Remove Asbestos Code of Practice* (Safe Work Australia, 2011).

3.5.3 Unexploded ordnance

Monitoring for UXO will be carried out in accordance with the overarching Military Material Management Plan included at Annexure D of the CCLMP and the Contractor's Military Material Management Plan. Monitoring of UXO will be developed with reference to *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).

3.6 Soil

The Contractor will collect and analysis samples of soil material for durability and aggressivity prior to the construction phase, to determine potential impacts of soil salinity on pavement infrastructure.

4 Baseline data

4.1 Surface water quality

Baseline data has been collected during the 12 month pre-construction phase, commencing from August 2017. The sampling locations for surface water sites (shown in green) are shown on Figure 3-1. These sites are located on Surveyors Creek (sites SV1 and SV2), on Cosgroves Creek (sites CG1, CG2, CG3), other waterways and farm dams (sites SW39US, SW39DS, SW29AUS, SW29ADS, SW5), and on Badgerys Creek (site BG).

Statistics from the baseline surface water monitoring is provided in Attachment 1. General observations on the baseline water quality in the vicinity of the Project are:

- Nutrient enrichment of both farm dams and flowing waterways is common, indicated particularly by highly elevated TP TN, NOx and Ammonia-N concentrations. These nutrients are associated with land that has been used historically 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 of some sites to Cyanobacterial growth are indicated by low N: P ratios, evident at some sites.

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

- **Site SV1** – This farm dam, on defence lands, associated with Surveyors Creek drainage channel, is quite poor in water quality, largely due to high EC, low DO and elevated nutrient concentrations. The site is also prone to Cyanobacterial growth.
- **Site SV2** – This site, which is on the western side of The Northern Road, is part of the flowing waterway, associated with Surveyors Creek. It recorded a low pH (acidic) in one instance, and was relatively moderate in EC, DO and nutrient concentrations. The site's propensity for Cyanobacterial growth is evident, due to elevated TP. Heavy metals (Cr, Cu and Zn) were also detected at the site, at concentrations, which occasionally exceeded the ANZECC Guidelines.
- **Sites CG1, CG2 and CG3** – These three farm dams, on Adams Road, are associated with the Cosgrove Creek drainage line. They are relatively large, and characterised by high EC and elevated nutrients. While DO levels are moderate (due to wind-driven turbulence and mixing), all three dams also contain the heavy metal pollutant Chromium, while Copper pollution is evident in CG1 and CG2. CG3 is particularly vulnerable to algal proliferation, because of high concentrations of readily-available, reactive P.
- **Sites SW39US and SW39DS** – These two farm dams, located within the Triple A Christmas Tree are also relatively poor in water quality, due to high EC, low DO and elevated nutrients.
- **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** – The southern-most, 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.

4.2 Groundwater

Baseline data has been collected from groundwater monitoring sites from September 2017. Monitoring well locations are shown on Figure 3-1. Statistics from the baseline surface water monitoring is provided in Attachment 2. General observations on the baseline water quality in the vicinity of the Project are:

- seasonable variability was demonstrated in groundwater quality parameters, in particular dissolved oxygen and temperature
- redox conditions ranged across the well network from reducing conditions to oxidising conditions
- no light non-aqueous phase liquid (LNAPL) was observed in any of the groundwater monitoring wells
- concentrations of total recoverable hydrocarbons (TRH fractions C16-C34 and C34-C40) were recorded above the laboratory limit of detection in monitoring well BH11.

5 Reporting

5.1 Monthly environmental report

The Construction Contractors' Environmental Site Representatives will prepare Monthly Environmental Reports for the duration of the Project for incorporation in the Contractors 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 the applicable aspects of this MP and the Contractor's 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, as outlined in Section 5.2 below.

5.2 Surface water and groundwater monitoring reporting

Data for the monitored parameters will be analysed by GHD using the STATISTICA statistical package and presented in Six Monthly Surface Water and Groundwater Monitoring Program Reports. The reports will provide the following information:

- the rainfall data for the reporting period
- summary statistics of the monitored parameters including number of samples, minimum, maximum, mean, median, 20th percentile (where a lower limit is applicable), 80th percentile, standard deviation for the monitored analytes
- comparison of the statistics to the site specific trigger values derived from the baseline data (Attachments 1 and 2) and, where site specific trigger values are not available, default trigger values (refer Table 2-1, Table 2-2 and Table 2-2) and identification of any exceedances
- 'Box and Whisker plots' of the monitored parameters, where the 'box' represents 50% of the dataset (20th and 80th percentile), the 'whiskers' extend to the minimum and maximum values and the median value is shown as a line within the box. Outliers and extreme data points, which may indicate significant deviances resulting from in extreme events, are also identified on these plots
- discussion and analysis of the results and recommendations arising from the monitoring.

5.3 Site discharge, soil and contamination monitoring report

In accordance with NSW-CoA C15, Water, Soil and Contamination Monitoring Reports detailing the results of the monitoring undertaken will be prepared in accordance with this MP for submission to the Secretary (for inclusion in the six monthly construction compliance reporting required under NSW-CoA A32) and relevant regulatory agencies (for information). Reports will be prepared six monthly for the duration of construction of the Project.

Reporting of surface water and groundwater monitoring will be undertaken by GHD on behalf of Roads and Maritime. The Construction Contractors will report on site discharge, contamination, climate statistics and UXO monitoring.

Monitoring Reports will include, but not be limited to, the following information:

- the locations and description of monitoring undertaken
- tabulations of monitoring data
- compliance monitoring results with the criteria identified in Section 2 and Attachments 1 and 2
- identification of exceedances of the nominated criteria and descriptions of the causes of these exceedances
- details of any alteration to the monitoring program
- summary of any complaints received regarding soil, water or contamination.

Roads and Maritime and its Contractors will maintain accurate records of all water, soil and contamination monitoring activities. These records will be made available to the DP&E and DoEE upon request, within the timeframe nominated in the request.

5.4 Reporting on non-conformances and exceedances

In the event that the criteria identified in Section 2 or Attachments 1 and 2 are exceeded, the Contractors (and/or GHD if applicable) 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 Reports and six monthly Monitoring Reports.

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 OACEMP and the Environmental Incident Classification and Reporting Procedure (refer to Appendix A7 of the OACEMP) will apply. The Contractor Environmental Site Representatives are responsible for reporting on incidents.

The Contractor 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.

The Contractor 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 Contractor's personnel who witnessed the event

- the name, address and business hours telephone number of other witnesses to the event
- action taken by the Contractor 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 the Contractor. The Contractor will provide such further details to the EPA within the time specified in the request. The Contractors 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.

5.5 EPL reporting

The Construction Contractor 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 issues, for inclusion in the annual EPL return. EPL annual returns will be prepared for each stage of the Project for which there is an EPL and submitted to the EPA within 60 days of the anniversary of the EPL for the duration of construction.

5.6 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 OACEMP).

The Construction Contractor will submit a report to the EPA that provides details of all complaints received in relation to construction activities regulated by the Contractor 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.

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

6 Adaptive management

Should soil, water or contamination monitoring results directly attributable to the Project exceed the criteria set out in Attachments 1, 2 and Section 2 of this MP, the following steps will be undertaken:

- analysis of the results by the Contractor Environmental Site Representatives, 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 Contractor Environmental Site Representatives
- 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, the Construction Contractor (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 OACEMP. The Construction Contractors will be required to verify and document the effectiveness of any management measures or preventative / corrective actions implemented to avoid further exceedances.

The Construction Contractors will communicate regularly with other high risk construction sites within 500 m of the site boundary to ensure plans are co-ordinated and cumulative soil and water quality impacts are minimised. The Community Consultation Strategy 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 relevant Contractor Project Engineer / Contractor 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).

Attachment 1: Surface Water Baseline Conditions

Baseline surface water quality monitoring results are provided in Tables 1 – 15 below. The locations of the surface water monitoring sites are shown on Figure 3-1 and described in Table 3-1.

The site specific trigger value for each parameter/analyte for each monitoring location is shown in bold font in Tables 1 – 15 below. The adopted trigger values are based on the 20th percentile value (lower limit trigger value if applicable) and / or 80th percentile value (upper limit trigger value) of the analysed baseline data.

Tables 1 – 15 also include the default guideline trigger values as identified in Table 2-1 and Table 2-2 of this MP for comparison purposes.

Monitoring sites SV2, SW29AUS, SW29ADS and SWBG are classified as lowland rivers for purposes of identifying the applicable default trigger values under the ANZECC Guideline, the remaining sites are classified as freshwater lakes for purposes of the ANZECC Guideline (Table 2-1).

The following table provides a list of the baseline parameters presented in this Annexure.

Table	Parameter	Table	Parameter
1	pH	9	Total Nitrogen
2	EC	10	SRP
3	Dissolved Oxygen	11	Total Phosphorus
4	Turbidity	12	Chlorophyll-*a*
5	Total Suspended Solids	13	Chromium
6	Faecal Coliforms	14	Copper
7	Ammonia	15	Zinc
8	NOx		

The following table provides the colour coding used for reporting the results in Tables 1 – 15 below. Cells shaded dark grey indicate monitored parameter values above (or below, where a lower limit is provided) the default guideline trigger values.

Code	Rating	% above or below ANZECC or NHMRC Guideline
	Very Good	0%
	Good	1-10%
	Fair	11-25%
	Poor	26-50%
	Very Poor	51-75%
	Extremely Poor	>75%

Table 1: Baseline data - pH (units)

Site	Default ANZECC trigger value	N	Min	Max	Mean	Median	Adopted trigger value (lower limit / upper limit) (80th, 20th %ile)	Std. Dev	No. Samples Outside Upper Guideline	% Outside Upper Guideline	No. Samples Outside Lower Guideline	% Outside Lower Guideline
SV1[2]	6.5-8.0	11	6.8	7.9	7.4	7.3	**7.2-7.7**	0.3				
SV2[1]	6.5-8.5	9	6.1	8.0	7.1	7.1	**6.7-7.7**	0.6			2	22
CG1[2]	6.5-8.0	12	7.8	8.9	8.4	8.4	**8.1-8.6**	0.3	11	92		
CG2[2]	6.5-8.0	12	8.0	9.2	8.6	8.5	**8.3-8.9**	0.4	12	100		
CG3[2]	6.5-8.0	8	7.9	9.1	8.5	8.3	**8.2-8.9**	0.4	7	88		
SW39DS[2]	6.5-8.0	8	6.7	8.3	7.7	7.7	**7.6-8.1**	0.5	2	25		
SW39US[2]	6.5-8.0	8	6.4	8.0	7.2	7.3	**6.5-7.7**	0.6			2	25
SW5[2]	6.5-8.0	11	7.1	9.7	8.0	7.7	**7.5-8.2**	0.8	4	36		
SW29AUS[1]	6.5-8.5	2	7.5	8.1	7.8	7.8	**7.6-7.9**	0.4				
SW29ADS[1]	6.5-8.5	8	6.3	8.2	7.4	7.4	**7.1-7.8**	0.6			1	13
SWBG[1]	6.5-8.5	12	7.1	8.5	7.8	7.9	**7.6-8.1**	0.4	1	8		

[1]: Lowland river [2]: Freshwater lake

Table 2: Baseline data - EC (µS/cm)

Site	Default ANZECC trigger value	N	Min	Max	Mean	Median	Adopted trigger value (upper limit - 80th %ile)	Std. Dev	No. Samples Outside Guideline	% Outside Guideline
SV1[2]	20-30	11	230	750	587	621	**682**	144	11	100
SV2[1]	200-300	9	237	854	357	257	**403**	221	2	22
CG1[2]	20-30	12	991	2134	1426	1333	**1680**	352	12	100
CG2[2]	20-30	12	1044	1724	1289	1234	**1373**	219	12	100
CG3[2]	20-30	8	707	937	775	747	**807**	76	8	100
SW39DS[2]	20-30	11	361	562	465	475	**524**	64	11	100
SW39US[2]	20-30	11	367	1853	858	481	**1303**	542	11	100
SW5[2]	20-30	11	1055	4878	3289	3839	**4239**	1345	11	100
SW29AUS[1]	200-300	2	1959	2686	2323	2323	**2541**	514	2	100
SW29ADS[1]	200-300	8	468	4589	2780	3533	**4353**	1825	8	100
SWBG[1]	200-300	12	3807	5636	4857	4867	**5295**	519	12	100

[1]: Lowland river [2]: Freshwater lake

Table 3: Baseline data - Dissolved Oxygen (% Saturation)

Site	Default ANZECC trigger value	N	Min	Max	Mean	Median	Adopted trigger value (lower limit - 20th %ile)	Adopted trigger value (upper limit - 80th %ile)	Std. Dev	No. Samples Outside Lower Guideline	% Outside Lower Guideline
SV1[2]	90-110	11	40.7	115.4	67.5	72.6	**48.0**	**74.9**	21.8	10	91
SV2[1]	85-110	9	45.9	96.9	68.7	62.4	**57.4**	**82.5**	16.6	7	78
CG1[2]	90-110	12	71.2	127.4	97.8	97.8	**85.5**	**110.6**	15.7	4	33
CG2[2]	90-110	12	87.7	177.2	110.8	103.9	**98.6**	**115.0**	23.0	1	8
CG3[2]	90-110	8	74.9	134.6	98.3	94.8	**87.3**	**107.7**	18.5	2	25
SW39DS[2]	90-110	11	74.2	127.1	96.2	91.9	**85.1**	**102.0**	15.6	3	27
SW39US[2]	90-110	11	40.2	119.6	83.5	92.9	**64.6**	**103.4**	24.7	5	45
SW5[2]	90-110	11	32.6	157.4	97.4	96.6	**80.5**	**120.3**	34.6	3	27
SW29AUS[1]	85-110	2	7.9	90.1	49.0	49.0	**24.3**	**73.7**	58.1	1	50
SW29ADS[1]	85-110	8	11.1	42.5	26.4	23.7	**15.8**	**39.5**	12.6	8	100
SWBG[1]	85-110	12	34.9	157.5	72.9	69.1	**38.6**	**89.7**	36.6	7	58

[1]: Lowland river [2]: Freshwater lake

Table 4: Baseline data - Turbidity (NTU)

Site	Default ANZECC trigger value	N	Min	Max	Mean	Median	Adopted trigger value (upper limit - 80th %ile)	Std. Dev	No. Samples Outside	% Outside
SV1[2]	20	10	1.0	464.2	57.7	9.6	**23.1**	143.2	2	20
SV2[1]	50	8	1.7	135.6	22.7	4.5	**16.8**	46.1	2	25
CG1[2]	20	11	4.8	116.0	24.7	19.7	**24.7**	31.5	5	45
CG2[2]	20	11	1.7	38.1	11.8	7.4	**14.9**	12.5	2	18
CG3[2]	20	7	3.7	9.0	5.6	4.8	**7.3**	2.0		
SW39DS[2]	20	9	4.5	16.6	11.5	13.4	**14.9**	4.5		
SW39US[2]	20	10	1.5	467.7	65.9	13.1	**57.4**	142.9	4	40
SW5[2]	20	11	0.5	63.1	12.8	9.1	**14.0**	17.6	1	9
SW29AUS[1]	50	2	39.0	107.2	73.1	73.1	**93.6**	48.2	2	100
SW29ADS[1]	50	7	2.0	82.5	29.8	17.1	**61.1**	33.2	3	43
SWBG[1]	50	9	0.9	94.1	13.7	2.3	**7.6**	30.3	1	11

[1]: Lowland river [2]: Freshwater lake

Table 5: Baseline data - Total Suspended Solids (mg/L)

Site	Default US EPA Guideline trigger value	N	Min	Max	Mean	Median	Adopted trigger value (upper limit - 80th %ile)	Std. Dev	No. Samples Outside Guideline*	% Outside Guideline
SV1[2]	80	11	7.0	52.0	24.6	21.0	**34.0**	14.7		
SV2[1]	80	9	2.5	61.0	15.1	11.0	**17.4**	18.4		
CG1[2]	80	12	2.5	140.0	36.4	24.0	**35.2**	39.3	2	17
CG2[2]	80	12	2.5	44.0	14.6	11.5	**17.0**	11.2		
CG3[2]	80	8	2.5	15.0	8.5	9.0	**11.6**	4.4		
SW39DS[2]	80	11	2.5	26.0	10.0	8.0	**13.0**	6.4		
SW39US[2]	80	11	2.5	66.0	23.3	10.0	**38.0**	22.5		
SW5[2]	80	11	2.5	38.0	13.0	12.0	**15.0**	9.5		
SW29AUS[1]	80	2	70.0	110.0	90.0	90.0	**102.0**	28.3	1	50
SW29ADS[1]	80	9	2.5	32.0	13.3	8.0	**22.4**	10.9		
SWBG[1]	80	12	2.5	29.0	10.7	9.5	**14.6**	8.4		

[1]: Lowland river [2]: Freshwater lake

Table 6: Baseline data - Faecal Coliforms (CFU/100 mL)

Site	Default ANZECC trigger value	N	Min	Max	Mean	Median	Adopted trigger value (upper limit - 80th %ile)	Std. Dev	No. Samples Outside 2ry Recreation Guideline	% Outside 2ry Recreation Guideline
SV1[2]	1000	11	13.0	470	160.5	170	**220**	138.3		
SV2[1]	1000	9	4.0	3,600	584.9	140	**480**	1,145.7	1	11
CG1[2]	1000	12	13.0	830	310.4	295	**552**	257.4		
CG2[2]	1000	12	6.0	41,000	3478.0	40.5	**140**	11,817	1	8
CG3[2]	1000	8	1.0	51	9.8	2.5	**10**	17.2		
SW39DS[2]	1000	11	2.0	220	57.9	30	**90**	65.7		
SW39US[2]	1000	11	0.5	320	49.7	5	**38**	97.3		
SW5[2]	1000	11	5.0	1,200	246.1	110	**220**	357.1	1	9
SW29AUS[1]	1000	2	34.0	72,000	36,017.0	36017	**57,607**	50,887.6	1	50
SW29ADS[1]	1000	9	12.0	18,000	3,645.8	1200	**5,040**	5,767.4	5	56
SWBG[1]	1000	12	6.0	33,000	2,961.4	150	**454**	9,461.7	1	8

[1]: Lowland river [2]: Freshwater lake
Note: ANZECC Guidelines default trigger = 1000 CFU/100/mL for secondary contact recreation

Table 7: Baseline data - Ammonia (mg/L)

Site	Default ANZECC trigger value	N	Min	Max	Mean	Median	Adopted trigger value (upper limit - 80th %ile)	Std. Dev	No. Samples Outside	% Outside
SV1[2]	0.01	11	0.005	2.560	0.773	0.350	**1.860**	0.926	10	91
SV2[1]	0.02	9	0.005	2.020	0.254	0.030	**0.056**	0.663	8	89
CG1[2]	0.01	12	0.005	0.130	0.030	0.020	**0.038**	0.035	8	67
CG2[2]	0.01	12	0.005	0.160	0.051	0.035	**0.076**	0.052	8	67
CG3[2]	0.01	8	0.030	0.800	0.359	0.315	**0.592**	0.283	8	100
SW39DS[2]	0.01	11	0.005	0.210	0.059	0.020	**0.090**	0.075	6	55
SW39US[2]	0.01	11	0.005	1.460	0.207	0.020	**0.050**	0.455	7	64
SW5[2]	0.01	11	0.005	0.380	0.153	0.070	**0.280**	0.144	8	73
SW29AUS[1]	0.02	2	0.660	0.830	0.745	0.745	**0.796**	0.120	2	100
SW29ADS[1]	0.02	9	0.060	1.590	0.452	0.260	**0.642**	0.366	9	100
SWBG[1]	0.02	12	0.040	0.150	0.073	0.060	**0.080**	0.032	12	100

[1]: Lowland river [2]: Freshwater lake

Table 8: Baseline data - NOx (mg/L)

Site	Default ANZECC trigger value	N	Min	Max	Mean	Median	Adopted trigger value (upper limit - 80th %ile)	Std. Dev	No. Samples Outside	% Outside
SV1[2]	0.01	11	0.005	0.480	0.145	0.100	**0.260**	0.146	9	82
SV2[1]	0.04	9	0.030	7.780	0.987	0.080	**0.368**	2.551	7	78
CG1[2]	0.01	12	0.005	3.300	0.288	0.005	**0.018**	0.949	3	25
CG2[2]	0.01	12	0.005	2.900	0.279	0.035	**0.068**	0.826	8	67
CG3[2]	0.01	6	0.005	0.170	0.058	0.040	**0.090**	0.063	4	67
SW39DS[2]	0.01	6	0.005	0.050	0.023	0.020	**0.040**	0.018	4	67
SW39US[2]	0.01	6	0.005	0.040	0.011	0.005	**0.005**	0.014	1	17
SW5[2]	0.01	7	0.005	0.320	0.085	0.050	**0.102**	0.110	5	71
SW29AUS[1]	0.04	2	0.040	1.080	0.560	0.560	**0.872**	0.735	1	50
SW29ADS[1]	0.04	6	0.005	0.310	0.081	0.023	**0.120**	0.121	2	33
SWBG[1]	0.04	10	0.320	36.700	9.495	5.625	**13.360**	10.804	10	100

[1]: Lowland river [2]: Freshwater lake

Table 9: Baseline data - TN (mg/L)

Site	Default ANZECC trigger value	N	Min	Max	Mean	Median	Adopted trigger value (upper limit - 80th %ile)	Std. Dev	No. Samples Outside	% Outside
SV1[2]	0.35	11	1.400	4.600	3.191	3.10	**4.500**	1.156	11	100
SV2[1]	0.35	9	0.050	9.200	1.850	0.40	**2.660**	3.081	5	56
CG1[2]	0.35	12	0.700	8.600	2.608	1.40	**3.940**	2.494	12	100
CG2[2]	0.35	12	0.700	5.000	1.483	1.10	**1.680**	1.168	12	100
CG3[2]	0.35	8	1.400	3.300	2.038	1.95	**2.300**	0.628	8	100
SW39DS[2]	0.35	11	0.700	1.900	1.127	1.10	**1.200**	0.332	11	100
SW39US[2]	0.35	11	0.700	3.300	1.609	1.50	**2.000**	0.735	11	100
SW5[2]	0.35	11	0.500	2.700	1.364	1.10	**1.600**	0.682	11	100
SW29AUS[1]	0.35	2	4.500	8.500	6.500	6.50	**7.700**	2.828	2	100
SW29ADS[1]	0.35	9	0.200	7.800	2.578	1.80	**4.240**	2.987	7	78
SWBG[1]	0.35	12	1.700	39.100	10.608	7.15	**13.340**	10.283	12	100

[1]: Lowland river [2]: Freshwater lake

Table 10: Baseline data - Soluble reactive Phosphorus SRP (mg/L)

Site	Default ANZECC trigger value	N	Min	Max	Mean	Median	Adopted trigger value (upper limit - 80th %ile)	Std. Dev	No. Samples Outside	% Outside
SV1[2]	0.005	11	0.005	0.290	0.143	0.100	**0.270**	0.108	10	91
SV2[1]	0.020	9	0.005	0.170	0.029	0.005	**0.027**	0.056	2	22
CG1[2]	0.005	12	0.005	0.005	0.005	0.005	**0.005**	0.000		
CG2[2]	0.005	12	0.005	0.005	0.005	0.005	**0.005**	0.000		
CG3[2]	0.005	8	0.005	0.240	0.138	0.170	**0.226**	0.100	6	75
SW39DS[2]	0.005	11	0.005	0.005	0.005	0.005	**0.005**	0.000		
SW39US[2]	0.005	11	0.005	0.005	0.005	0.005	**0.005**	0.000		
SW5[2]	0.005	11	0.005	0.040	0.025	0.030	**0.040**	0.014	8	73
SW29AUS[1]	0.020	2	0.005	0.005	0.005	0.005	**0.005**	0.000		
SW29ADS[1]	0.020	9	0.005	0.230	0.071	0.040	**0.144**	0.085	5	56
SWBG[1]	0.020	12	0.005	0.100	0.037	0.025	**0.060**	0.035	6	50

[1]: Lowland river [2]: Freshwater lake

Table 11: Baseline data – Total Phosphorus (mg/L)

Site	Default ANZECC trigger value	N	Min	Max	Mean	Median	Adopted trigger value (upper limit - 80th %ile)	Std. Dev	No. Samples Outside	% Outside
SV1[2]	0.010	11	0.020	0.850	0.424	0.420	**0.590**	0.224	11	100
SV2[1]	0.025	9	0.005	0.210	0.055	0.005	**0.108**	0.082	3	33
CG1[2]	0.010	12	0.005	0.510	0.111	0.060	**0.126**	0.147	11	75
CG2[2]	0.010	12	0.005	0.130	0.041	0.035	**0.064**	0.036	11	75
CG3[2]	0.010	8	0.050	0.330	0.215	0.255	**0.314**	0.112	8	100
SW39DS[2]	0.010	11	0.005	0.450	0.073	0.030	**0.070**	0.127	10	73
SW39US[2]	0.010	11	0.020	0.210	0.066	0.050	**0.080**	0.051	11	100
SW5[2]	0.010	11	0.005	0.140	0.051	0.050	**0.060**	0.036	10	91
SW29AUS[1]	0.025	2	0.240	0.620	0.430	0.430	**0.544**	0.269	2	100
SW29ADS[1]	0.025	9	0.005	0.600	0.207	0.160	**0.354**	0.199	6	78
SWBG[1]	0.025	12	0.040	0.390	0.124	0.090	**0.166**	0.096	10	100

[1]: Lowland river [2]: Freshwater lake

Table 12: Baseline data - Chlorophyll-*a* (µg/L)

Site	Default ANZECC trigger value	N	Min	Max	Mean	Median	Adopted trigger value (upper limit - 80th %ile)	Std. Dev	No. Samples Outside	% Outside
SV1[2]	5	11	1.0	114.0	39.5	36.0	**65.0**	36.4	8	73
SV2[1]	3	9	0.5	55.0	15.3	4.0	**30.4**	20.9	5	56
CG1[2]	5	12	1.0	77.0	27.8	23.5	**42.4**	24.9	9	75
CG2[2]	5	12	1.0	56.0	21.4	19.5	**36.6**	18.1	9	75
CG3[2]	5	8	0.5	24.0	8.3	5.0	**14.4**	8.4	3	38
SW39DS[2]	5	11	3.0	13.0	6.7	6.0	**10.0**	3.2	6	55
SW39US[2]	5	11	2.0	52.0	16.1	9.0	**31.0**	15.9	9	82
SW5[2]	5	11	0.5	36.0	16.8	14.0	**31.0**	12.4	8	73
SW29AUS[1]	3	2	38.0	301.0	169.5	169.5	**248.4**	186.0	2	100
SW29ADS[1]	3	9	0.5	41.0	8.3	3.0	**10.4**	13.7	3	33
SWBG[1]	3	12	2.0	467.0	55.1	15.5	**30.8**	130.3	11	92

[1]: Lowland river [2]: Freshwater lake

Table 13: Baseline data - Chromium (mg/L)

Site	Default ANZECC trigger value	N	Min	Max	Mean	Median	Adopted trigger value (upper limit - 80th %ile)	Std. Dev	No. Samples Outside	% Outside
SV1[2]	0.001	11	0.0005	0.0005	0.0005	0.0005	**0.0005**	0.0000		
SV2[1]	0.001	9	0.0005	0.0020	0.0008	0.0005	**0.0011**	0.0007	2	22
CG1[2]	0.001	12	0.0005	0.0030	0.0007	0.0005	**0.0005**	0.0007	1	8
CG2[2]	0.001	12	0.0005	0.0010	0.0005	0.0005	**0.0005**	0.0001		
CG3[2]	0.001	8	0.0005	0.0005	0.0005	0.0005	**0.0005**	0.0000		
SW39DS[2]	0.001	11	0.0005	0.0005	0.0005	0.0005	**0.0005**	0.0000		
SW39US[2]	0.001	11	0.0005	0.0020	0.0007	0.0005	**0.0005**	0.0005	1	9
SW5[2]	0.001	11	0.0005	0.0020	0.0007	0.0005	**0.0010**	0.0005	1	9
SW29AUS[1]	0.001	2	0.0005	0.0030	0.0018	0.0018	**0.0025**	0.0018	1	50
SW29ADS[1]	0.001	9	0.0005	0.0010	0.0006	0.0005	**0.0005**	0.0002		
SWBG[1]	0.001	12	0.0005	0.0005	0.0005	0.0005	**0.0005**	0.0000		

Table 14: Baseline data - Copper (mg/L)

Site	Default ANZECC trigger value	N	Min	Max	Mean	Median	Adopted trigger value (upper limit - 80th %ile)	Std. Dev	No. Samples Outside	% Outside
SV1[2]	0.0014	11	0.0005	0.0030	0.0017	0.0020	**0.0020**	0.0009	7	64
SV2[1]	0.0014	9	0.0005	0.0220	0.0040	0.0010	**0.0040**	0.0071	4	44
CG1[2]	0.0014	12	0.0005	0.0080	0.0022	0.0010	**0.0038**	0.0024	5	42
CG2[2]	0.0014	12	0.0005	0.0020	0.0008	0.0005	**0.0009**	0.0006	2	17
CG3[2]	0.0014	8	0.0005	0.0040	0.0012	0.0005	**0.0016**	0.0013	2	25
SW39DS[2]	0.0014	11	0.0005	0.0030	0.0013	0.0010	**0.0020**	0.0009	5	45
SW39US[2]	0.0014	11	0.0005	0.0240	0.0037	0.0020	**0.0030**	0.0068	6	55
SW5[2]	0.0014	7	0.0005	0.0020	0.0008	0.0005	**0.0009**	0.0006	1	14
SW29AUS[1]	0.0014	2	0.0005	0.0060	0.0033	0.0033	**0.0049**	0.0039	1	50
SW29ADS[1]	0.0014	5	0.0005	0.0050	0.0022	0.0010	**0.0042**	0.0021	2	40
SWBG[1]	0.0014	7	0.0020	0.0060	0.0039	0.0040	**0.0048**	0.0013	7	100

Table 15: Baseline data - Zinc (mg/L)

Site	Default ANZECC trigger value	N	Min	Max	Mean	Median	Adopted trigger value (upper limit - 80th %ile)	Std. Dev	No. Samples Outside	% Outside
SV1[2]	0.008	11	0.0025	0.0150	0.0050	0.0025	**0.0060**	0.0038	1	9
SV2[1]	0.008	9	0.0025	0.0420	0.0091	0.0025	**0.0124**	0.0131	3	33
CG1[2]	0.008	12	0.0025	0.0130	0.0049	0.0025	**0.0068**	0.0041	2	17
CG2[2]	0.008	12	0.0025	0.0260	0.0052	0.0025	**0.0053**	0.0068	1	8
CG3[2]	0.008	8	0.0025	0.0160	0.0046	0.0025	**0.0046**	0.0048	1	13
SW39DS[2]	0.008	11	0.0025	0.0210	0.0045	0.0025	**0.0025**	0.0056	1	9
SW39US[2]	0.008	11	0.0025	0.0690	0.0179	0.0025	**0.0280**	0.0212	5	45
SW5[2]	0.008	11	0.0025	0.0160	0.0051	0.0025	**0.0070**	0.0044	2	18
SW29AUS[1]	0.008	2	0.0025	0.0350	0.0188	0.0188	**0.0285**	0.0230	1	50
SW29ADS[1]	0.008	9	0.0025	0.0180	0.0048	0.0025	**0.0047**	0.0053	1	11
SWBG[1]	0.008	12	0.0025	0.0070	0.0037	0.0025	**0.0058**	0.0018		

Attachment 2: Baseline groundwater data and trigger values

Groundwater trigger values

BH	DO (mg/L)		EC (µS/cm)	pH		Temperature (°C)		Ammonia (mg/L)	Nickel (mg/L)	Zinc (mg/L)	TKN (mg/L)	TN (mg/L)	TP (mg/L)
	20th %ile	80th %ile	80th %ile	20th %ile	80th %ile	20th %ile	80th %ile	80th %ile	80th %ile	80th %ile	80th %ile	80th %ile	80th %ile
BH19	0.21	1.684	7421	6.2	6.6	18.6	20.6	0.772	0.071	0.0426	1.04	1.06	0.176
BH26	0.67	1.52	5,912	6.0	6.7	18.4	20.1	0.716	0.059	0.046	1.06	1.06	0.280
BH28	0.74	1.62	8,600	6.2	7.0	20.1	23.3	1.062	0.074	0.0632	1.30	1.36	0.124
BH29	0.47	1.774	8,152	6.1	6.7	18.9	21.6	1.984	0.070	0.0766	2.06	2.18	0.088
BH5	0.93	2.396	27,734	6.1	6.5	20.9	21.9	0.258	0.052	0.0748	4.04	4.60	1.390
BHG-116	0.36	1.686	27,292	6.0	6.7	19.1	20.6	1.28	0.022	0.115	1.90	2.42	0.460

Locations of monitoring boreholes are shown on Figure 3-1.

Annexure C – Template Sediment Basin Management Plan

A template for the proposed structure and content for the Contractors' Sediment Basin Management Plan is provided below. The Contractors will prepare a Sediment Basin Management Plan as part of the Contractors' CSWMPs in accordance with the legislation, guidelines and standards identified in Section 3 of this overarching CSWMP and consistent with this template Sediment Basin Management Plan.

Where appropriate, the Contractors may supply a Sediment Basin Management Plan with an alternative structure provided it meets the requirements identified in this CSWMP and the relevant Roads and Maritime specifications. Roads and Maritime will review the Contractors' documentation to confirm consistency with the applicable requirements.

Contents

1 Introduction

1.1 Purpose

A number of sediment basins will be required throughout the Project during Construction. The purpose of this Sediment Basin Management Plan 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 Plan will ensure that appropriate environmental protection measures are in place relating to sediment basins and construction water management. Implementation of this Plan 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 Plan has been developed in accordance with best practice guidelines such as *Managing Urban Stormwater Soils and Construction* (Landcom, 2004) and Roads and Maritime specifications.

1.2 Objective

The objectives of this Plan 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 EPLs
  - this overarching CSWMP
- ensure compliance with the environmental requirements of the Project, including all legal requirements and contractual obligations.

1.3 Scope

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

1.4 Induction / training

All site personnel involved in the design, construction, management or maintenance of sediment basins on the Project will be trained and inducted in this Plan.

The Contractors will prepare EWMS for construction and operation of sediment basins and/or buffer swales and connecting drainage for the associated catchment area. EWMS will also be prepared for discharge of construction water into natural waterways.

1.5 Roles and responsibilities

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

The Contractor's Soil Conservationist will review sediment basins and associated infrastructure and controls prior to their installation.

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

1.6 Review

This Plan will be updated by the Contractor and reviewed by the Contractor's Soil Conservationist and Roads and Maritime Environmental Manager (or delegate) prior to commencement of Construction.

This Plan will be updated throughout Construction of the Project to include any new sediment basins and additional management measures. This Plan will be reviewed annually or as required in accordance with the continuous improvement process described in Section 8 of the CSWMP.

2 Procedure

2.1 Location and construction of sediment basins

The Contractor will undertake an assessment of the construction phase catchments and the selected sediment basin locations to confirm all sediment basin locations.

Sediment basins will be 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) is to be provided in the ESCPs. Fencing will be installed around each sediment basin to prevent entry by unauthorised people.

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

- all requirements of *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004)
- Roads and Maritime Specification – G38 Soil and Water Management (Soil and Water Management Plan)
- the overarching CSWMP and template Sediment Basin Management Plan.

The Contractor 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. The Contractors will detail how the design will direct runoff from each catchment to the sediment basins via stabilised controls such as catch drains.

The Contractors 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. The Contractors will prepare a supporting report that lists design parameters, including confirmation by the Contractor Soil Conservationist that sediment basin designs (and restoration and revegetation proposals) conform to the requirements.

The Contractor will install and commission all sediment basins and associated drainage 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.

2.2 Water quality criteria

Before any water can be discharged from sediment basins it must meet the water quality parameter limits for discharges of pollutants to water set out in the applicable EPL. If the criteria are met, the water is suitable for discharge. If the criteria are not met, treatment of water will occur in accordance with Section 2.4.

The Licenced Discharge Points (LDP) in the approved EPLs will be identified in the Contractors' ESCPs. The water quality discharge criteria which apply to the LDPs are listed in Table 2-1.

Table 2-1: Discharge water quality criteria

Parameter	Units of measure	100 percentile concentration limit	Frequency	Sampling method
Oil and Grease*	Visible	No visible	Special Frequency 1	Visual inspection
pH	pH	6.5 –8.5	Special Frequency 1	Probe
Total Suspended Solids	milliequivalents per litre	50 mg/L	Special Frequency 1	Grab Sample

Special Frequency 1 means:

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

2.3 Water quality testing of sediment basins

Prior to discharge of water from sediment basins, pH and turbidity will be measured and visible oil and grease will be recorded. Water samples will be taken from the sediment basin in bottles appropriate for the analytes to be tested and sent to a NATA accredited laboratory to be tested for pH, TSS, salinity and heavy metals. Water quality of the samples must meet the criteria set out in the EPL (refer Table 2-1) prior to discharge.

Exceedance of the limits specified in Table 2-1 for pH and TSS for discharges from LDPs is only permitted when the five day total rainfall at the site exceeds the total identified in the stage specific EPL.

The Contractors may use turbidity (NTU) in place of TSS to determine compliance with the TSS limits in Table 2-1, provided a statistical correlation is developed which identifies the relationship between NTU and TSS for water quality from the discharge points in order to determine the NTU equivalent of 50 mg/L TSS before its use.

The Contractors will provide the EPA with a copy of the statistical assessment methodology and results before using NTU in place of TSS. The Contractors will develop and implement a method to enable the ongoing verification of the relationship between NTU and TSS and provide the EPA with any amendments made to the statistical correlation as a result of the ongoing verification before using the revised statistical correlation.

2.4 Water treatment

The Contractors will identify the methods for treating sediment basin water if it does not meet the discharge criteria set out in the EPL. This will include measures for treatment of pH, a flocculation procedure to manage TSS, and methods to remove hydrocarbons, metals or other pollutants.

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. The Contractors may use an alternative flocculant 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.

The Contractors will ensure that flocculants and other water treatment chemicals are appropriately stored on site. Bulk flocculants will be covered and positioned within erosion and sediment controls away from areas with the potential for water runoff. All treatment chemicals will be stored in appropriately bunded and covered locations that are locked to prevent unauthorised access. Requirements of the Material Safety Data Sheets will be followed.

2.5 Discharging water

Water discharge from sediment basins will only occur following approval by the Contractor Environmental Site Representative. The EPA will be notified in writing at least 48 hours prior to any discharge from a sediment basin. The EPA notification will include provision of an updated Temporary Sediment Basin Discharge Point Schedule.

The method for discharge will depend on the design of the sediment basin. The Contractor will undertake the following tasks prior to discharging from sediment basins:

- the discharge point will be checked to ensure there will be no scour or erosion when the water is released
- immediately prior to discharge, sediment basin water pH and turbidity will be re-tested in-situ
- where possible, water will be re-used for Construction, such as dust suppression and watering of vegetation
- site personnel undertaking discharge will be trained and authorised to release the sediment basin
- pumps, if used for discharge, must include an attached float to prevent sediment being picked up during discharge
- construction water that is to be discharged to land will be within the areas approved in the EPL and identified on a map.

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.

The Contractor will update the Sediment Basin Discharge Register following the discharging of water.

2.6 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 Contractors will ensure that removed sediment is disposed of in appropriate locations to avoid the sediment being conveyed back into the Construction area, into watercourses or off site.

The Contractors 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 for the stage. The details will also be included in the Contractors' CEMPs and CSWMPs.

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.

2.7 Removal of sediment basins

Removal of sediment basins will occur in accordance with the EPL requirements following revegetation or stabilisation of upstream areas. The Contractor 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 Contractors will progressively update ESCPs to reflect the decommissioning of sediment basins.

3 Inspection and monitoring

The Contractor's Soil Conservationist will undertake inspections of sediment basins regularly. The Contractor's Soil Conservationist will prepare a report detailing findings from these inspections. 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.

The Contractor will provide a monitoring program for sediment basins which will include, as a minimum, weekly monitoring during dry weather, one working day following a storm event, heavy or violent rainfall event, and prior to discharge. The details will be recorded in the Sediment Basin Discharge Register.

4 Records

The Contractors will maintain records of relevant data, including records of water quality management and water discharge. Records will be provided to the EPA if requested.

A record will be maintained for each sediment basin that will include details such as basin inspections, maintenance, water treatment (flocculation or chemical) details, water quality monitoring details and occurrences (time of commencement and cessation) and amounts of discharge from the basin.

The Contractors will maintain a Sediment Basin Discharge Register that details discharge volumes and dates, water quality testing and treatment (flocculation), discharge water quality and volumes of sediment removed. The register will include 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.

The Contractors will report on site discharge monitoring results in the Water, Soil and Contamination Monitoring Reports to be prepared six monthly for the duration of Construction of the Project. Details of the reporting are outlined in the Construction Water, Soil and Contamination Monitoring Program (refer Annexure B of this CSWMP).

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Annexure D – Template Stockpile Management Protocol

A template for the proposed structure and content for the Contractors' Stockpile Management Protocol is provided below. The Contractors will prepare a Stockpile Management Protocol as part of the Contractors' CSWMPs in accordance with the legislation, guidelines and standards identified in Section 3 of the overarching CSWMP and consistent with this template Stockpile Management Protocol.

Where appropriate, the Contractors may supply a Stockpile Management Protocol with an alternative structure provided it meets the requirements identified in this CSWMP and the relevant Roads and Maritime specifications. Roads and Maritime will review the Contractors' documentation to confirm consistency with the applicable requirements.

Contents

1. Introduction

1.1 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:

- *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004)
- *Technical Guideline EMS-TG-010: Stockpile Site Management Guideline* (RTA, 2011)
- *Stockpile Management Guidelines* (Roads and Maritime, 2015)
- Roads and Maritime specifications.

1.2. 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
- ASS subject to treatment prior to reuse
- 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 and therefore condition A16 would apply. The stockpile will be detailed in the AFMP and subject to approval. The criteria in condition A15 will also apply to its location.

Potential contaminated soil or other material will be managed in accordance with the Unexpected Discovery of Contaminated Land Procedure (refer Annexure B of the CCLMP). ASS will be managed in accordance with the Asbestos Management Plan (refer Annexure C of the CCLMP).

The process for monitoring and managing spoil, including details of how excavated material will be managed on-site and during off-site transport is detailed within the Construction Waste and Energy Management Plan (CWEMP). 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.

1.3 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.

1.4 Roles and responsibilities

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

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

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

1.5 Review

This Protocol will be updated by the Contractor Environmental Site Representative and reviewed by the Contractor Soil Conservationist and Roads and Maritime Environmental Manager (or delegate) prior to commencement of Construction of the Project.

This Protocol will be reviewed annually, or as required in accordance with the continuous improvement process described in Section 8 of this CSWMP.

2. Stockpile location criteria

2.1 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.

2.2 Stockpile Register

The Contractor will include approved stockpile locations on ESCPs or relevant site plans and will maintain a record of stockpile locations in a Stockpile Register prepared as part of the Contractor's CSWMP. The Stockpile Register will demonstrate compliance with the location criteria in Section 2.1. The Stockpile Register will also include the purpose of the stockpile, the type and quantity of material contained, timing for establishment and removal.

3. Stockpile management protocol

3.1 Stockpile location approval

Prior to the establishment of any stockpile on Site as part of the Project, the Contractor will detail how the stockpile site meets each of the criteria in Section 2.1. Before establishing a new stockpile site, the Contractor will consider whether any existing stockpile site in the vicinity can be used. The Contractor will undertake an advanced contamination assessment prior to disturbance of any land being or intended to be used by the Contractor for the location of stockpiles.

The proposed locations and maximum dimensions of the proposed stockpiles will be 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.

3.2 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. Any change in use will be reflected where required in the Contractor ESCP and the Stockpile Register.

Site-specific mitigation measures, where they are necessary to further reduce impacts, will be detailed in the Contractor's Stockpile Management Plan and/or ESCP. 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.

3.2.1 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:

- 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 located on elevated ground
- 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 E of this CSWMP).

Any mulch material applied or stockpiled on land inside the DEOH boundary fence or on land that will be within 30 m of the DEOH boundary fence on completion of the Project will fulfil the requirements of the Mulch Exemption 2016 and the Mulch Order 2016 as if the mulch were being applied to an environmentally sensitive area as defined in the Exemption and the Order.

3.2.2 Topsoil stockpiles

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

- prior to stockpiling topsoil, the Contractors 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 m^3 each.

The Contractors 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. The Contractors 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.

3.3 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.

4. Inspection, monitoring and reporting

Compliance with this Protocol will be tracked through weekly environmental inspections of stockpile sites. 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.

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Annexure E – Template Management of Tannins from Vegetation Mulch Procedure

A template for the proposed structure and content for the Contractors' Management of Tannins from Vegetation Mulch Procedure is provided below. The Contractors will prepare a Management of Tannins from Vegetation Mulch Procedure as part of the Contractors' CSWMPs in accordance with the legislation, guidelines and standards identified in Section 3 of this overarching CSWMP and consistent with this template Management of Tannins from Vegetation Mulch Procedure.

Where appropriate, the Contractors may supply a Management of Tannins from Vegetation Mulch Procedure with an alternative structure provided it meets the requirements identified in this CSWMP and the relevant Roads and Maritime specifications. Roads and Maritime will review the Contractors' documentation to confirm consistency with the applicable requirements.

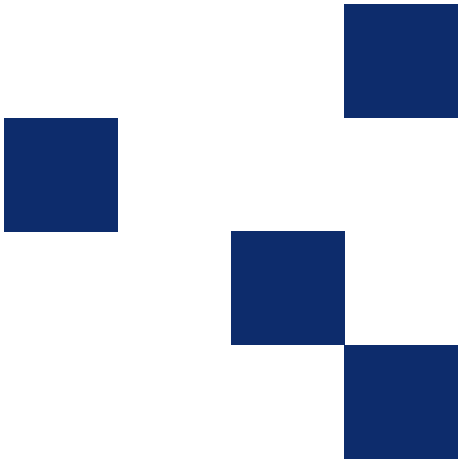
Transport Roads & Maritime Services

NSW GOVERNMENT

ENVIRONMENTAL DIRECTION

Management of Tannins from Vegetation Mulch

JANUARY 2012



ABOUT THIS RELEASE

Environmental Direction number	25
Environmental Direction title	Management of Tannins from Vegetation Mulch
Author	Environment Branch (Environmental Policy)

Issue	Date	Revision description
1	December 2011	Final draft
2	January 2012	Final

CONTENTS

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 (eg *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 flocculants. 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	
Site Occupier	<insert name of contractor / alliance etc>
Project Name	<insert project name>
Location	<insert location of mulch stockpile>
Mulch stockpile access directions	<insert adequate directions for community members to find the stockpile location>

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.

Community Mulch Giveaway Record Sheet				
Date	**Car Registration**	**I have read and understand the 'Community Mulch Giveaway Information Sheet'**	**Name**	**Signature**
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		

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Annexure F – Concept Erosion and Sediment Control Plans

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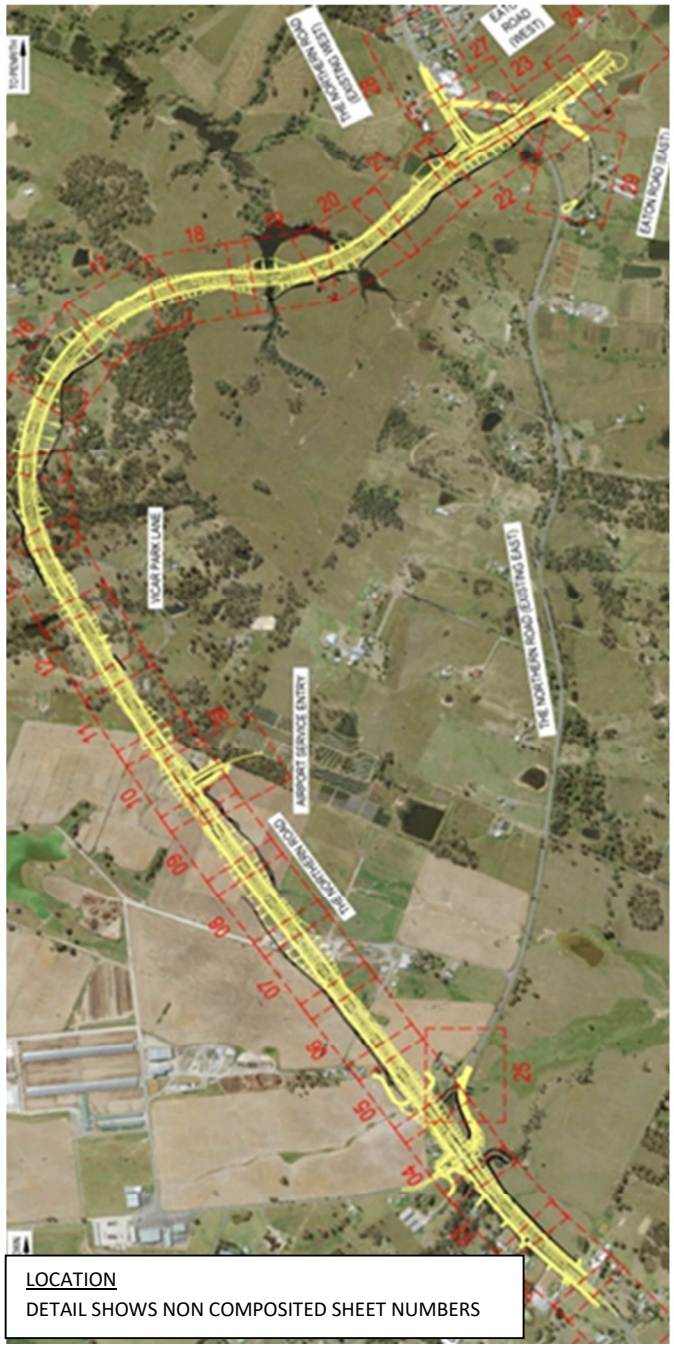
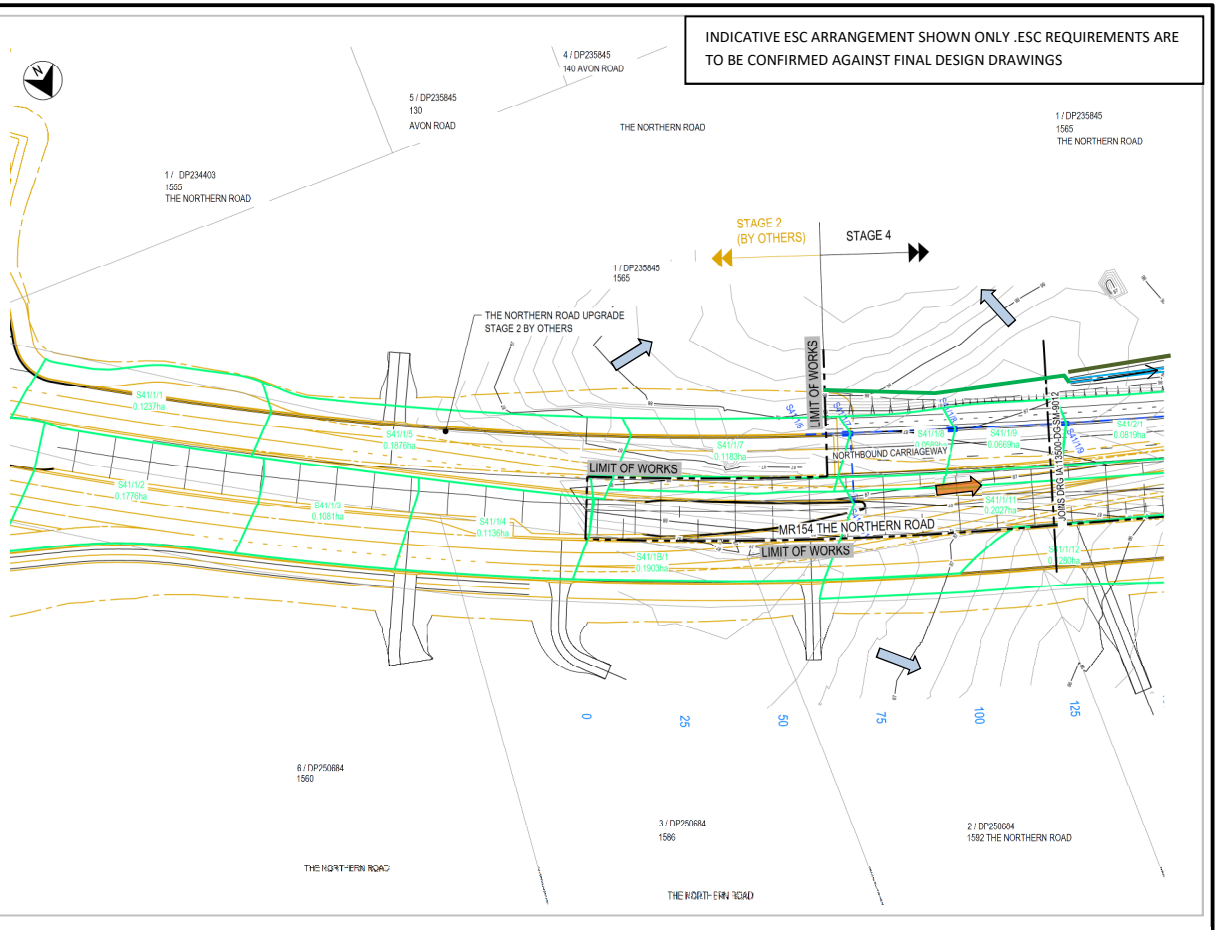
Stage 4 Concept ERSED Plans



KEY TO SHEETS	
SHEET	CHAINAGE
1.	0-125
2.	125-625
3.	625-1125
4.	1125-1650
5.	1650-2125
6.	2125-2625
7.	2625-3125
8.	3625-4125
9.	4125-4625
10.	4625-5125
11.	5125-5375
12.	5375-5800

BASIN SCHEDULE
TAKEN FROM CONSTRCUTION STAGING DWGS (BY OTHERS)
B560R
B670R
B880R
B1320R
B940R
B2580L
B2820L
B4400L
B3250L
B3340L
B3800L
B3740L
B4500L
B4760L
B5060L
B5140L
B2200L
B5710R



ASSESSMENT OF EROSION RISK AND BASIN CAPACITY REQUIREMENTS

SOIL LOSS CALCULATION (REVISED UNIVERSAL SOIL LOSS EQUATION)				
R = 2200	K=0.04*	LS = 1.2**	C= 1.0	P= 1.3
GIVES: 2 MONTH STORAGE VOLUME = 81.25M3/HA AT 1.3 T/M3 SOIL LOSS = 145 TONNE / HA / YEAR OR 110M3/HA/YEAR 2 MONTH SOIL LOSS = 18.5M3/HA				
SETTLING ZONE				
CV=0.6		R(80%/5 DAY) =27.6***		
GIVES SETTLING ZONE REQUIRED OF 166M3/HA				
TOTAL VOLUME OF BASIN REQUIRED APPROX =184.4 M3/HA **ADOPT VALUE – 185- 200M3/HA**				
*	K	BLACKTOWN AND LUDDENHAM SOIL LANDSCAPES		
**	LS	80M AT 5%		
***	R	WALLACIA (FROM MANAGING URBAN STORMWATER		

KEY	ESC MEASURES – APPROXIMATE LOCATION ONLY
	NATURAL DRAINAGE LINE
	GENERAL FALL OF SURFACE – OF SITE CATCHMENTS
	GENERAL FALL OF SURFACE - WORKS CATCHMENTS
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	SHAPED MULCH BERM SEDIMENT CONTROL
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ErSed Environmental Pty Ltd
PO Box 1124 Leichhardt 2040

M. 0424 203 046
E.info@ersed.com.au

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- GENERAL NOTES TO ESC (SHEET 14)
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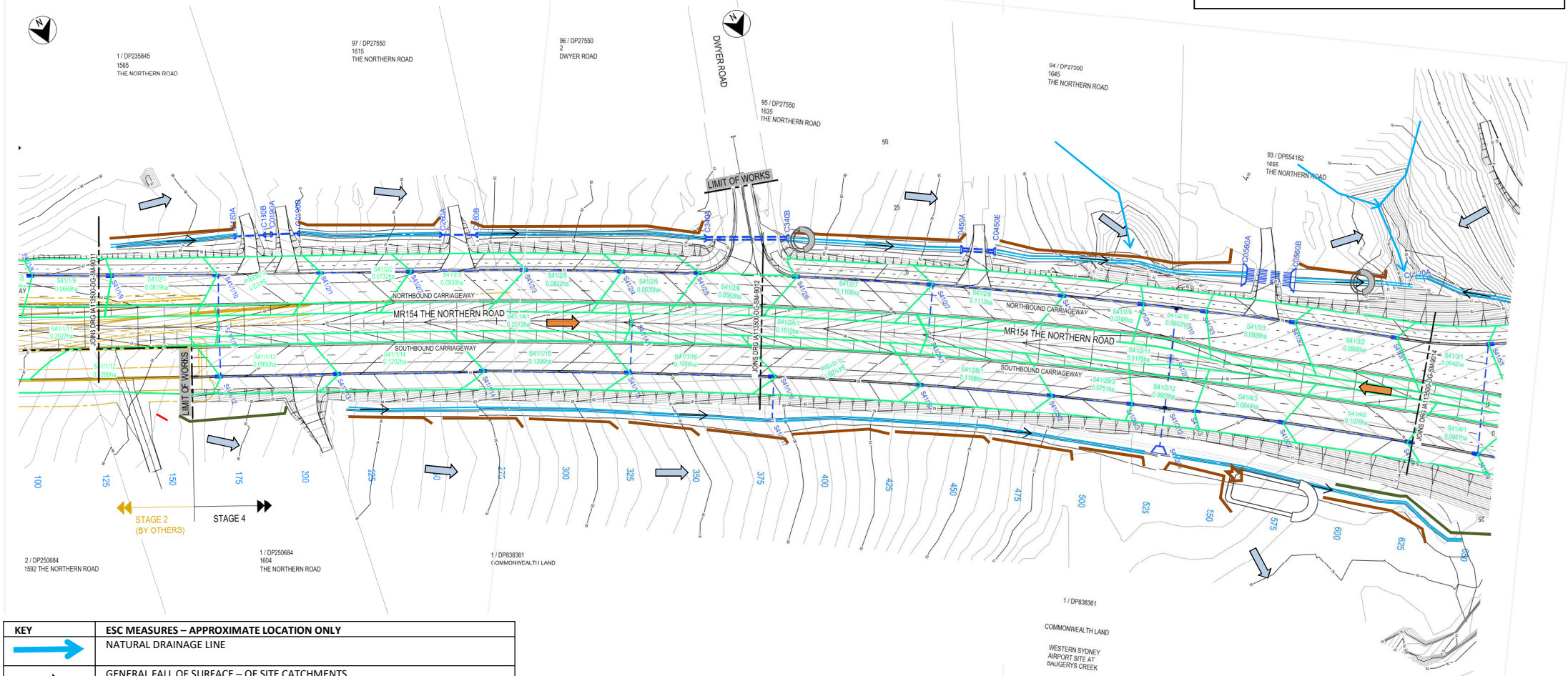
CLIENT BASE PLANS: DS2016/000435 (COMPOSITE)

ERSED REF:	18003	**PROGRESSIVE EROSION AND SEDIMENT CONTROL PLAN**	
DRAWN	CV	THE NORTHERN ROAD UPGRADE STAGE 4	
CREATED	JAN 2018	GENERAL ARRANGEMENT: INDICATIVE ERSOSION AND SEDIMENT CONTROL PLAN	
DATE THIS AMDT	07 MAY 2018	ESC INDICATIVE 1 of 15	2
CLIENT	RMS	PREFIX NUMBER SHEET	AMDT

INDICATIVE ESC ARRANGEMENT SHOWN ONLY .ESC REQUIREMENTS ARE TO BE CONFIRMED AGAINST FINAL DESIGN DRAWINGS



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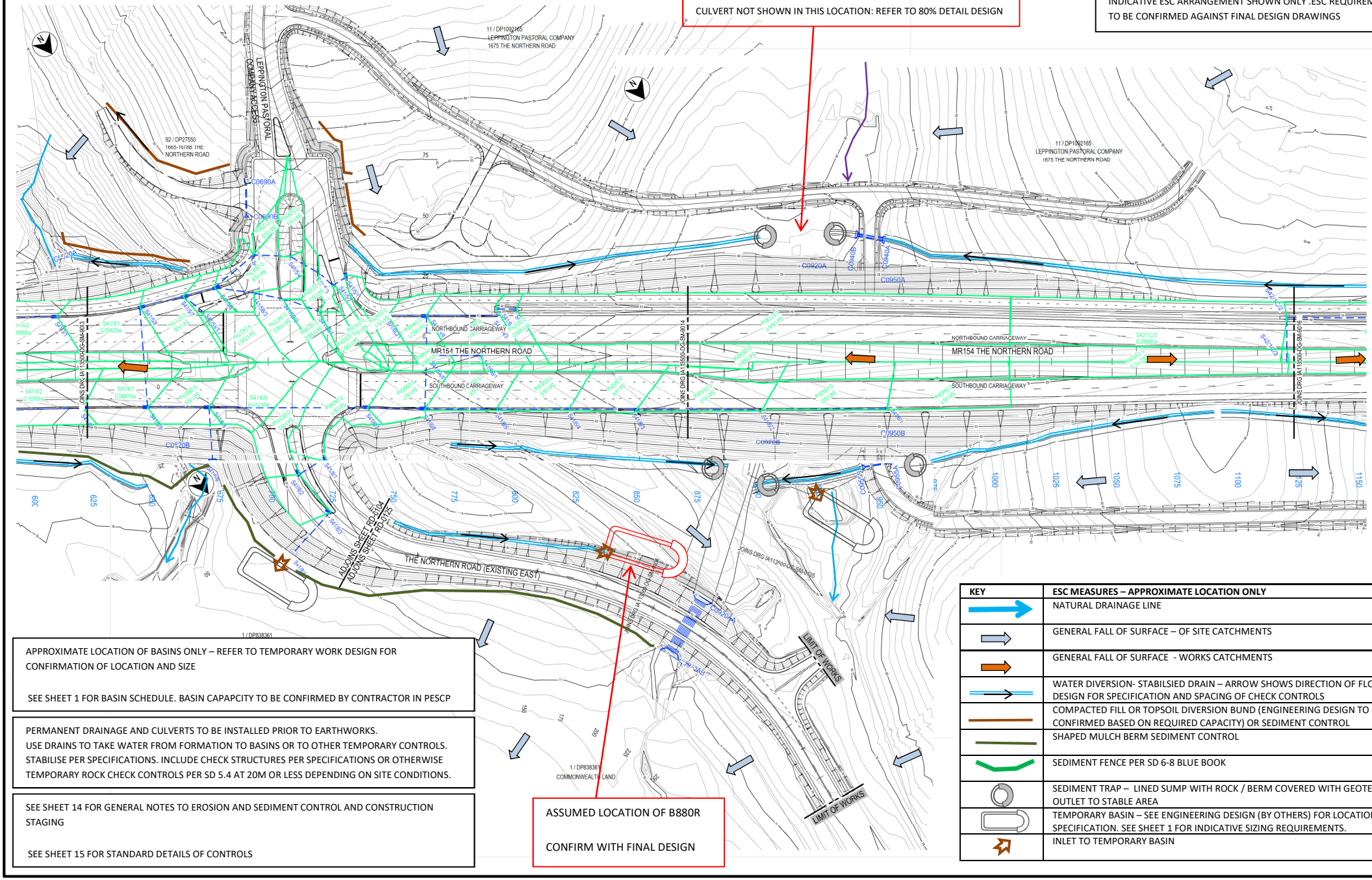

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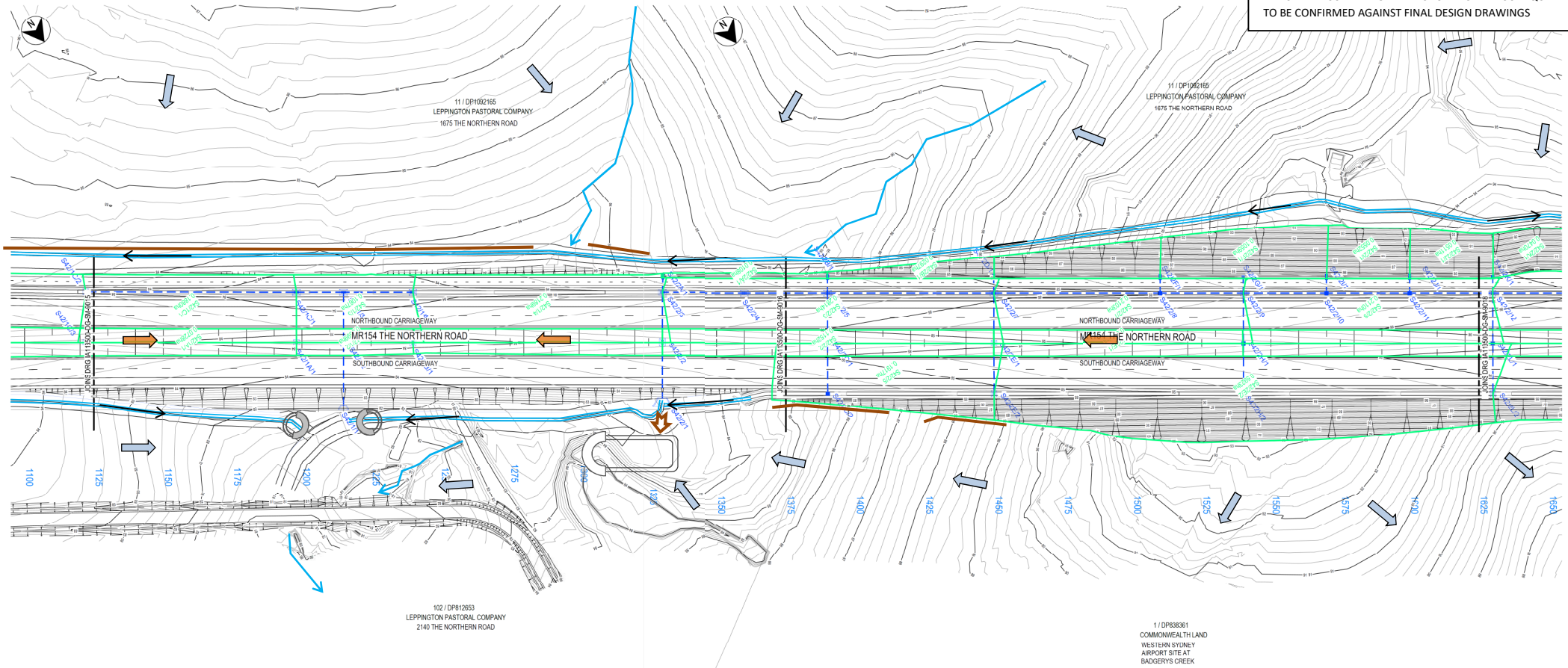

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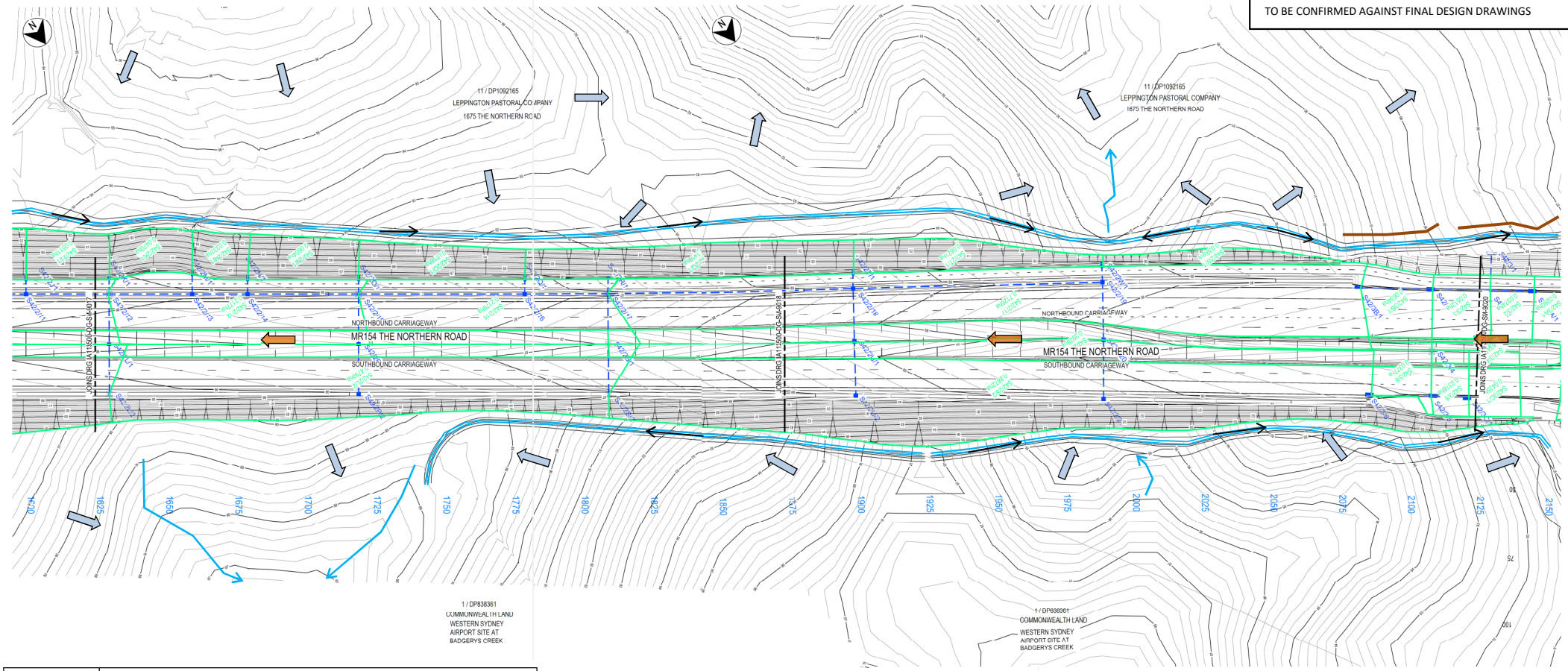

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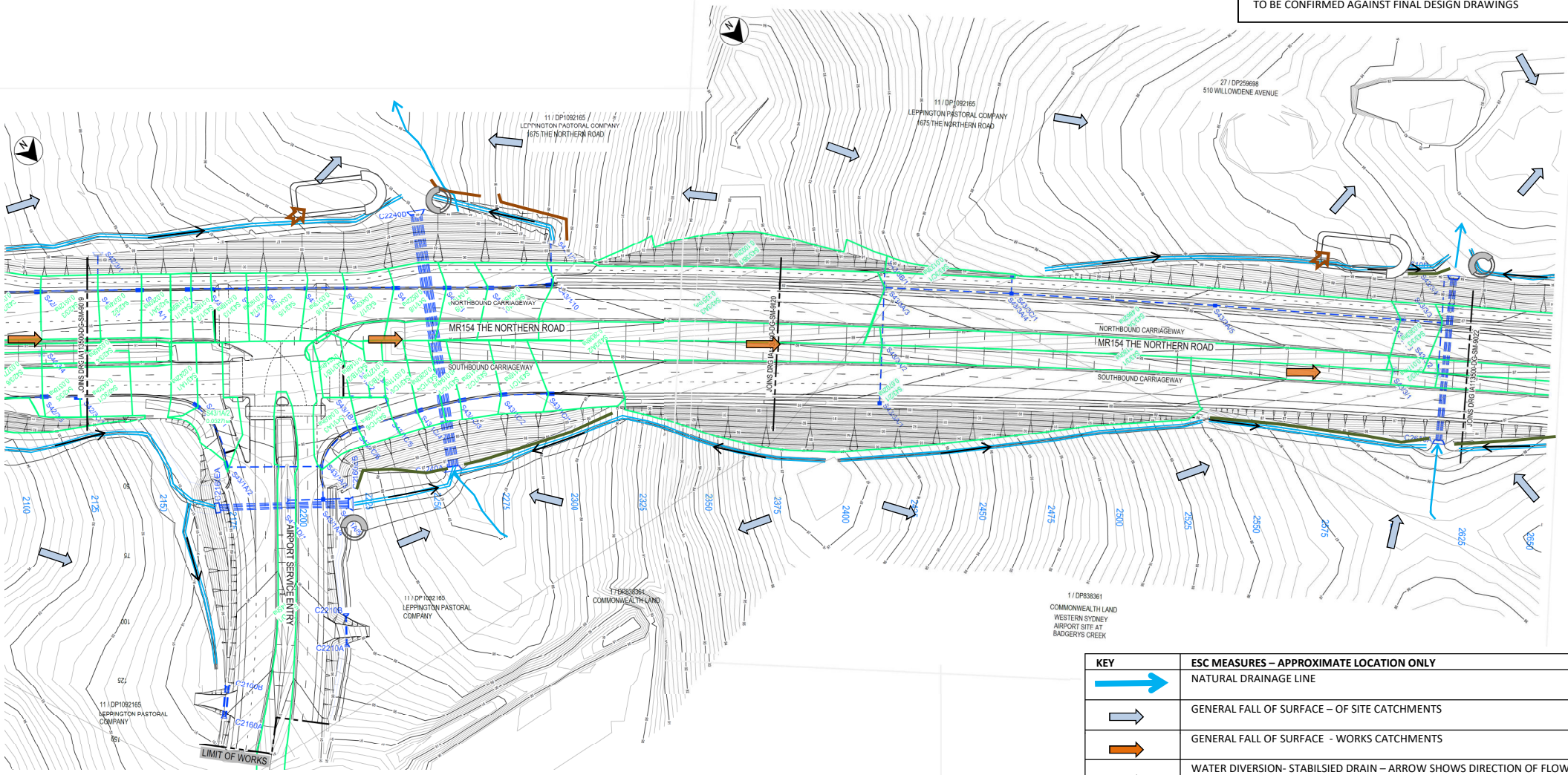

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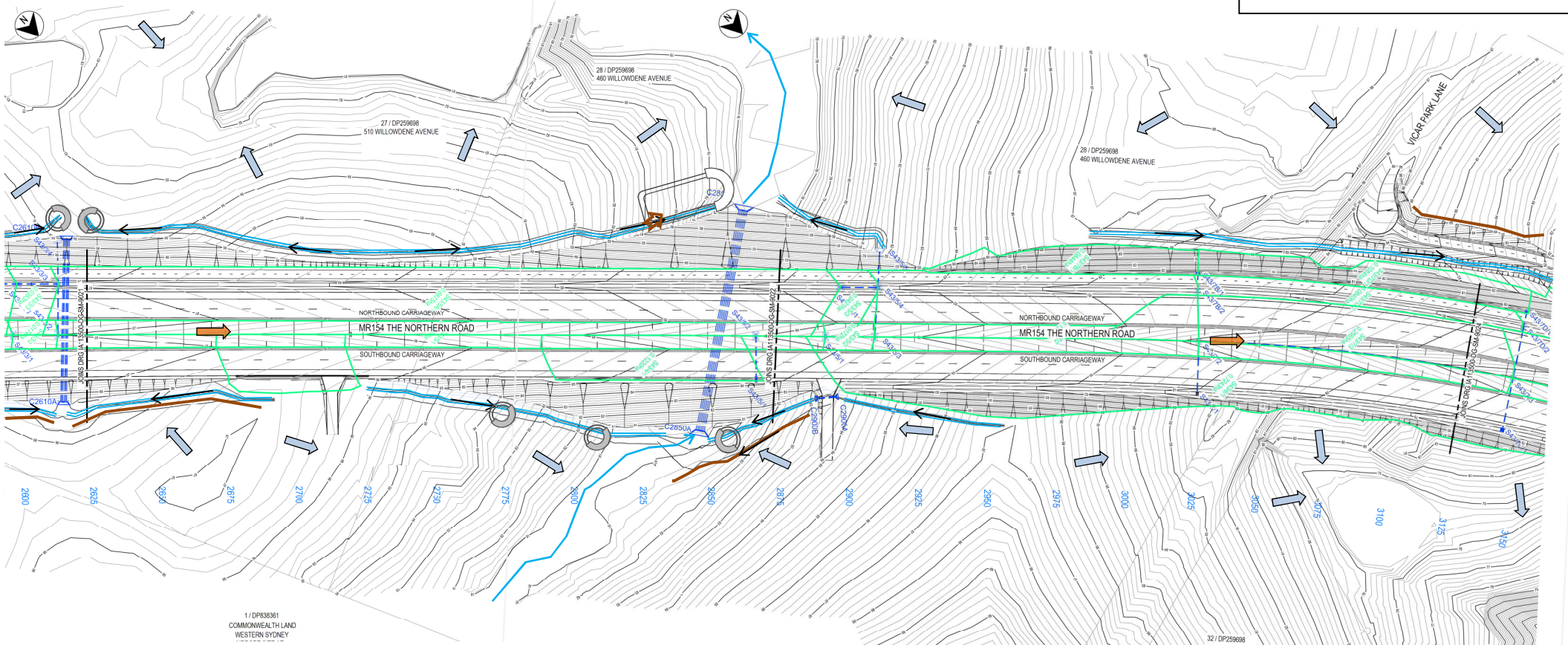

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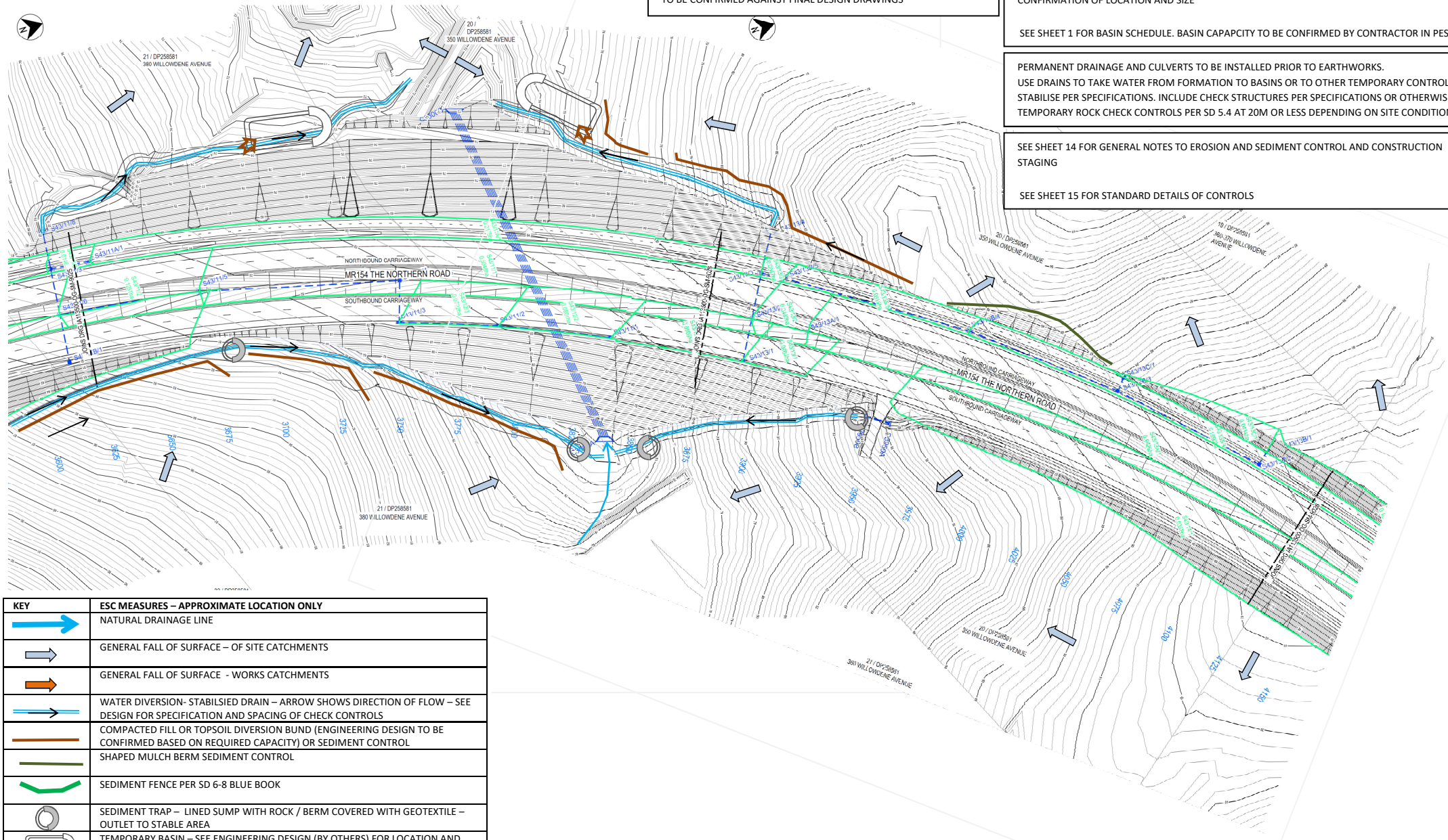

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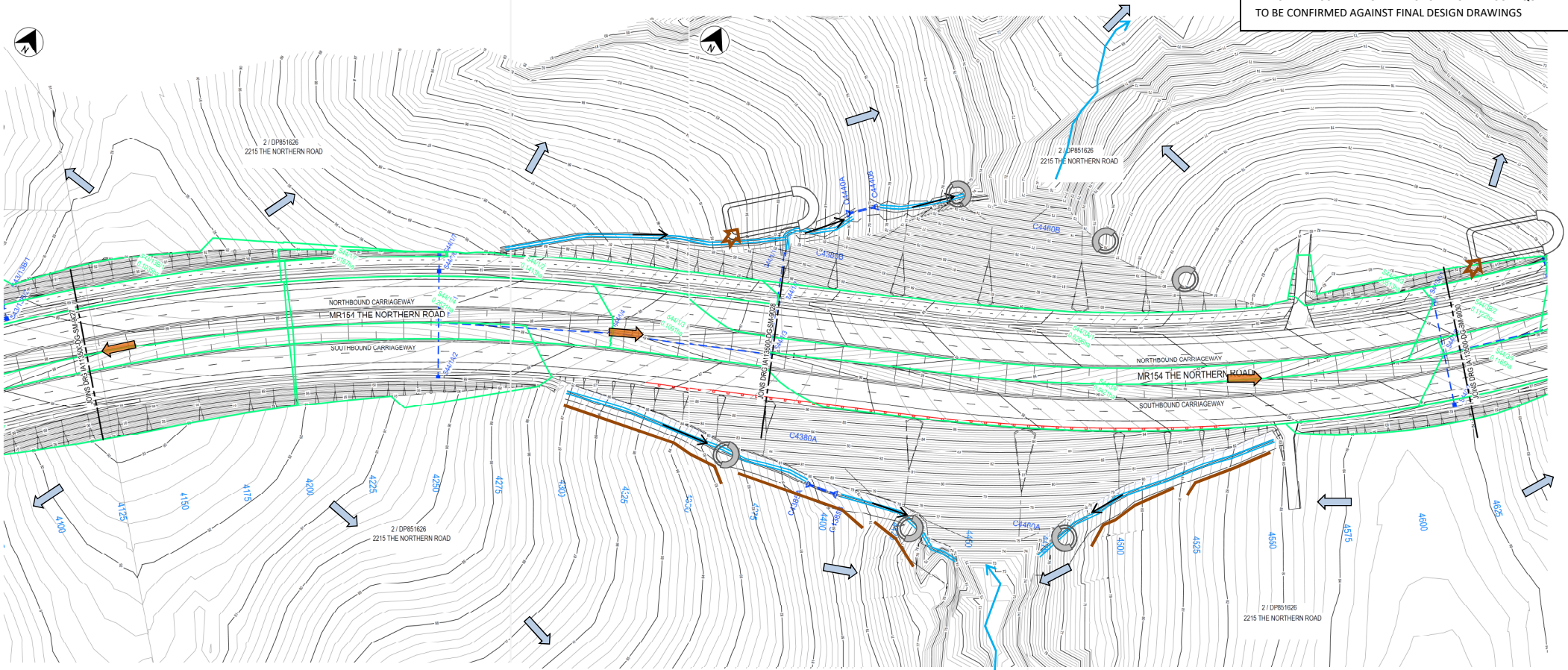

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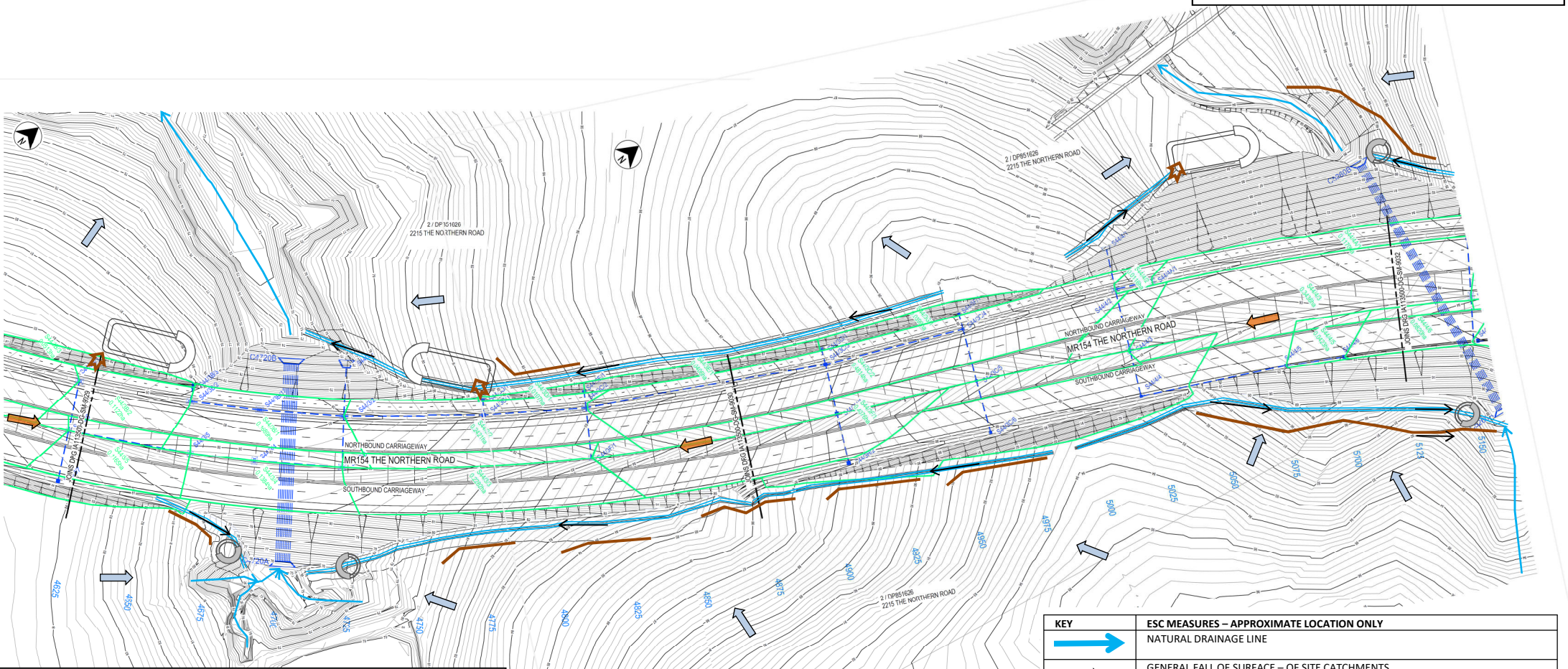

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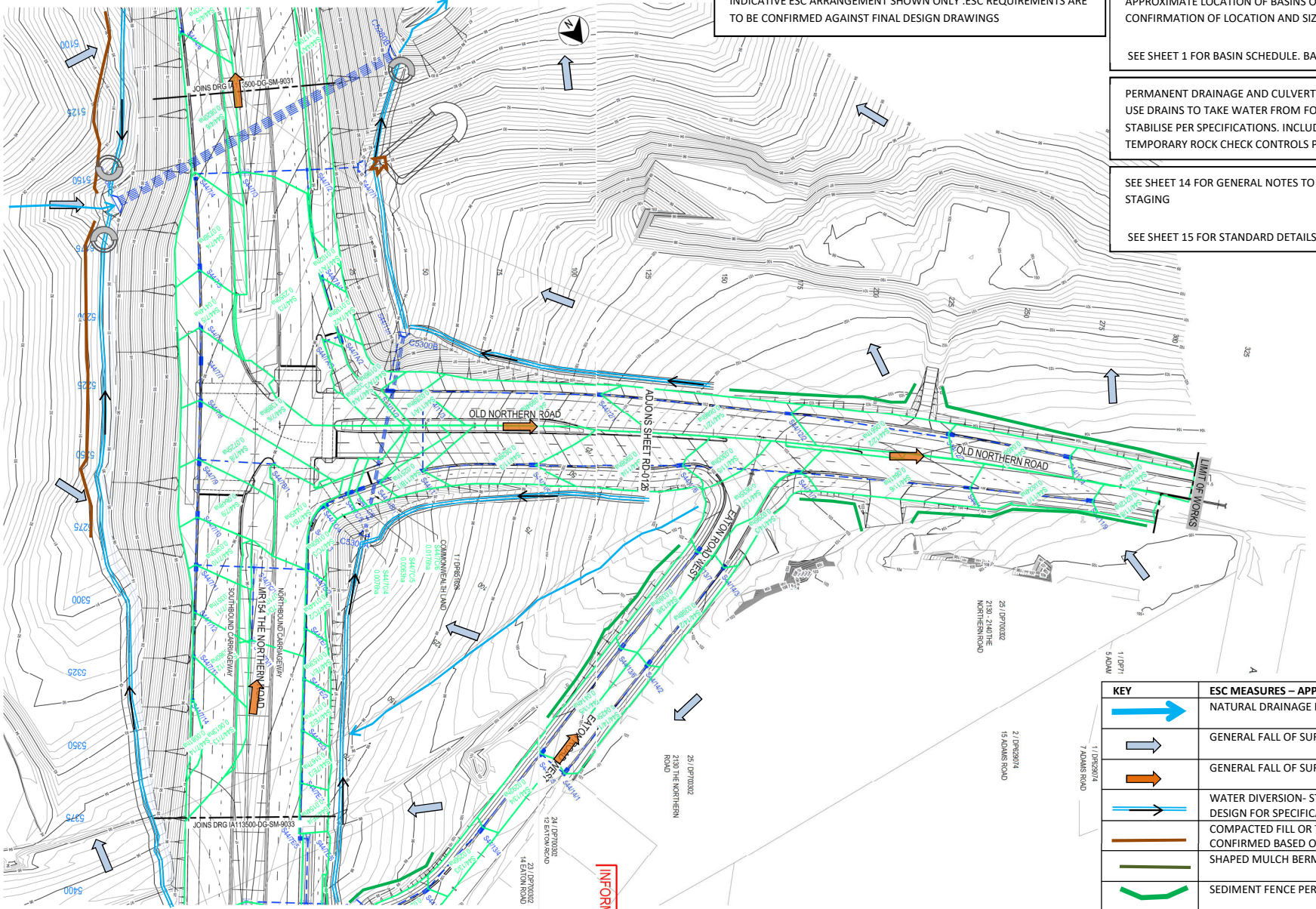
CREATED	JAN 18	GENERAL ARRANGEMENT: INDICATIVE ERSOSION AND SEDIMENT CONTROL PLAN	
DATE THIS AMDT	07 MAY 2018	ESC PREFIX: INDICATIVE	SHEET: 11 of 15 / AMDT: 2
CLIENT	RMS	NUMBER	



INDICATIVE ESC ARRANGEMENT SHOWN ONLY .ESC REQUIREMENTS ARE TO BE CONFIRMED AGAINST FINAL DESIGN DRAWINGS

APPROXIMATE LOCATION OF BASINS ONLY – REFER TO TEMPORARY WORK DESIGN FOR CONFIRMATION OF LOCATION AND SIZE

SEE SHEET 1 FOR BASIN SCHEDULE. BASIN CAPAPCITY TO BE CONFIRMED BY CONTRACTOR IN PESCP

PERMANENT DRAINAGE AND CULVERTS TO BE INSTALLED PRIOR TO EARTHWORKS.
USE DRAINS TO TAKE WATER FROM FORMATION TO BASINS OR TO OTHER TEMPORARY CONTROLS.
STABILISE PER SPECIFICATIONS. INCLUDE CHECK STRUCTURES PER SPECIFICATIONS OR OTHERWISE TEMPORARY ROCK CHECK CONTROLS PER SD 5.4 AT 20M OR LESS DEPENDING ON SITE CONDITIONS.

SEE SHEET 14 FOR GENERAL NOTES TO EROSION AND SEDIMENT CONTROL AND CONSTRUCTION STAGING

SEE SHEET 15 FOR STANDARD DETAILS OF CONTROLS

KEY	ESC MEASURES – APPROXIMATE LOCATION ONLY
	NATURAL DRAINAGE LINE
	GENERAL FALL OF SURFACE – OF SITE CATCHMENTS
	GENERAL FALL OF SURFACE - WORKS CATCHMENTS
	WATER DIVERSION- STABILSIED DRAIN – ARROW SHOWS DIRECTION OF FLOW – SEE DESIGN FOR SPECIFICATION AND SPACING OF CHECK CONTROLS
	COMPACTED FILL OR TOPSOIL DIVERSION BUND (ENGINEERING DESIGN TO BE CONFIRMED BASED ON REQUIRED CAPACITY) OR SEDIMENT CONTROL
	SHAPED MULCH BERM SEDIMENT CONTROL
	SEDIMENT FENCE PER SD 6-8 BLUE BOOK
	SEDIMENT TRAP – LINED SUMP WITH ROCK / BERM COVERED WITH GEOTEXTILE – OUTLET TO STABLE AREA
	TEMPORARY BASIN – SEE ENGINEERING DESIGN (BY OTHERS) FOR LOCATION AND SPECIFICATION. SEE SHEET 1 FOR INDICATIVE SIZING REQUIREMENTS.
	INLET TO TEMPORARY BASIN

ErSed Environmental Pty Ltd
PO Box 1124 Leichhardt 2040

M. 0424 203 046
E.info@ersed.com.au

SHEETS IN THIS PLAN SET
- GENERAL ARRANGEMENT – INDICATIVE ERSOSION AND SEDIMENT CONTROL PLAN (SHEETS 1-13)
- GENERAL NOTES TO ESC (SHEET 14)
- STANDARD DETAILS (SHEET 15)

CLIENT BASE PLANS: DS2016/000435 (COMPOSITE)

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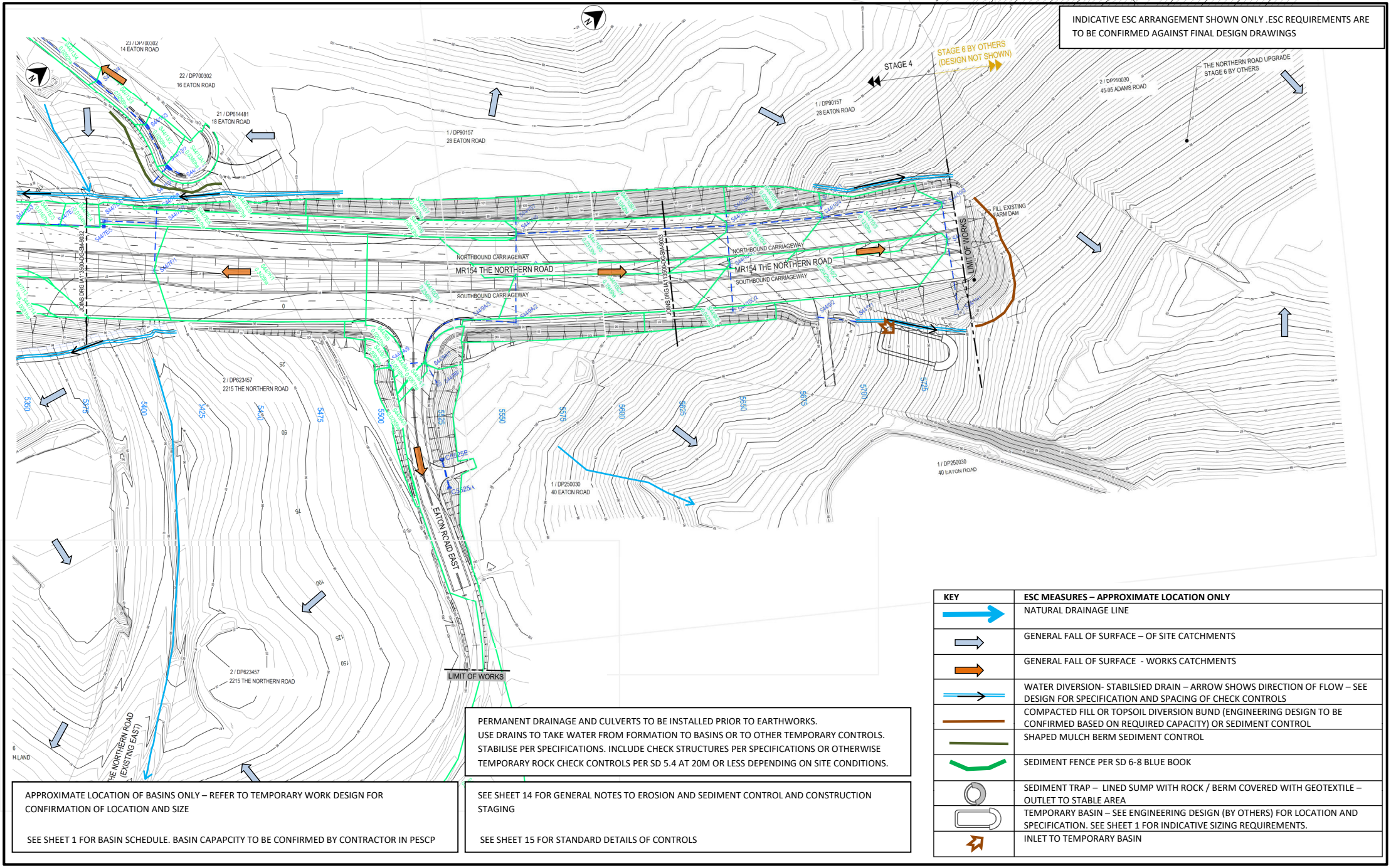

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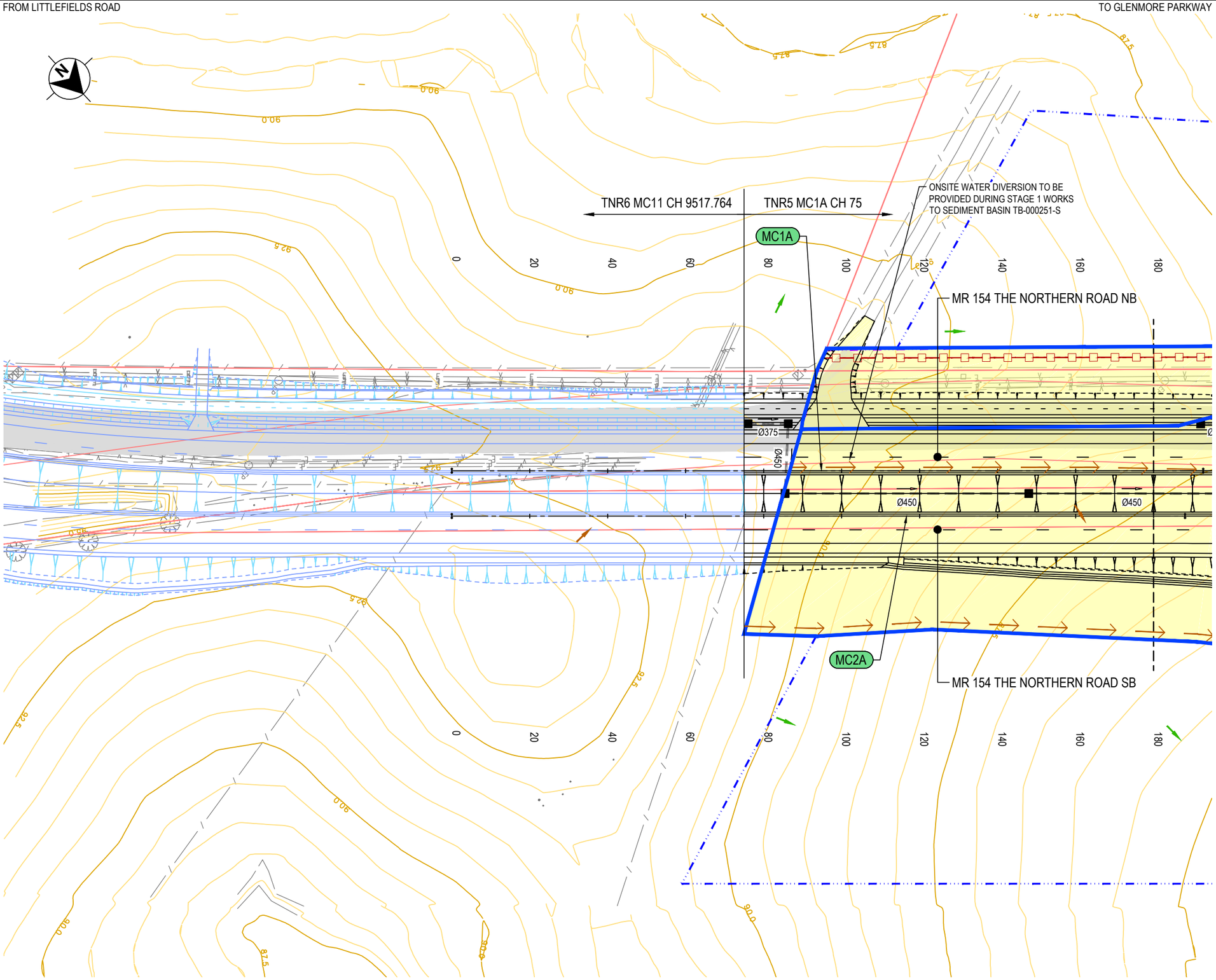
Stage 5 Concept ERSED Plans

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY



FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8402

FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
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- ON-SITE WATER FLOW DIRECTION
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- CONCRETE SCOUR PROTECTION
- TEMPORARY SEDIMENTATION BASIN
- * — SEDIMENT BASIN DISCHARGE POINT

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NOT FOR CONSTRUCTION

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PLOT DATE / TIME: 4/10/2018 2:21 PM
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REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20) AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

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PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT: NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY
STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 1 OF 36

RMS REGISTRATION No. DS2016/002687

PART 8

ISSUE STATUS: ISSUED FOR INFORMATION
EDMS No.:
SHEET No.: SM-8401
ISSUE: 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8401

ADJOINS 21-25734-DD SHEET SM-8403

MR 154 THE NORTHERN ROAD NB

MR 154 THE NORTHERN ROAD SB

MC1A

MC2A

PROVIDE OFF-SITE DIVERSION TO EXISTING WATERCOURSE UNTIL COMPLETION OF CONSTRUCTION

UTILISE EXISTING CULVERT TO TRANSFER SURFACE FLOWS DURING STAGE 1

DIVERT ON-SITE FLOWS INTO NEW PAVEMENT DRAINAGE TO DISCHARGE TO BASIN TB-000251-S DURING STAGE 2 WORKS

TB-000251-S

FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

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SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20) AT A3

CO-ORDINATE SYSTEM MGA ZONE 56
HEIGHT DATUM AHD

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PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
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	NAME	DATE
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DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT
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PREPARED FOR
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WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
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STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 2 OF 36

RMS REGISTRATION No. DS2016/002687

PART 8

ISSUE STATUS ISSUED FOR INFORMATION

EDMS No.

SHEET No. SM-8402

ISSUE 0

FROM LITTLEFIELDS ROAD

ADJOINS 21-25734-DD SHEET SM-8426

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8402

ADJOINS 21-25734-DD SHEET SM-8404

LITTLEFIELDS ROAD

MR 154 THE NORTHERN ROAD NB

MR 154 THE NORTHERN ROAD SB

MOBILE PHONE TOWER

MC1A

MC2A

MCA1

MCA2

MCB1

MCB2

MCB2

MCB1

FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

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FROM LITTLEFIELDS ROAD

ADJOINS 21-25734-DD SHEET SM-8427

TO GLENMORE PARKWAY

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CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

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PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
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W WWW.GHD.COM.AU

TITLE	NAME	DATE
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DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT: NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

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STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN — SHEET 3 OF 36

A3

RMS REGISTRATION No. DS2016/002687 — PART 8

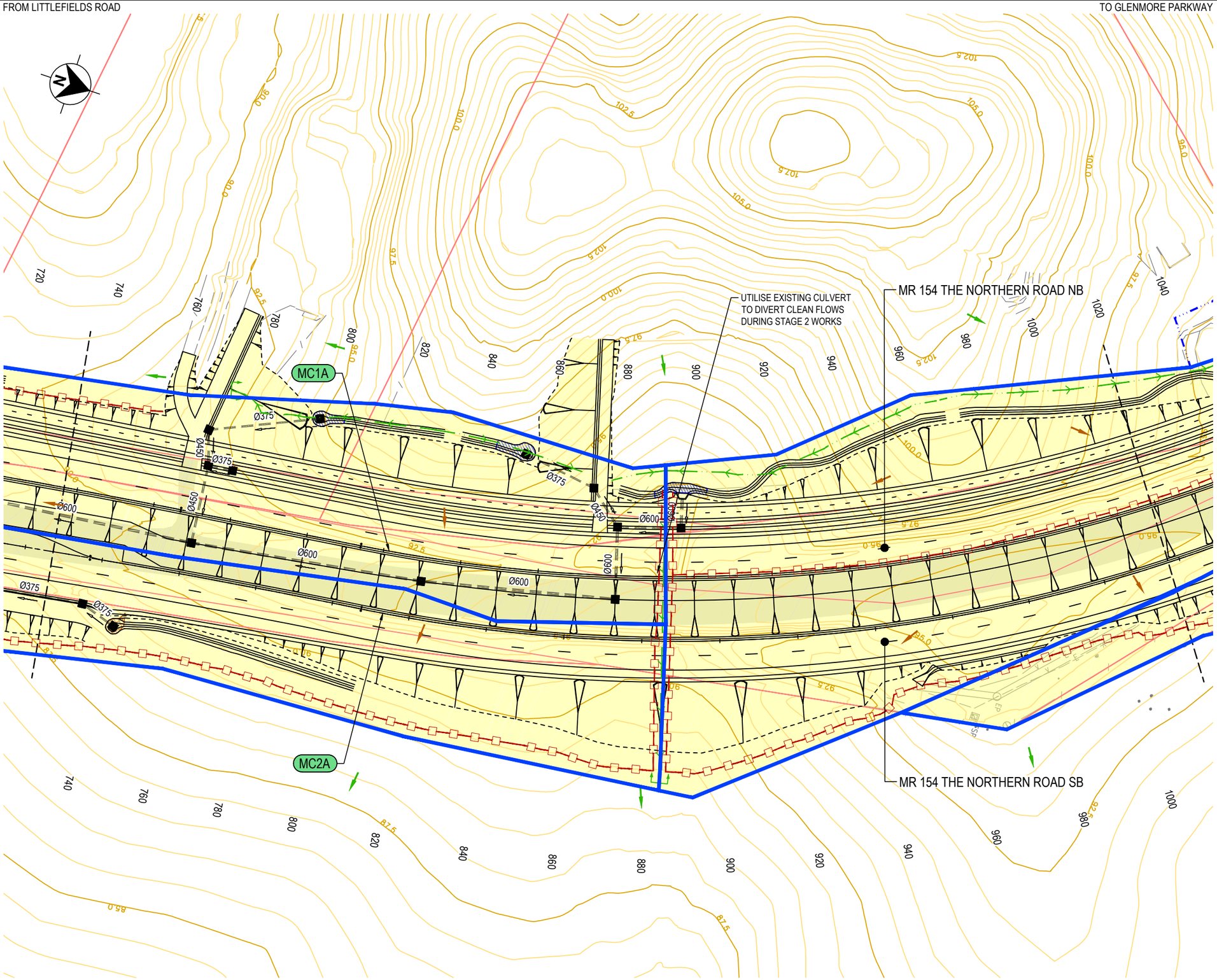
ISSUE STATUS: ISSUED FOR INFORMATION — EDMS No. — SHEET No. SM-8403 — ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8403

ADJOINS 21-25734-DD SHEET SM-8405



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FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

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TITLE	NAME	DATE
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DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
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SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 4 OF 36

RMS REGISTRATION No. DS2016/002687

PART 8

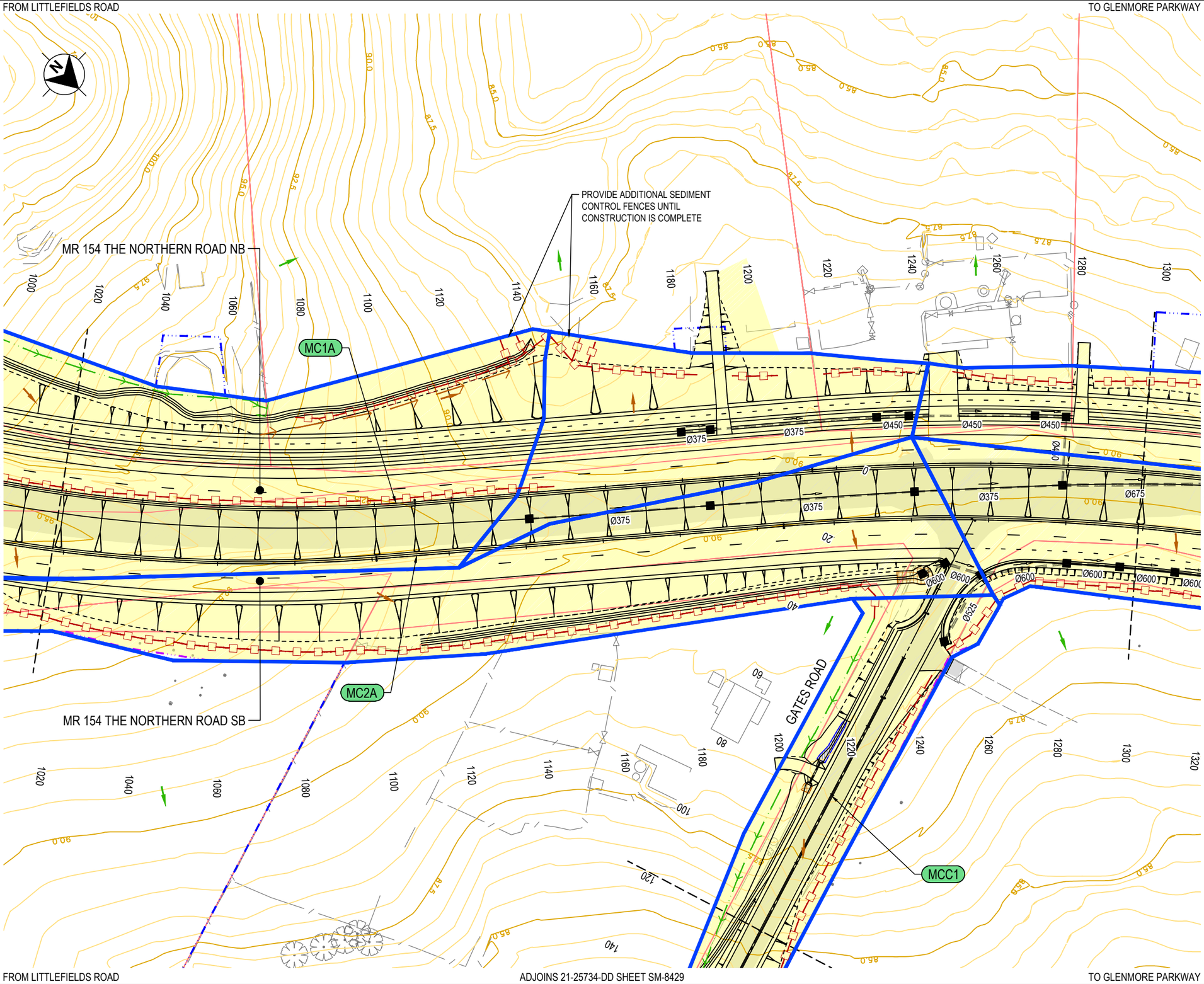
ISSUE STATUS: ISSUED FOR INFORMATION
EDMS No.
SHEET No. SM-8404
ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8404

ADJOINS 21-25734-DD SHEET SM-8406



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FROM LITTLEFIELDS ROAD — ADJOINS 21-25734-DD SHEET SM-8429 — TO GLENMORE PARKWAY

NOT FOR CONSTRUCTION

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SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 5 OF 36

RMS REGISTRATION No. DS2016/002687 — PART 8

ISSUE STATUS: ISSUED FOR INFORMATION
EDMS No.
SHEET No. SM-8405
ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8405

ADJOINS 21-25734-DD SHEET SM-8407

ADJOINS 21-25734-DD SHEET SM-2235

MR 154 THE NORTHERN ROAD NB

MR 154 THE NORTHERN ROAD SB

MC1A

MC2A

WATERNSW PIPELINES

ELECTRICITY SUBSTATION

DEOH ACCESS TRACK

ACCESS TRACK IS TO BE CONSTRUCTED AS PART OF EARLY WORKS - ENSURE APPROPRIATE SEDIMENT CONTROLS ARE IN PLACE

DEFENCE ESTABLISHMENT ORCHARD HILLS

FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
- EXISTING SURFACE MINOR CONTOURS (0.2m)
- Ø375 — PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
- OFF-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- ON-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- SEDIMENT CONTROL, FOR EXAMPLE REFER BLUE BOOK STD DRG SD6-7 / SD 6-8
- CATCHMENT AREA
- ON-SITE WATER FLOW DIRECTION
- OFF-SITE WATER FLOW DIRECTION
- DISTURBED AREA
- RIP RAP SCOUR PROTECTION
- CONCRETE SCOUR PROTECTION
- TEMPORARY SEDIMENTATION BASIN
- * SEDIMENT BASIN DISCHARGE POINT

NOTES

1. FOR EROSION AND SEDIMENT CONTROL NOTES REFER TO DRAWING SM-8451
2. FOR EROSION AND SEDIMENT CONTROL DETAILS REFER TO DRAWINGS SM-8452 AND SM-8453 AND "THE BLUE BOOK" STANDARDS DRAWINGS AS NOMINATED
3. ENSURE ACCESS IS MAINTAINED WHERE SEDIMENT CONTROLS CROSS DRIVEWAYS THROUGH PROVISION OF A TEMPORARY PIPE OR EQUIVALENT MEANS

NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME: G:\21\25734\CADD\Drawings\21-25734-DD-SM-8400.dwg

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING: FILE NAME ; DESN TNR5

SCALES ON A3 SIZE DRAWING: SCALE 1:1000 (10 0 10 20 AT A3)

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

PLOT DATE / TIME: 4/10/2018 2:22 PM — PLOT BY: jcleary

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT: NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY
STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN — SHEET 6 OF 36

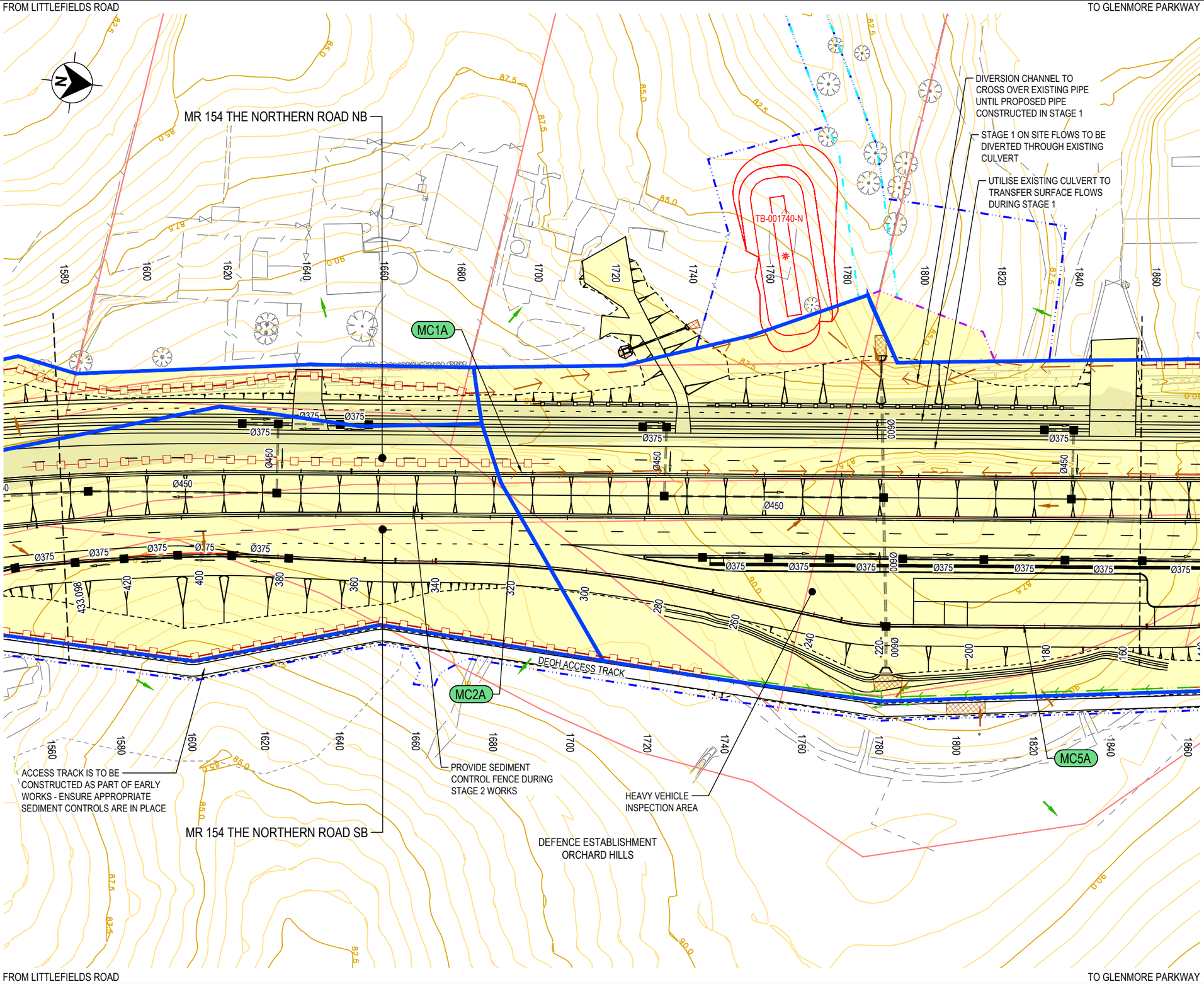
A3

RMS REGISTRATION No.: DS2016/002687 — PART: 8

ISSUE STATUS: ISSUED FOR INFORMATION — EDMS No. — SHEET No.: SM-8406 — ISSUE: 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY



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LEGEND

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SEDIMENT AND EROSION CONTROL

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0 5 10 15 25 35 45 50mm ON A3 SIZE ORIGINAL

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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

PLOT DATE / TIME 4/10/2018 2:22 PM — PLOT BY jcleary

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20 AT A3)

CO-ORDINATE SYSTEM MGA ZONE 56 — HEIGHT DATUM AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT
NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR
INFRASTRUCTURE DEVELOPMENT
WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN — SHEET 7 OF 36

A3

RMS REGISTRATION No. DS2016/002687 — PART 8

ISSUE STATUS ISSUED FOR INFORMATION — EDMS No. — SHEET No. SM-8407 — ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8407

ADJOINS 21-25734-DD SHEET SM-8409

MR 154 THE NORTHERN ROAD NB

MC1A

MC2A

MC5A

DEOH ACCESS TRACK

ACCESS TRACK

PB-002182-S

HEAVY VEHICLE INSPECTION AREA

MR 154 THE NORTHERN ROAD SB

DURING STAGE 2, DIVERT ON-SITE FLOWS INTO NEW PAVEMENT DRAINAGE TO DISCHARGE TO BASIN PB-002182-S

DEFENCE ESTABLISHMENT ORCHARD HILLS

ACCESS TRACK IS TO BE CONSTRUCTED AS PART OF EARLY WORKS - ENSURE APPROPRIATE SEDIMENT CONTROLS ARE IN PLACE

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

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- MCXX — DESIGN CONTROL LINE LABEL
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SEDIMENT AND EROSION CONTROL

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- * — SEDIMENT BASIN DISCHARGE POINT

NOTES

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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

PLOT DATE / TIME: 4/10/2018 2:22 PM
PLOT BY: jcleary

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 10 0 10 20 AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

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NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR
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WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 8 OF 36

RMS REGISTRATION No. DS2016/002687

PART 8

ISSUE STATUS: ISSUED FOR INFORMATION
EDMS No.:
SHEET No.: SM-8408
ISSUE: 0

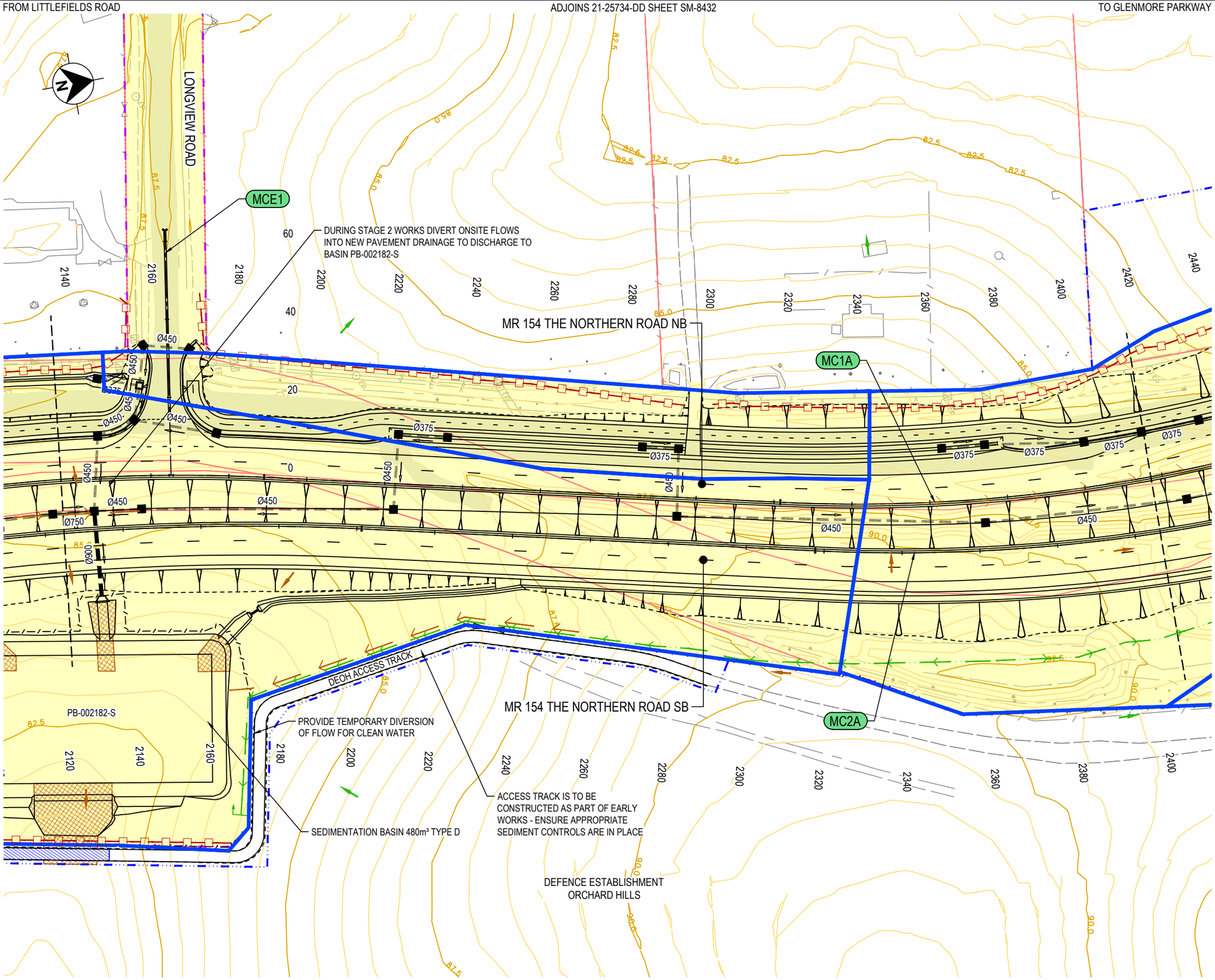
FROM LITTLEFIELDS ROAD

ADJOINS 21-25734-DD SHEET SM-8432

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8408

ADJOINS 21-25734-DD SHEET SM-8410



FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

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- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

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NOTES

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3. ENSURE ACCESS IS MAINTAINED WHERE SEDIMENT CONTROLS CROSS DRIVEWAYS THROUGH PROVISION OF A TEMPORARY PIPE OR EQUIVALENT MEANS

NOT FOR CONSTRUCTION

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

0 5 10 15 25 35 145 150mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

PLOT DATE / TIME 4/10/2018 2:22 PM
PLOT BY jcleary

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20) AT A3

CO-ORDINATE SYSTEM MGA ZONE 56
HEIGHT DATUM AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT
NSW GOVERNMENT Transport Roads & Maritime Services

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INFRASTRUCTURE DEVELOPMENT
WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 9 OF 36

RMS REGISTRATION No. DS2016/002687

PART 8

ISSUE STATUS ISSUED FOR INFORMATION

EDMS No.

SHEET No. SM-8409

ISSUE 0

FROM LITTLEFIELDS ROAD

ADJOINS 21-25734-DD SHEET SM-8430

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8409

ADJOINS 21-25734-DD SHEET SM-8411

MCF1

MCF2

KINGS HILL ROAD

MR 154 THE NORTHERN ROAD NB

DIVERT ONSITE FLOWS VIA EXISTING CULVERT DURING STAGE 2 WORKS IF REQUIRED

DIVERT ON-SITE FLOWS VIA NEW MEDIANTO NEW PAVEMENT TO DISCHARGE TO BASIN No. PB-002921-S DURING STAGE 2 WORKS

MC1A

MC2A

DEOH ACCESS TRACK

MR 154 THE NORTHERN ROAD SB

ACCESS TRACK IS TO BE CONSTRUCTED AS PART OF EARLY WORKS - ENSURE APPROPRIATE SEDIMENT CONTROLS ARE IN PLACE

PROTECT AND DO NOT DISTURB FENCE AREA AROUND MARSDINIA VIVAFLORA

DEFENCE ESTABLISHMENT ORCHARD HILLS

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
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SEDIMENT AND EROSION CONTROL

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NOTES

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REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20) AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
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T 61 2 8898 8800 F 61 2 8898 8810
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PLOT DATE / TIME: 4/10/2018 2:22 PM
PLOT BY: jcleary

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
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PROJECT MNGR	D.KINNIBURGH	

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PREPARED FOR
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WESTERN SYDNEY INFRASTRUCTURE
PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 10 OF 36

RMS REGISTRATION No. DS2016/002687

PART 8

ISSUE STATUS: ISSUED FOR INFORMATION

EDMS No.

SHEET No. SM-8410

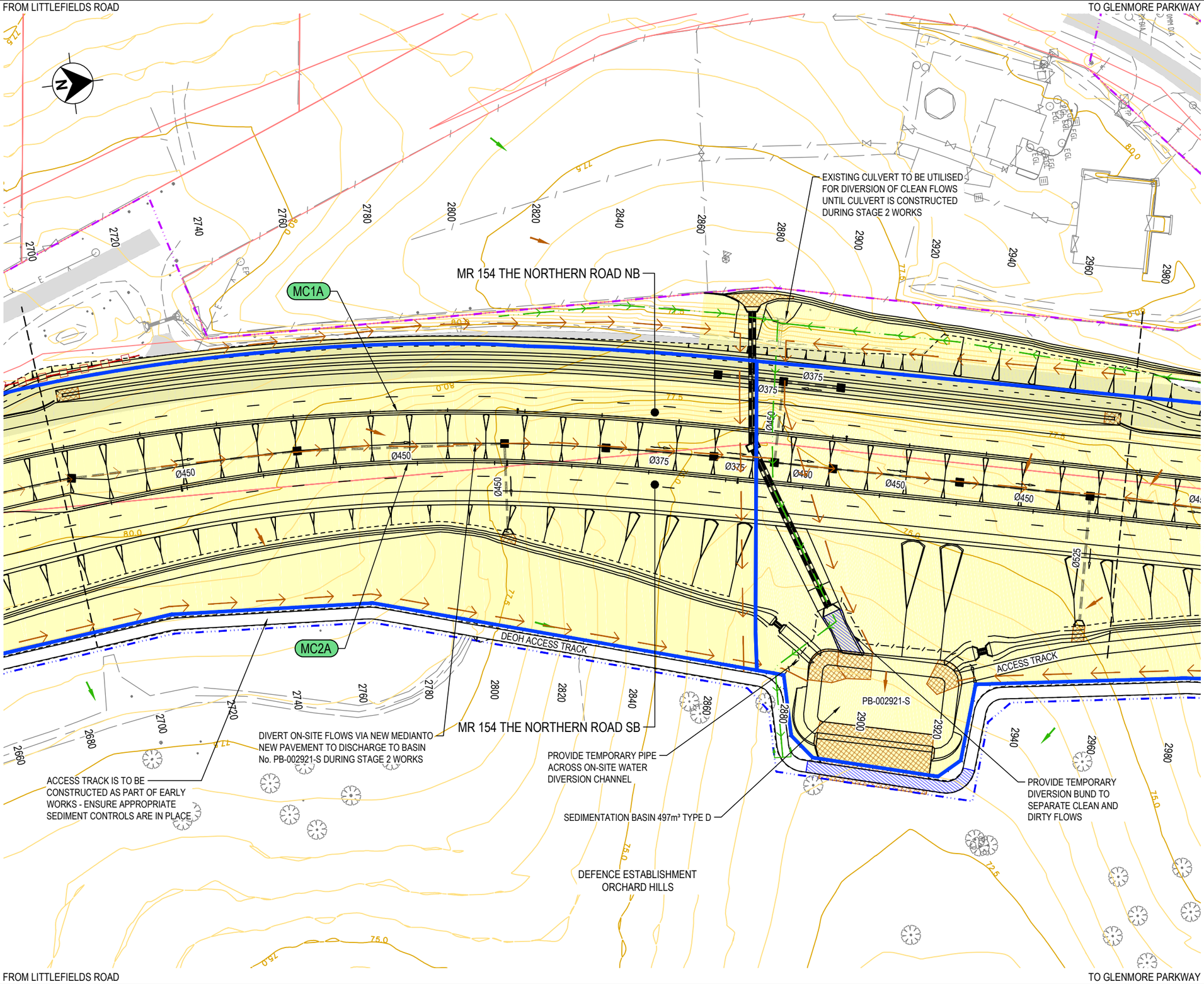
ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8410

ADJOINS 21-25734-DD SHEET SM-8412



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CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

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STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 11 OF 36

RMS REGISTRATION No. DS2016/002687

PART 8

ISSUE STATUS: ISSUED FOR INFORMATION

EDMS No.

SHEET No. SM-8411

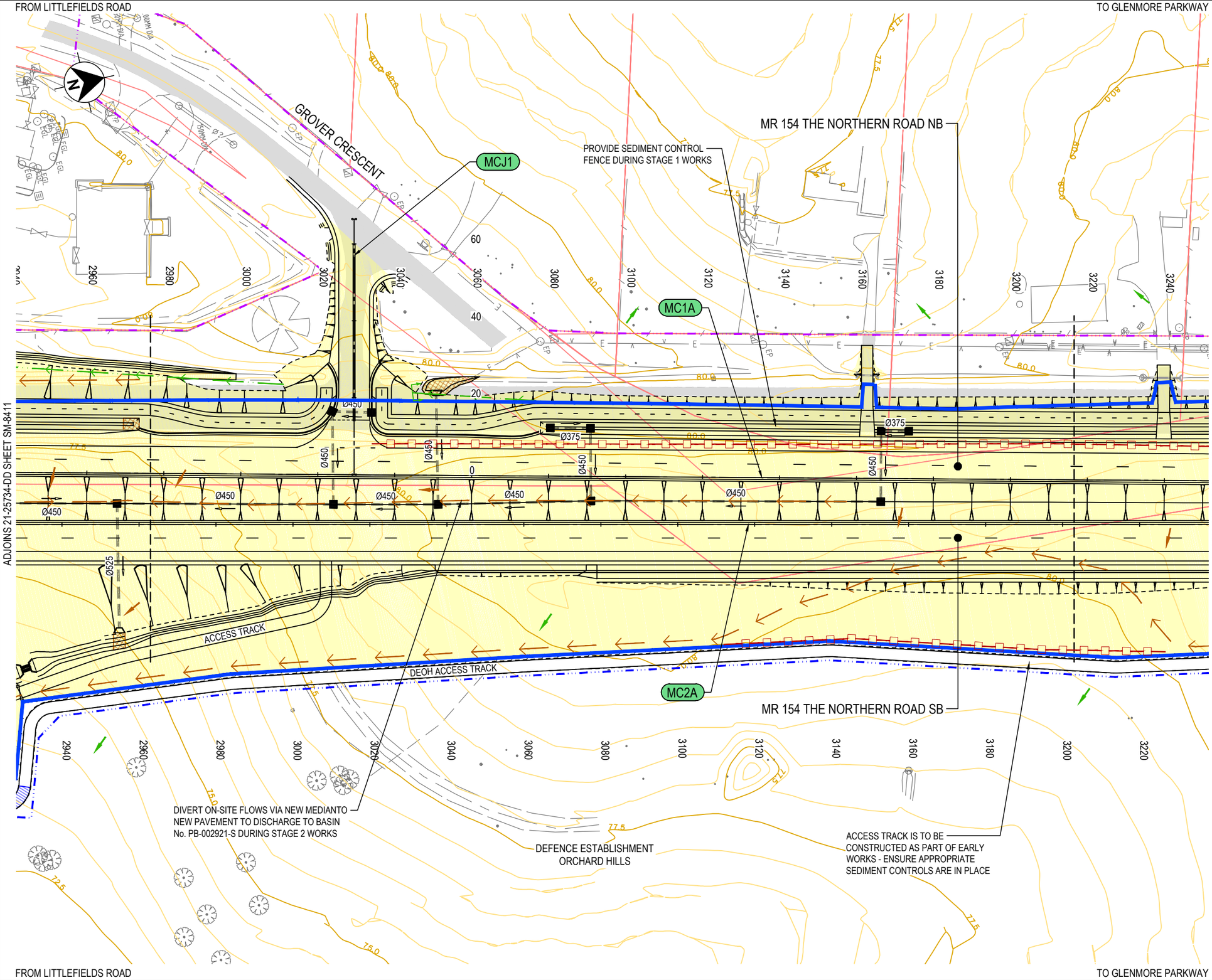
ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8411

ADJOINS 21-25734-DD SHEET SM-8413



FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE (910)
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
- EXISTING SURFACE MINOR CONTOURS (0.2m)
- Ø375 — PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
- OFF-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- ON-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- SEDIMENT CONTROL, FOR EXAMPLE REFER BLUE BOOK STD DRG SD6-7 / SD 6-8
- CATCHMENT AREA
- ON-SITE WATER FLOW DIRECTION
- OFF-SITE WATER FLOW DIRECTION
- DISTURBED AREA
- RIP RAP SCOUR PROTECTION
- CONCRETE SCOUR PROTECTION
- TEMPORARY SEDIMENTATION BASIN
- * SEDIMENT BASIN DISCHARGE POINT

NOTES

1. FOR EROSION AND SEDIMENT CONTROL NOTES REFER TO DRAWING SM-8451
2. FOR EROSION AND SEDIMENT CONTROL DETAILS REFER TO DRAWINGS SM-8452 AND SM-8453 AND "THE BLUE BOOK" STANDARDS DRAWINGS AS NOMINATED
3. ENSURE ACCESS IS MAINTAINED WHERE SEDIMENT CONTROLS CROSS DRIVEWAYS THROUGH PROVISION OF A TEMPORARY PIPE OR EQUIVALENT MEANS

NOT FOR CONSTRUCTION

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

DRAWING FILE LOCATION / NAME
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REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20) AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

PLOT DATE / TIME: 4/10/2018 2:22 PM
PLOT BY: jcleary

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

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NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR
INFRASTRUCTURE DEVELOPMENT
WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

A3

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN — SHEET 12 OF 36

RMS REGISTRATION No. DS2016/002687 — PART 8

ISSUE STATUS: ISSUED FOR INFORMATION
EDMS No.
SHEET No. SM-8412
ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8412

ADJOINS 21-25734-DD SHEET SM-8414

MR 154 THE NORTHERN ROAD NB

MC1A

MC2A

DEOH ACCESS TRACK

ACCESS TRACK IS TO BE CONSTRUCTED AS PART OF EARLY WORKS - ENSURE APPROPRIATE SEDIMENT CONTROLS ARE IN PLACE

MR 154 THE NORTHERN ROAD SB

DEFENCE ESTABLISHMENT ORCHARD HILLS

DIVERT ON-SITE FLOWS TO NEW PAVEMENT DRAINAGE (VIA MEDIAN) TO DISCHARGE TO BASIN PB-003658-S

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
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- Ø375 — PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
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- DISTURBED AREA
- RIP RAP SCOUR PROTECTION
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- TEMPORARY SEDIMENTATION BASIN
- * — SEDIMENT BASIN DISCHARGE POINT

NOTES

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DRAWING FILE LOCATION / NAME
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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

PLOT DATE / TIME: 4/10/2018 2:23 PM
PLOT BY: jcleary

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20 AT A3)

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
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PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

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PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 13 OF 36

RMS REGISTRATION No. DS2016/002687

PART 8

ISSUE STATUS: ISSUED FOR INFORMATION

EDMS No.

SHEET No. SM-8413

ISSUE 0

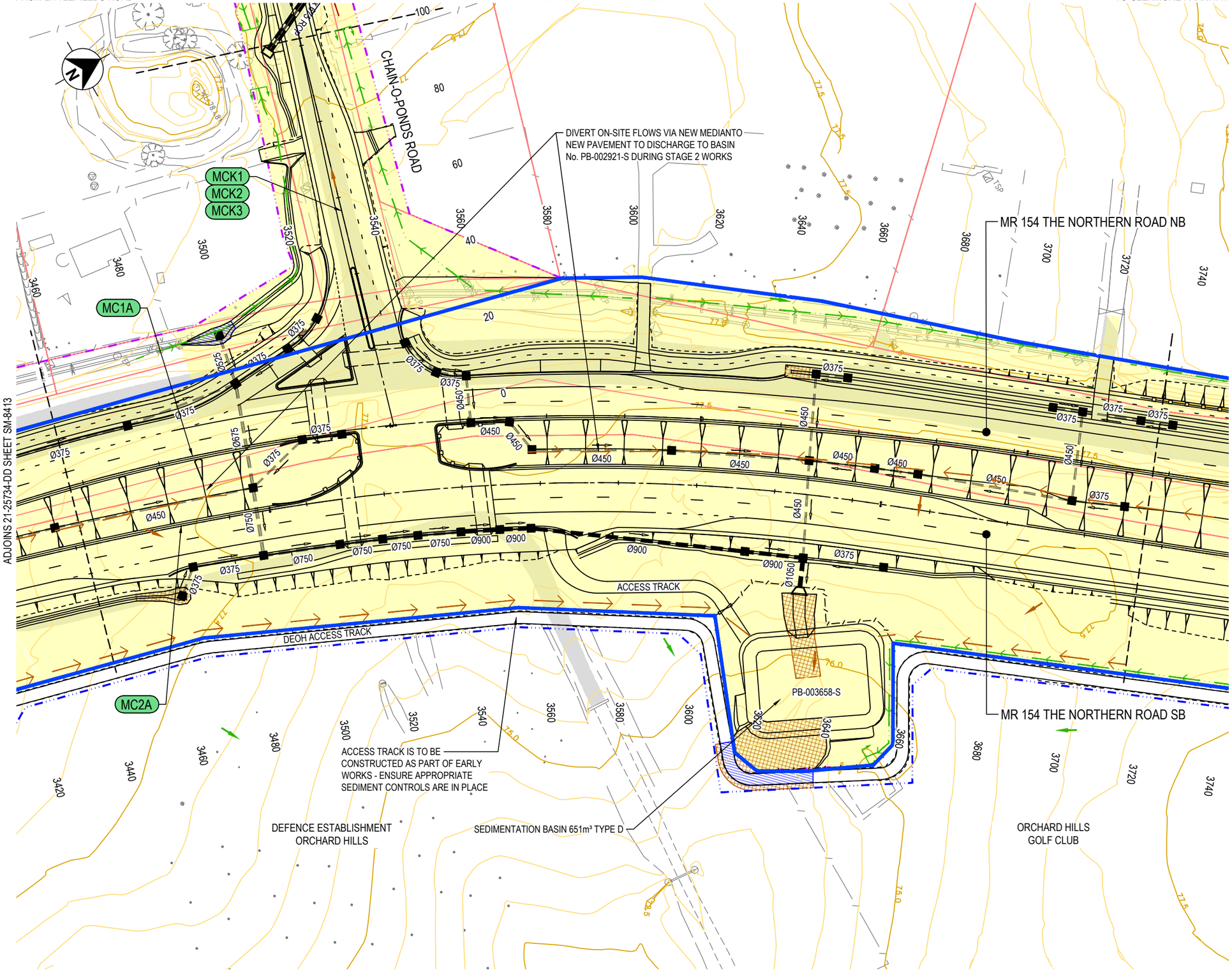
FROM LITTLEFIELDS ROAD

ADJOINS 21-25734-DD SHEET SM-8433

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8413

ADJOINS 21-25734-DD SHEET SM-8415



FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

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- EXISTING BOUNDARY FENCE
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NOTES

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FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

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0 5 15 25 35 45 50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
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REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

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FILE NAME ; DESN TNR5

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 10 0 10 20 AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

PLOT DATE / TIME: 4/10/2018 2:23 PM
PLOT BY: jcleary

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

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PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 14 OF 36

RMS REGISTRATION No. DS2016/002687

PART 8

ISSUE STATUS: ISSUED FOR INFORMATION

EDMS No.

SHEET No. SM-8414

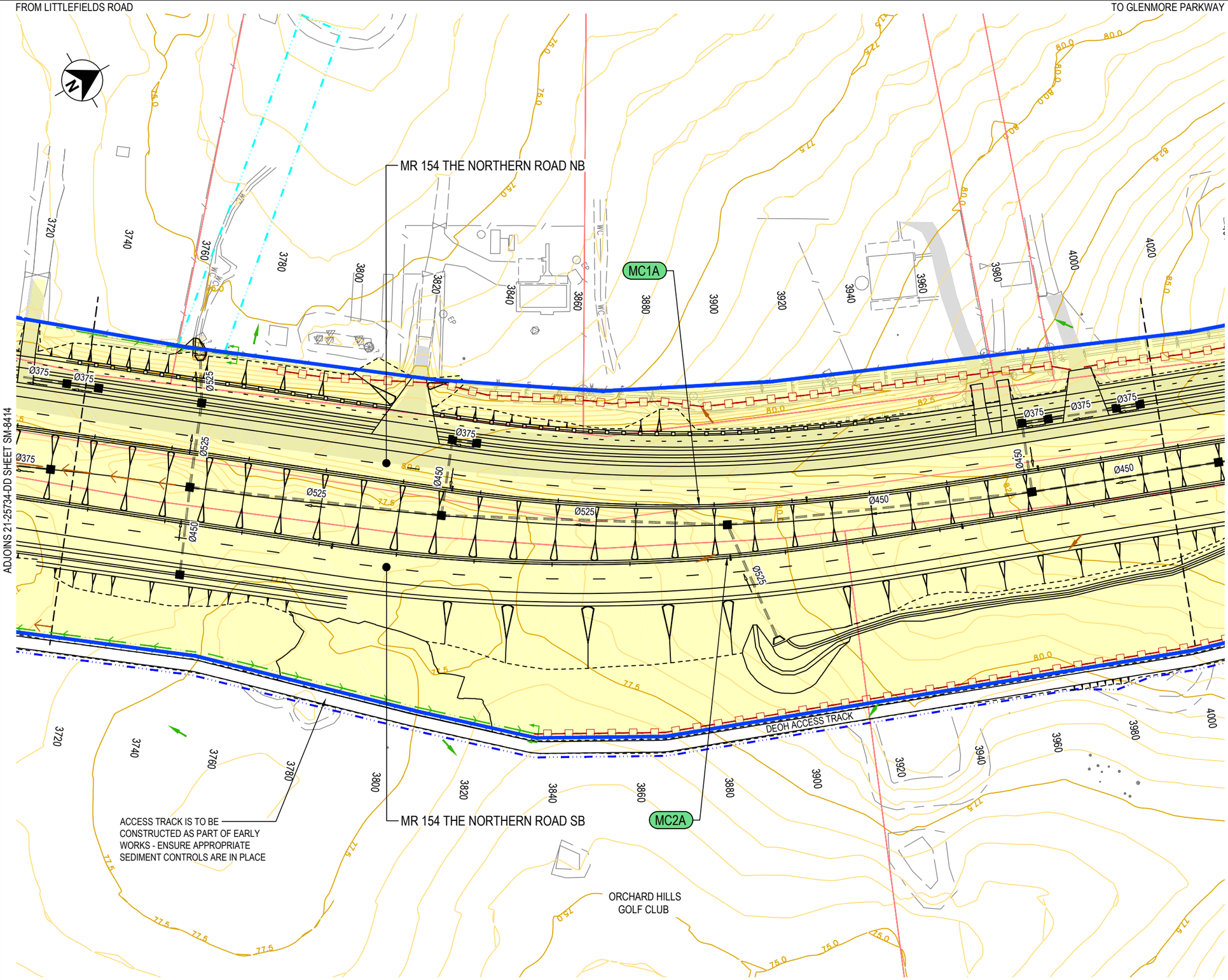
ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8414

ADJOINS 21-25734-DD SHEET SM-8416



FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
- EXISTING SURFACE MINOR CONTOURS (0.2m)
- Ø375 — PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
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- DISTURBED AREA
- RIP RAP SCOUR PROTECTION
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NOTES

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NOT FOR CONSTRUCTION

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

0 | 5 | 10 | 15 | 25 | 35 | 145 | 150mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

PLOT DATE / TIME: 4/10/2018 2:23 PM
PLOT BY: jcleary

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20 AT A3)

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

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WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 15 OF 36

RMS REGISTRATION No. DS2016/002687

PART 8

ISSUE STATUS: ISSUED FOR INFORMATION

EDMS No.

SHEET No. SM-8415

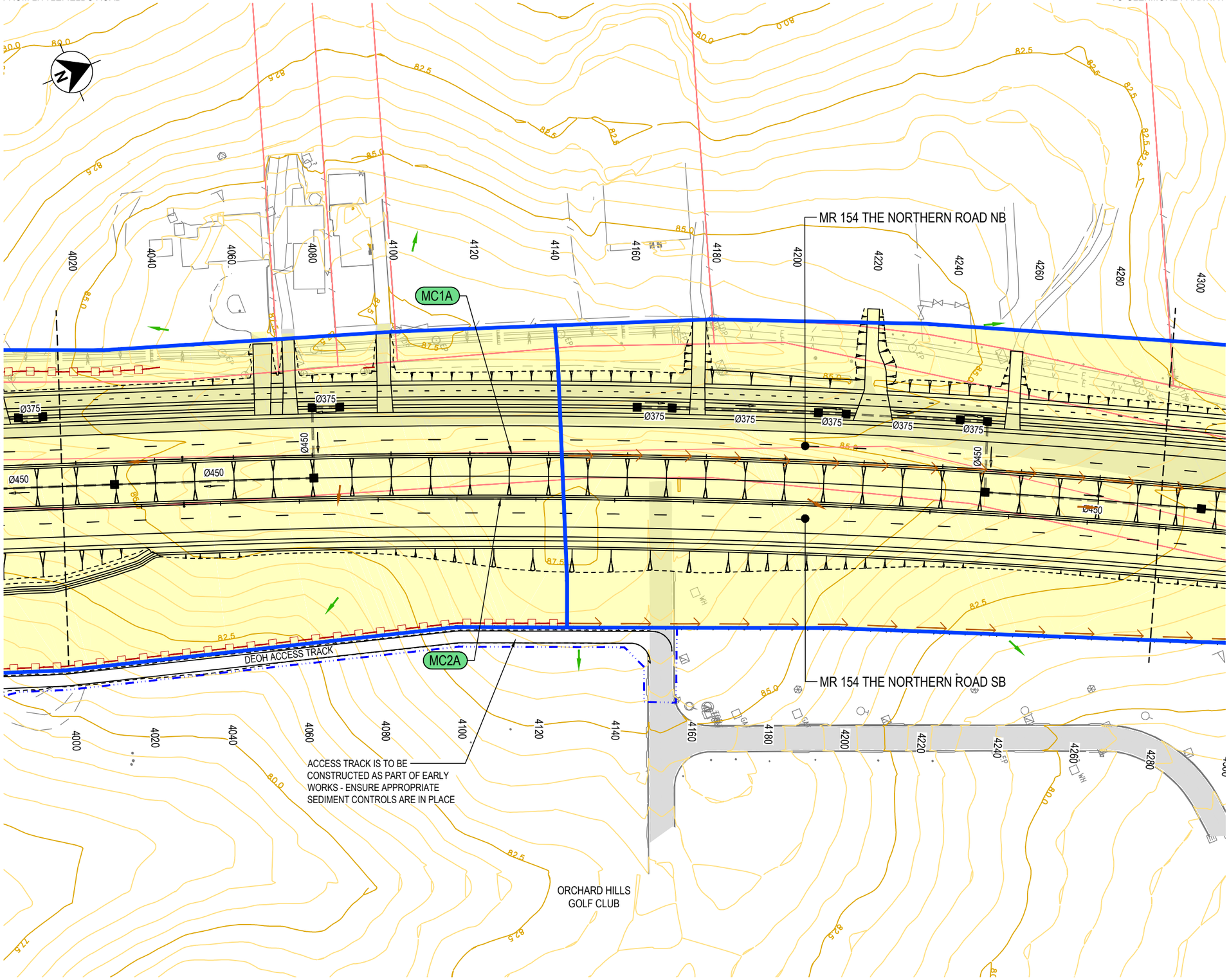
ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8415

ADJOINS 21-25734-DD SHEET SM-8417



FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
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- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
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- RIP RAP SCOUR PROTECTION
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NOTES

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0 5 10 15 25 35 45 50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
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REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 10 0 10 20 AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56
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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
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PLOT DATE / TIME: 4/10/2018 2:23 PM
PLOT BY: jcleary

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

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STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 16 OF 36

RMS REGISTRATION No. DS2016/002687

PART 8

ISSUE STATUS: ISSUED FOR INFORMATION

EDMS No.

SHEET No. SM-8416

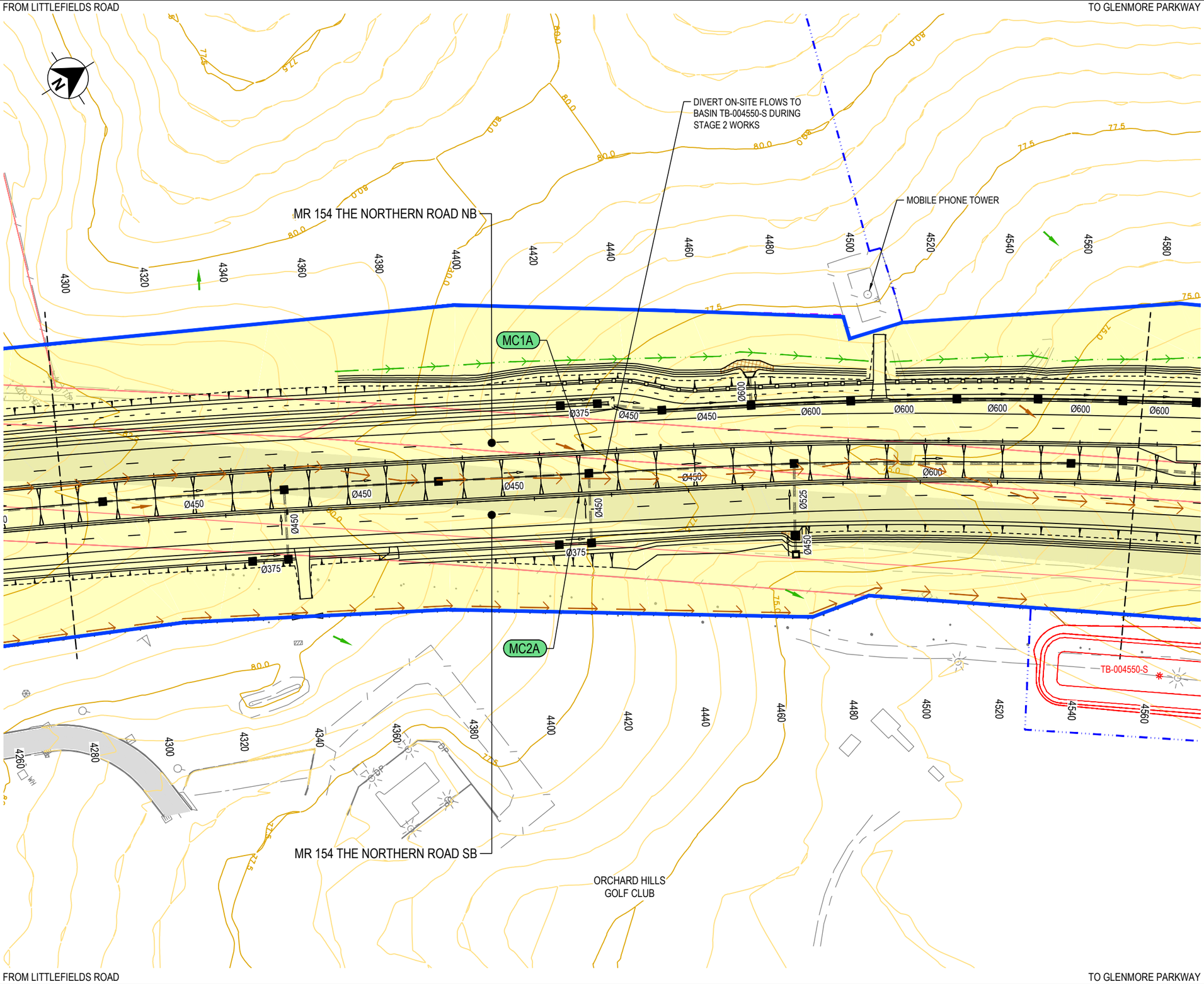
ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8416

ADJOINS 21-25734-DD SHEET SM-8418



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LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
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SEDIMENT AND EROSION CONTROL

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FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

NOT FOR CONSTRUCTION

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150mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

PLOT DATE / TIME: 4/10/2018 2:23 PM
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SCALES ON A3 SIZE DRAWING
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CO-ORDINATE SYSTEM: MGA ZONE 56
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DRAWINGS / DESIGN PREPARED BY

GHD
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STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 17 OF 36

RMS REGISTRATION No. DS2016/002687

PART 8

ISSUE STATUS: ISSUED FOR INFORMATION

EDMS No.

SHEET No. SM-8417

ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8417

ADJOINS 21-25734-DD SHEET SM-8419

DEOH U-TURN FACILITY

MCL0

MC1A

MC2A

MCM1

MR 154 THE NORTHERN ROAD NB

MR 154 THE NORTHERN ROAD SB

DEOH ACCESS

TB-004550-S

TEMPORARY PIPES REQUIRED ACROSS EXISTING ROAD TO CONVEY SITE FLOWS DURING STAGE 2 WORKS

ORCHARD HILLS GOLF CLUB

DEFENCE ESTABLISHMENT ORCHARD HILLS

FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
- EXISTING SURFACE MINOR CONTOURS (0.2m)
- Ø375 — PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
- OFF-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- ON-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- SEDIMENT CONTROL, FOR EXAMPLE REFER BLUE BOOK STD DRG SD6-7 / SD 6-8
- CATCHMENT AREA
- ON-SITE WATER FLOW DIRECTION
- OFF-SITE WATER FLOW DIRECTION
- DISTURBED AREA
- RIP RAP SCOUR PROTECTION
- CONCRETE SCOUR PROTECTION
- TEMPORARY SEDIMENTATION BASIN
- * SEDIMENT BASIN DISCHARGE POINT

NOTES

1. FOR EROSION AND SEDIMENT CONTROL NOTES REFER TO DRAWING SM-8451
2. FOR EROSION AND SEDIMENT CONTROL DETAILS REFER TO DRAWINGS SM-8452 AND SM-8453 AND "THE BLUE BOOK" STANDARDS DRAWINGS AS NOMINATED
3. ENSURE ACCESS IS MAINTAINED WHERE SEDIMENT CONTROLS CROSS DRIVEWAYS THROUGH PROVISION OF A TEMPORARY PIPE OR EQUIVALENT MEANS

NOT FOR CONSTRUCTION

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50mm ON A3 SIZE ORIGINAL

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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING: FILE NAME ; DESN TNR5

PLOT DATE / TIME: 4/10/2018 2:23 PM — PLOT BY: jcleary

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

SCALES ON A3 SIZE DRAWING: SCALE 1:1000 (10 0 10 20) AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT: NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY
STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 18 OF 36

RMS REGISTRATION No. DS2016/002687 — PART 8

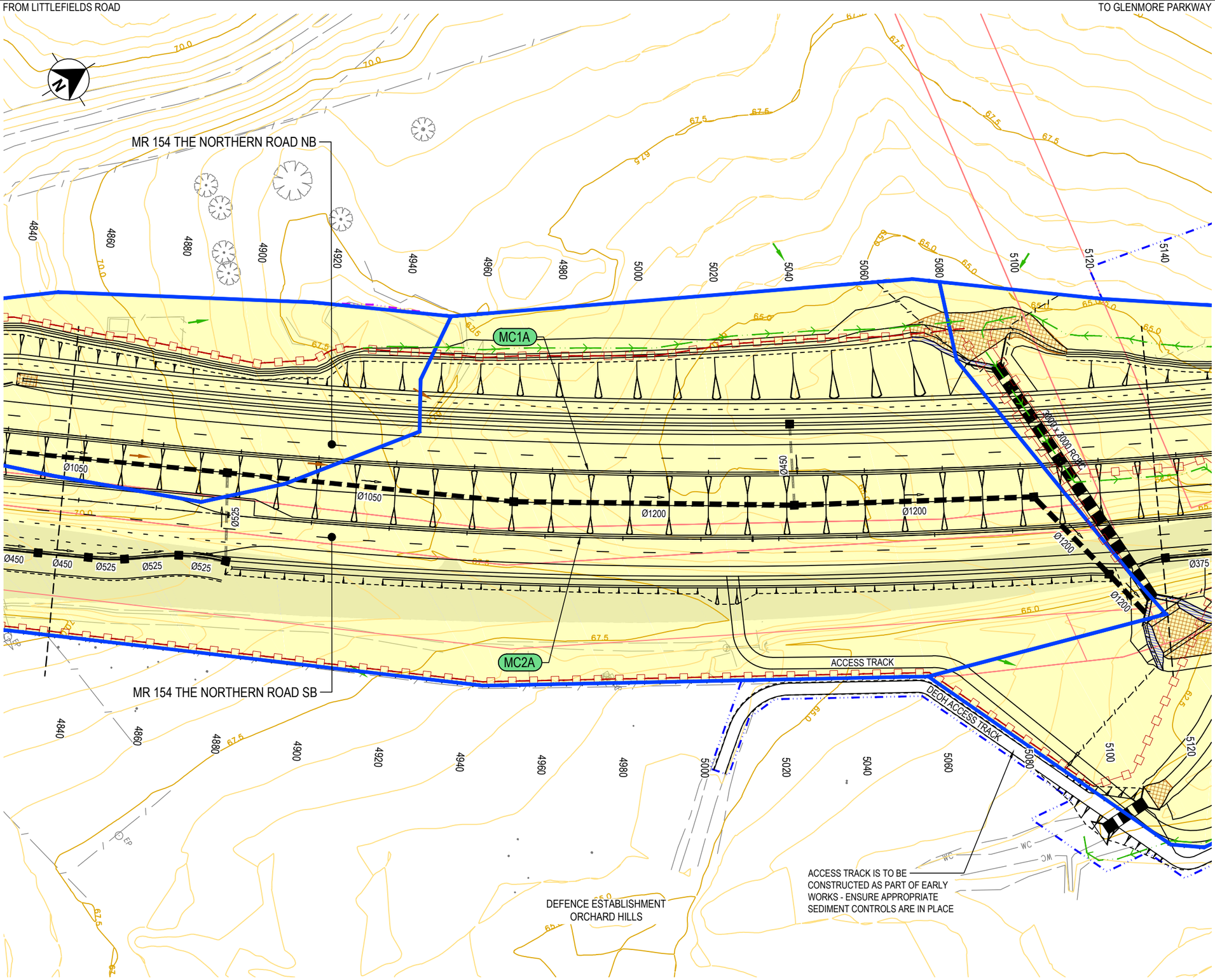
ISSUE STATUS: ISSUED FOR INFORMATION — EDMS No. — SHEET No. SM-8418 — ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8418

ADJOINS 21-25734-DD SHEET SM-8420



FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
- EXISTING SURFACE MINOR CONTOURS (0.2m)
- Ø375 — PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
- OFF-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- ON-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- SEDIMENT CONTROL, FOR EXAMPLE REFER BLUE BOOK STD DRG SD6-7 / SD 6-8
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- ON-SITE WATER FLOW DIRECTION
- OFF-SITE WATER FLOW DIRECTION
- DISTURBED AREA
- RIP RAP SCOUR PROTECTION
- CONCRETE SCOUR PROTECTION
- TEMPORARY SEDIMENTATION BASIN
- * SEDIMENT BASIN DISCHARGE POINT

NOTES

1. FOR EROSION AND SEDIMENT CONTROL NOTES REFER TO DRAWING SM-8451
2. FOR EROSION AND SEDIMENT CONTROL DETAILS REFER TO DRAWINGS SM-8452 AND SM-8453 AND "THE BLUE BOOK" STANDARDS DRAWINGS AS NOMINATED
3. ENSURE ACCESS IS MAINTAINED WHERE SEDIMENT CONTROLS CROSS DRIVEWAYS THROUGH PROVISION OF A TEMPORARY PIPE OR EQUIVALENT MEANS

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0 5 15 25 35 45 50mm ON A3 SIZE ORIGINAL

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FILE NAME ; DESN TNR5

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20 AT A3)

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

PLOT DATE / TIME: 4/10/2018 2:23 PM
PLOT BY: jcleary

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT
NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR
INFRASTRUCTURE DEVELOPMENT
WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 19 OF 36

RMS REGISTRATION No. DS2016/002687
PART 8
ISSUE STATUS: ISSUED FOR INFORMATION
EDMS No.
SHEET No. SM-8419
ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8419

ADJOINS 21-25734-DD SHEET SM-8421

MR 154 THE NORTHERN ROAD NB

MC1A

MC2A

ACCESS TRACK

DEOH ACCESS TRACK

MR 154 THE NORTHERN ROAD SB

ACCESS TRACK IS TO BE CONSTRUCTED AS PART OF EARLY WORKS - ENSURE APPROPRIATE SEDIMENT CONTROLS ARE IN PLACE

DEFENCE ESTABLISHMENT ORCHARD HILLS

EXISTING DAM TO BE UTILISED FOR ONSITE SEDIMENT DURING STAGE 1 WORKS

FROM LITTLEFIELDS ROAD

ADJOINS 21-25734-DD SHEET SM-8436

TO GLENMORE PARKWAY

FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
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- Ø375 — PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
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- SEDIMENT CONTROL, FOR EXAMPLE REFER BLUE BOOK STD DRG SD6-7 / SD 6-8
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- ON-SITE WATER FLOW DIRECTION
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- RIP RAP SCOUR PROTECTION
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- TEMPORARY SEDIMENTATION BASIN
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NOTES

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0 5 10 15 25 35 45 50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
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REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
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FILE NAME ; DESN TNR5

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20 AT A3)

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

PLOT DATE / TIME: 4/10/2018 2:23 PM
PLOT BY: jcleary

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT
NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR
INFRASTRUCTURE DEVELOPMENT
WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
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STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY
STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 20 OF 36

RMS REGISTRATION No. DS2016/002687

PART 8

ISSUE STATUS: ISSUED FOR INFORMATION

EDMS No.

SHEET No. SM-8420

ISSUE 0

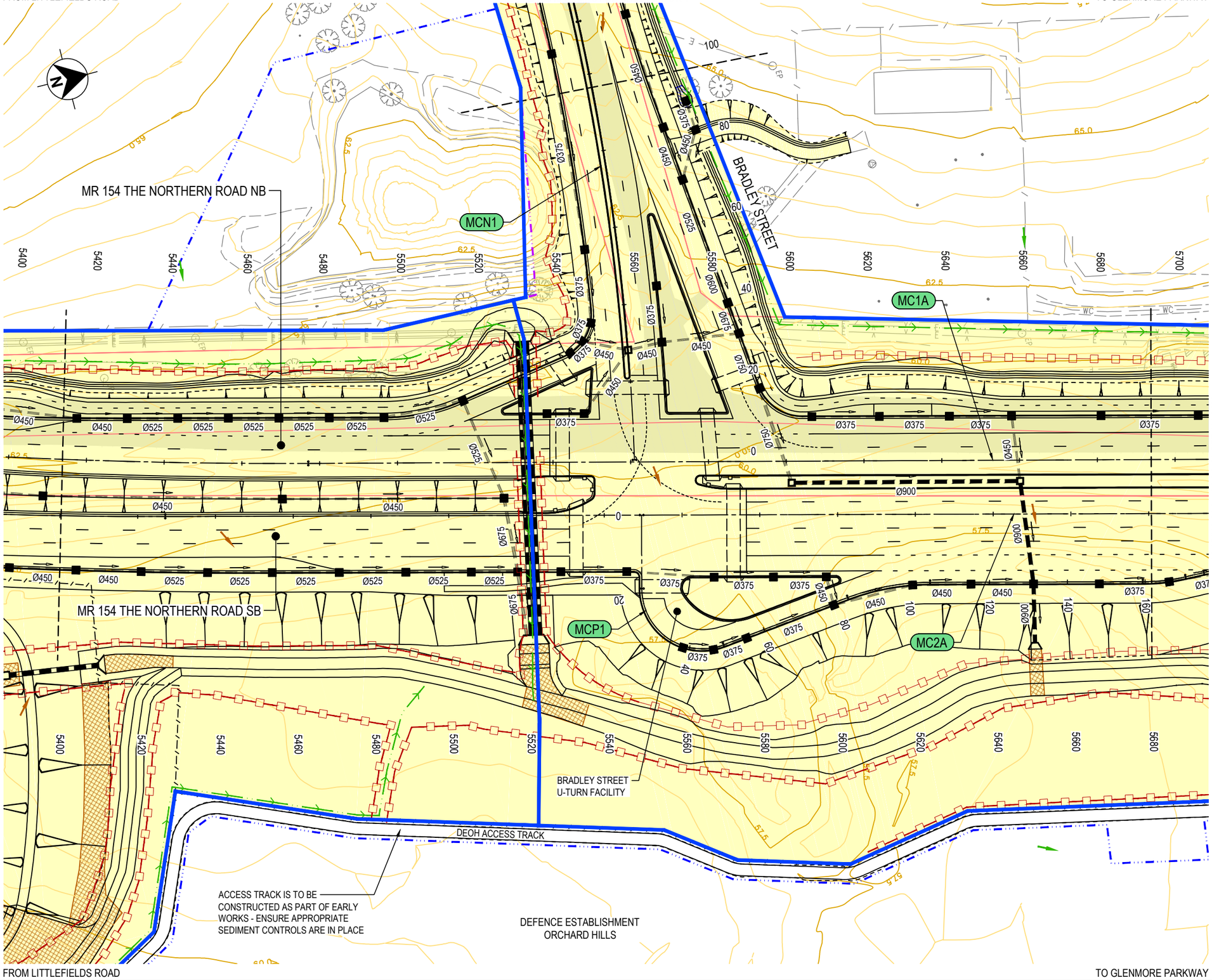
FROM LITTLEFIELDS ROAD

ADJOINS 21-25734-DD SHEET SM-8434

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8420

ADJOINS 21-25734-DD SHEET SM-8422



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LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
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- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
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NOTES

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0 5 10 15 25 35 145 150mm ON A3 SIZE ORIGINAL

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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING: FILE NAME ; DESN TNR5

PLOT DATE / TIME: 4/10/2018 2:24 PM — PLOT BY: jcleary

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SCALES ON A3 SIZE DRAWING: SCALE 1:1000 (10 0 10 20) AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

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PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT: NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

A3

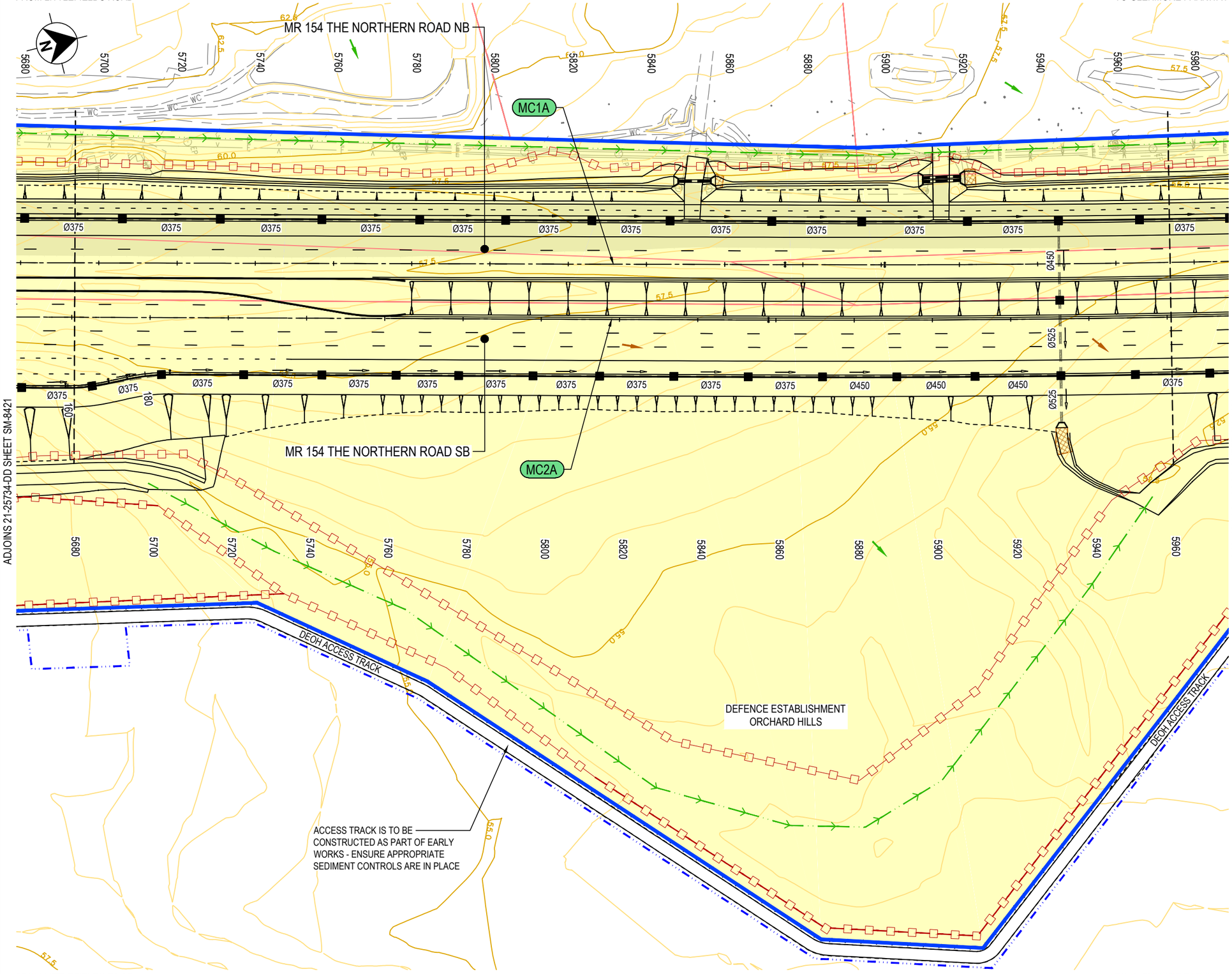
PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY
STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN — SHEET 21 OF 36

RMS REGISTRATION No.: DS2016/002687 — PART: 8

ISSUE STATUS: ISSUED FOR INFORMATION — EDMS No. — SHEET No.: SM-8421 — ISSUE: 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY



FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
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- PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
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- CATCHMENT AREA
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- * SEDIMENT BASIN DISCHARGE POINT

NOTES

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3. ENSURE ACCESS IS MAINTAINED WHERE SEDIMENT CONTROLS CROSS DRIVEWAYS THROUGH PROVISION OF A TEMPORARY PIPE OR EQUIVALENT MEANS

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FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

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50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME: G:\21\25734\CADD\Drawings\21-25734-DD-SM-8400.dwg

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SCALES ON A3 SIZE DRAWING: SCALE 1:1000 (10 0 10 20) AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

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LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
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PLOT DATE / TIME: 4/10/2018 2:24 PM — PLOT BY: jcleary

TITLE	NAME	DATE
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DESIGN MNGR	A.PENN	
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CLIENT: NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN — SHEET 22 OF 36

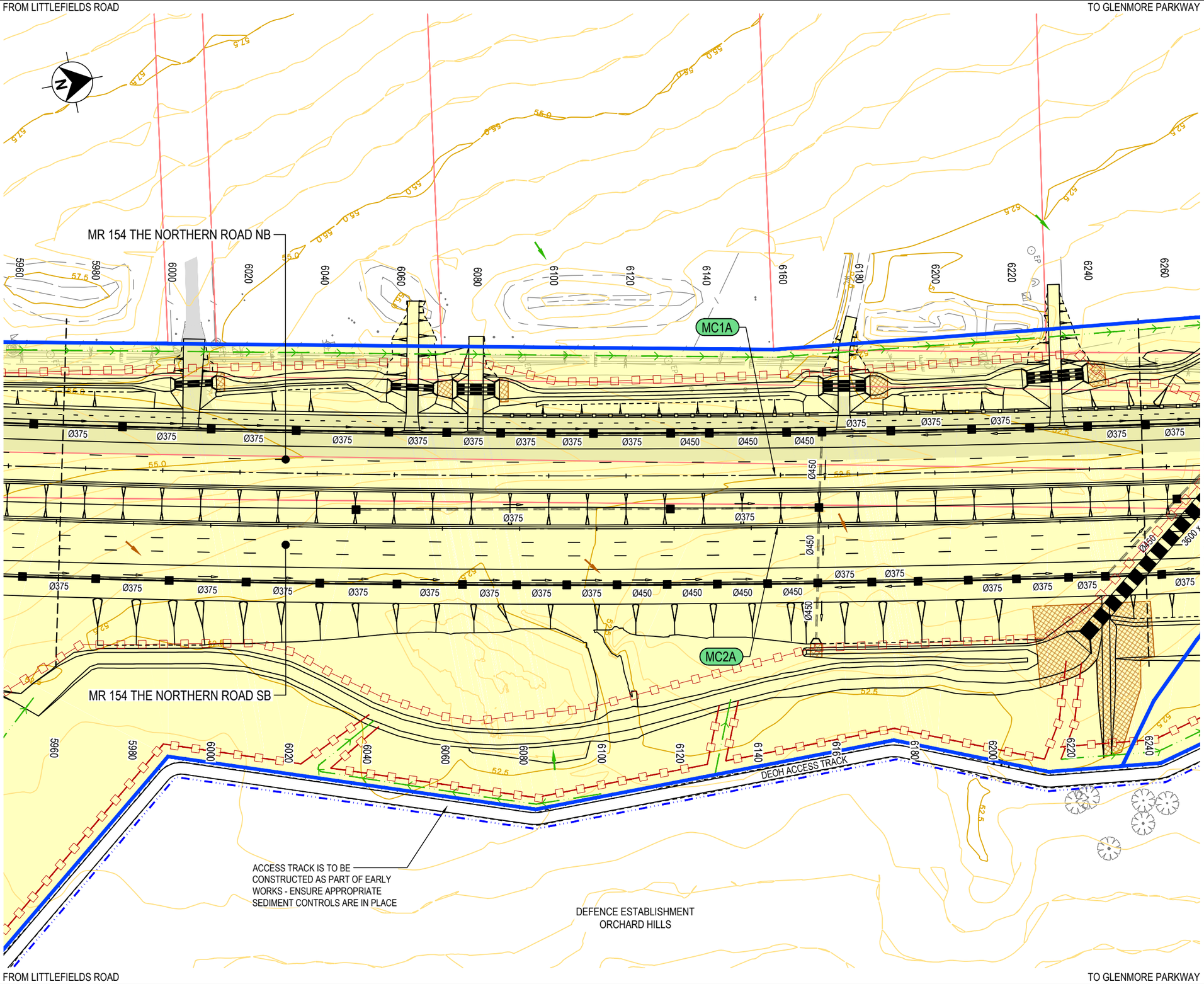
A3

RMS REGISTRATION No. DS2016/002687 — PART 8

ISSUE STATUS: ISSUED FOR INFORMATION — EDMS No. — SHEET No. SM-8422 — ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY



ADJOINS 21-25734-DD SHEET SM-8422

ADJOINS 21-25734-DD SHEET SM-8424

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE (910)
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
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- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
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- EXISTING SURFACE MAJOR CONTOURS (1m)
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- RIP RAP SCOUR PROTECTION
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NOTES

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DRAWING FILE LOCATION / NAME: G:\21\25734\CADD\Drawings\21-25734-DD-SM-8400.dwg

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING: FILE NAME ; DESN TNR5

SCALES ON A3 SIZE DRAWING: SCALE 1:1000 (10 0 10 20) AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
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DRAWINGS / DESIGN PREPARED BY

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CLIENT: NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA

MR 154 - THE NORTHERN ROAD UPGRADE

STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)

SEDIMENT AND EROSION CONTROL PLAN — SHEET 23 OF 36

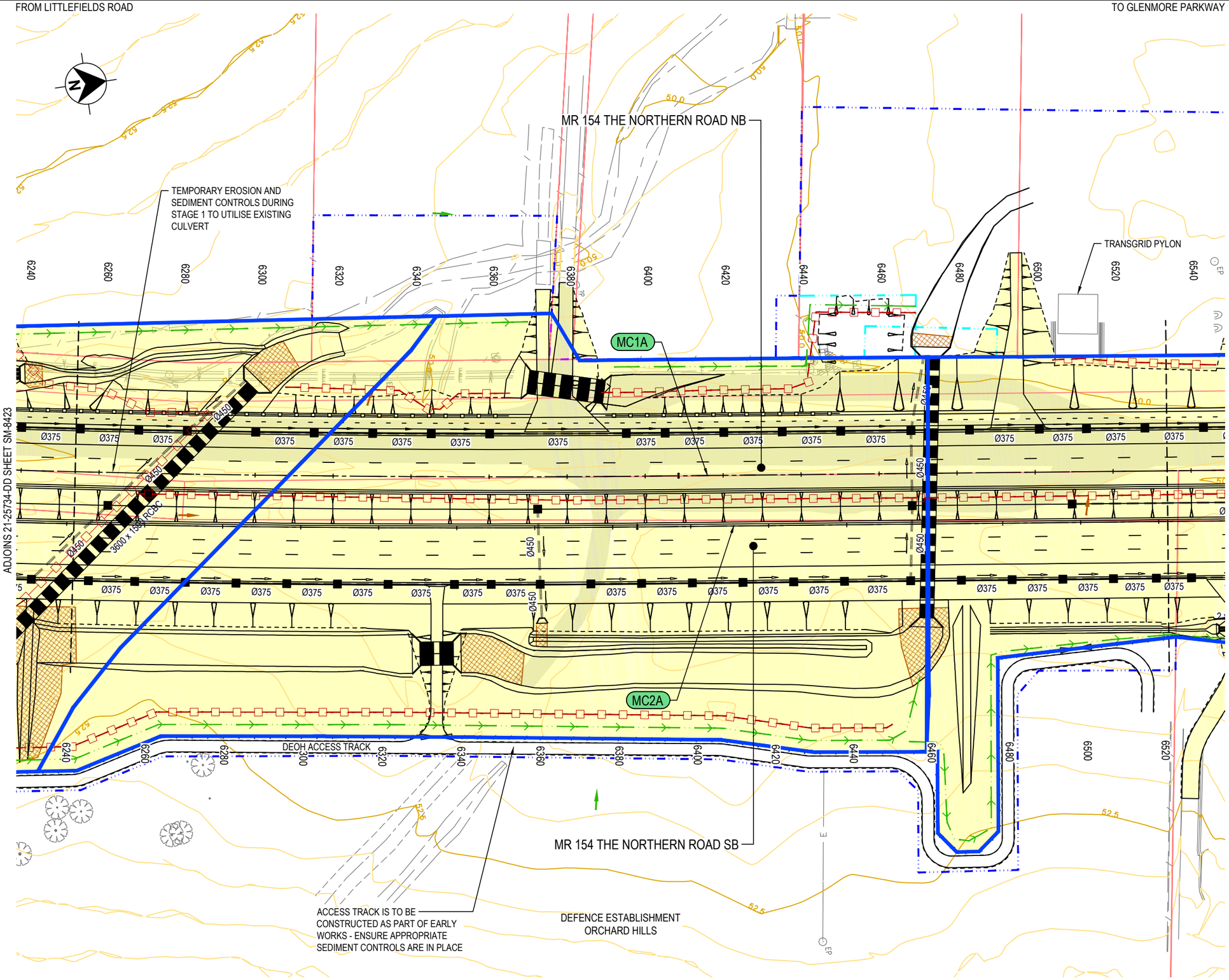
A3

RMS REGISTRATION No. DS2016/002687 — PART 8

ISSUE STATUS: ISSUED FOR INFORMATION — EDMS No. — SHEET No. SM-8423 — ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY



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LEGEND

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- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
- EXISTING SURFACE MINOR CONTOURS (0.2m)
- Ø375 — PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
- OFF-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- ON-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- SEDIMENT CONTROL, FOR EXAMPLE REFER BLUE BOOK STD DRG SD6-7 / SD 6-8
- CATCHMENT AREA
- ON-SITE WATER FLOW DIRECTION
- OFF-SITE WATER FLOW DIRECTION
- DISTURBED AREA
- RIP RAP SCOUR PROTECTION
- CONCRETE SCOUR PROTECTION
- TEMPORARY SEDIMENTATION BASIN
- * SEDIMENT BASIN DISCHARGE POINT

NOTES

1. FOR EROSION AND SEDIMENT CONTROL NOTES REFER TO DRAWING SM-8451
2. FOR EROSION AND SEDIMENT CONTROL DETAILS REFER TO DRAWINGS SM-8452 AND SM-8453 AND "THE BLUE BOOK" STANDARDS DRAWINGS AS NOMINATED
3. ENSURE ACCESS IS MAINTAINED WHERE SEDIMENT CONTROLS CROSS DRIVEWAYS THROUGH PROVISION OF A TEMPORARY PIPE OR EQUIVALENT MEANS

NOT FOR CONSTRUCTION

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

DRAWING FILE LOCATION / NAME
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REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20) AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

PLOT DATE / TIME: 4/10/2018 2:24 PM
PLOT BY: jcleary

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT
NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR
INFRASTRUCTURE DEVELOPMENT
WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY
STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

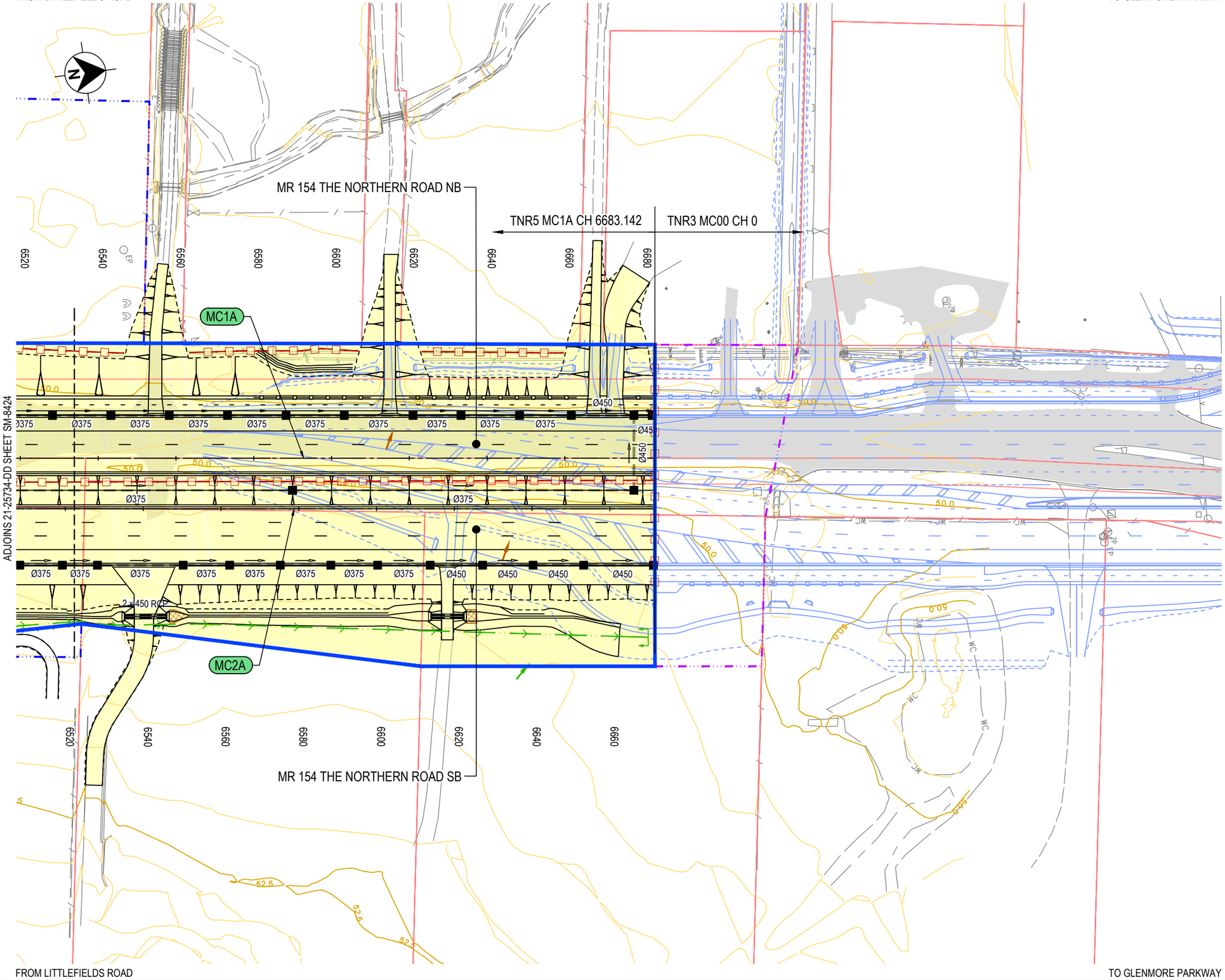
A3

SHEET 24 OF 36

RMS REGISTRATION No. DS2016/002687
PART 8
ISSUE STATUS: ISSUED FOR INFORMATION
EDMS No.
SHEET No. SM-8424
ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY



FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
- EXISTING SURFACE MINOR CONTOURS (0.2m)
- Ø375 — PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
- OFF-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
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- SEDIMENT CONTROL, FOR EXAMPLE REFER BLUE BOOK STD DRG SD6-7 / SD 6-8
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- ON-SITE WATER FLOW DIRECTION
- OFF-SITE WATER FLOW DIRECTION
- DISTURBED AREA
- RIP RAP SCOUR PROTECTION
- CONCRETE SCOUR PROTECTION
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- * SEDIMENT BASIN DISCHARGE POINT

NOTES

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NOT FOR CONSTRUCTION

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

ADJOINS 21-25734-DD SHEET SM-8424

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

0 5 10 15 25 35 45 150mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

PLOT DATE / TIME: 4/10/2018 2:24 PM
PLOT BY: jcleary

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20) AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT
NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR
INFRASTRUCTURE DEVELOPMENT
WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 25 OF 36

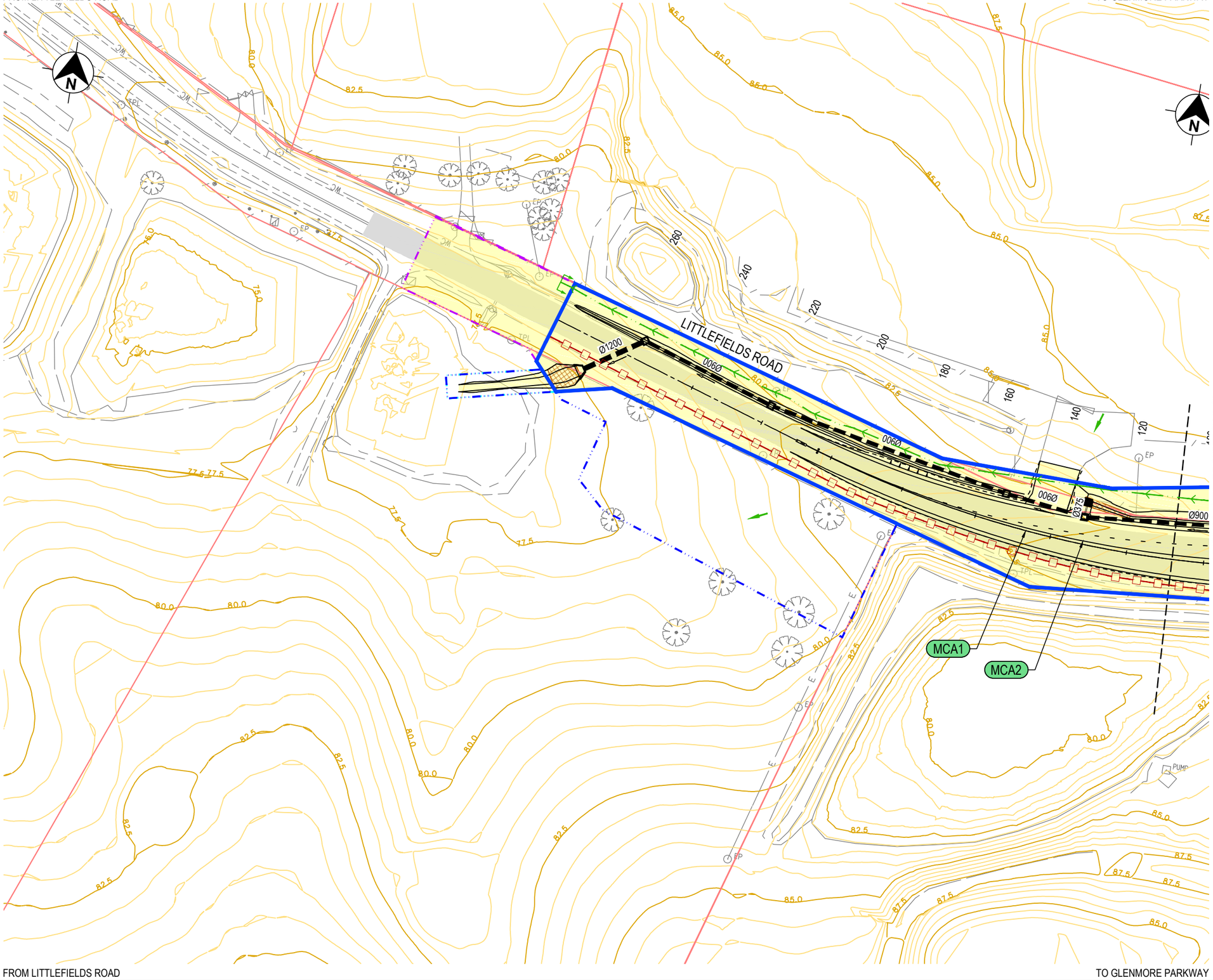
RMS REGISTRATION No. DS2016/002687

PART 8

ISSUE STATUS: ISSUED FOR INFORMATION
EDMS No.:
SHEET No.: SM-8425
ISSUE: 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY



FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
- EXISTING SURFACE MINOR CONTOURS (0.2m)
- Ø375 — PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
- OFF-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- ON-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- SEDIMENT CONTROL, FOR EXAMPLE REFER BLUE BOOK STD DRG SD6-7 / SD 6-8
- CATCHMENT AREA
- ON-SITE WATER FLOW DIRECTION
- OFF-SITE WATER FLOW DIRECTION
- DISTURBED AREA
- RIP RAP SCOUR PROTECTION
- CONCRETE SCOUR PROTECTION
- TEMPORARY SEDIMENTATION BASIN
- * — SEDIMENT BASIN DISCHARGE POINT

ADJOINS 21-25734-DD SHEET SM-8403

NOTES

1. FOR EROSION AND SEDIMENT CONTROL NOTES REFER TO DRAWING SM-8451
2. FOR EROSION AND SEDIMENT CONTROL DETAILS REFER TO DRAWINGS SM-8452 AND SM-8453 AND "THE BLUE BOOK" STANDARDS DRAWINGS AS NOMINATED
3. ENSURE ACCESS IS MAINTAINED WHERE SEDIMENT CONTROLS CROSS DRIVEWAYS THROUGH PROVISION OF A TEMPORARY PIPE OR EQUIVALENT MEANS

NOT FOR CONSTRUCTION

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME: G:\21\25734\CADD\Drawings\21-25734-DD-SM-8400.dwg

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING: FILE NAME ; DESN TNR5

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

SCALES ON A3 SIZE DRAWING: SCALE 1:1000 (10 0 10 20) AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

PLOT DATE / TIME: 4/10/2018 2:24 PM — PLOT BY: jcleary

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT: NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 26 OF 36

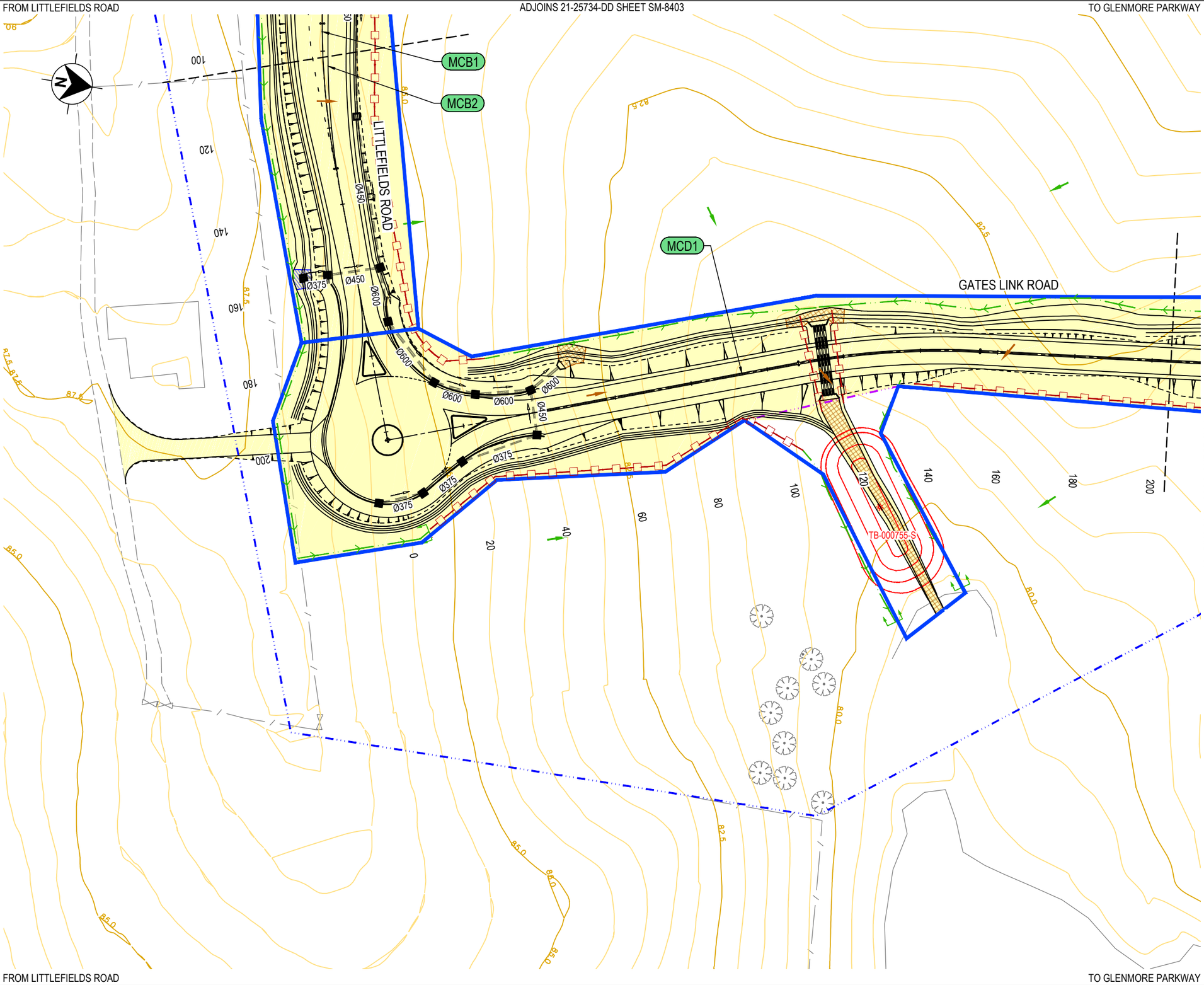
RMS REGISTRATION No. DS2016/002687 — PART 8

ISSUE STATUS: ISSUED FOR INFORMATION — EDMS No. — SHEET No. SM-8426 — ISSUE 0

FROM LITTLEFIELDS ROAD

ADJOINS 21-25734-DD SHEET SM-8403

TO GLENMORE PARKWAY



ADJOINS 21-25734-DD SHEET SM-8428

FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
- EXISTING SURFACE MINOR CONTOURS (0.2m)
- Ø375 — PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
- OFF-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- ON-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- SEDIMENT CONTROL, FOR EXAMPLE REFER BLUE BOOK STD DRG SD6-7 / SD 6-8
- CATCHMENT AREA
- ON-SITE WATER FLOW DIRECTION
- OFF-SITE WATER FLOW DIRECTION
- DISTURBED AREA
- RIP RAP SCOUR PROTECTION
- CONCRETE SCOUR PROTECTION
- TEMPORARY SEDIMENTATION BASIN
- * SEDIMENT BASIN DISCHARGE POINT

NOTES

1. FOR EROSION AND SEDIMENT CONTROL NOTES REFER TO DRAWING SM-8451
2. FOR EROSION AND SEDIMENT CONTROL DETAILS REFER TO DRAWINGS SM-8452 AND SM-8453 AND "THE BLUE BOOK" STANDARDS DRAWINGS AS NOMINATED
3. ENSURE ACCESS IS MAINTAINED WHERE SEDIMENT CONTROLS CROSS DRIVEWAYS THROUGH PROVISION OF A TEMPORARY PIPE OR EQUIVALENT MEANS

NOT FOR CONSTRUCTION

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

150mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
G:\21\25734\CADD\Drawings\21-25734-DD-SM-8400.dwg

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

PLOT DATE / TIME: 4/10/2018 2:24 PM
PLOT BY: jcleary

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20) AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT
NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR
INFRASTRUCTURE DEVELOPMENT
WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 27 OF 36

RMS REGISTRATION No. DS2016/002687

PART 8

ISSUE STATUS: ISSUED FOR INFORMATION

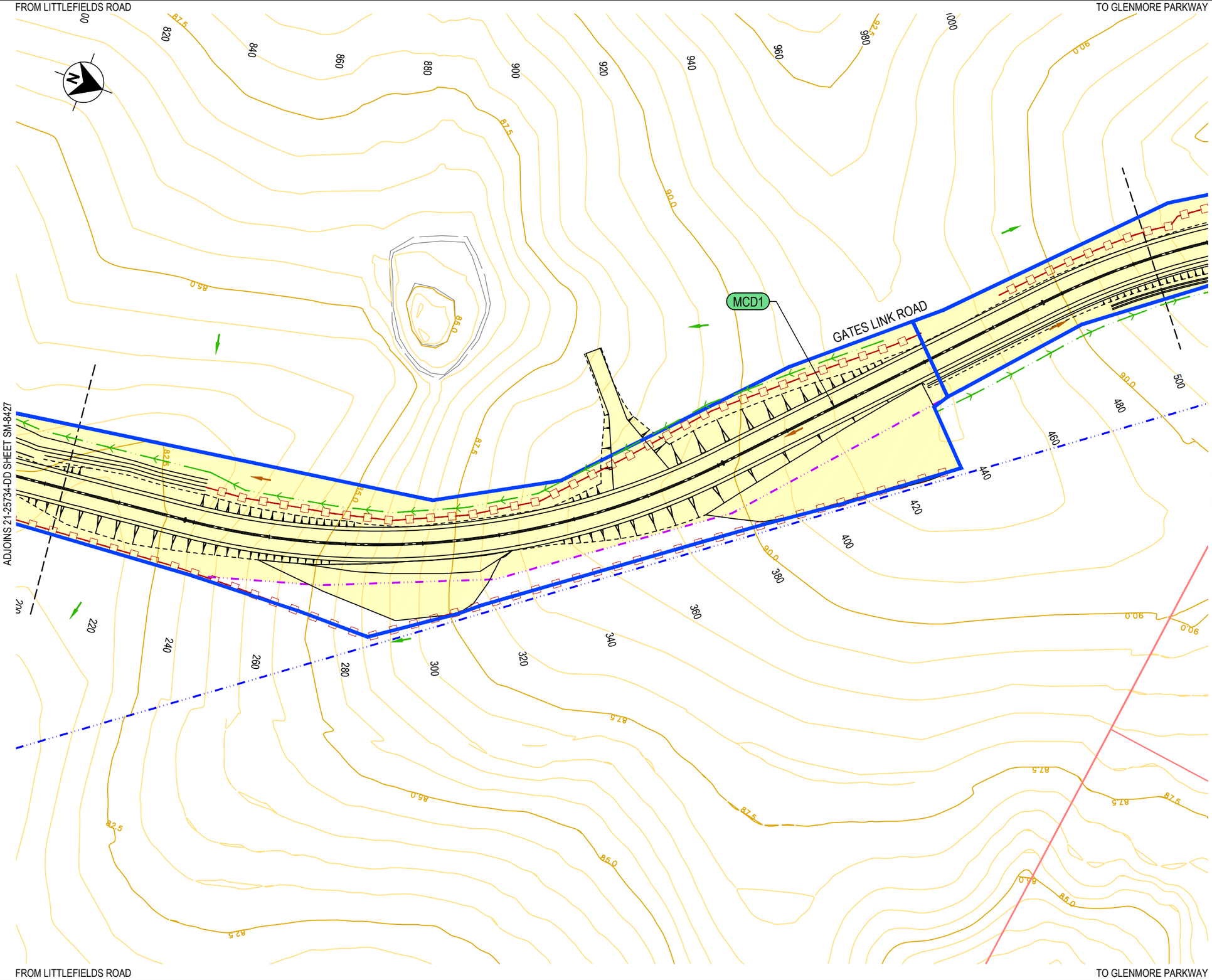
EDMS No.

SHEET No. SM-8427

ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY



FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
- EXISTING SURFACE MINOR CONTOURS (0.2m)
- Ø375 — PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
- OFF-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- ON-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- SEDIMENT CONTROL, FOR EXAMPLE REFER BLUE BOOK STD DRG SD6-7 / SD 6-8
- CATCHMENT AREA
- ON-SITE WATER FLOW DIRECTION
- OFF-SITE WATER FLOW DIRECTION
- DISTURBED AREA
- RIP RAP SCOUR PROTECTION
- CONCRETE SCOUR PROTECTION
- TEMPORARY SEDIMENTATION BASIN
- * — SEDIMENT BASIN DISCHARGE POINT

NOTES

1. FOR EROSION AND SEDIMENT CONTROL NOTES REFER TO DRAWING SM-8451
2. FOR EROSION AND SEDIMENT CONTROL DETAILS REFER TO DRAWINGS SM-8452 AND SM-8453 AND "THE BLUE BOOK" STANDARDS DRAWINGS AS NOMINATED
3. ENSURE ACCESS IS MAINTAINED WHERE SEDIMENT CONTROLS CROSS DRIVEWAYS THROUGH PROVISION OF A TEMPORARY PIPE OR EQUIVALENT MEANS

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

0 5 15 25 35 45 50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 10 0 10 20 AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
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PLOT DATE / TIME: 4/10/2018 2:24 PM
PLOT BY: jcleary

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
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CLIENT
NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR
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WESTERN SYDNEY INFRASTRUCTURE
PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

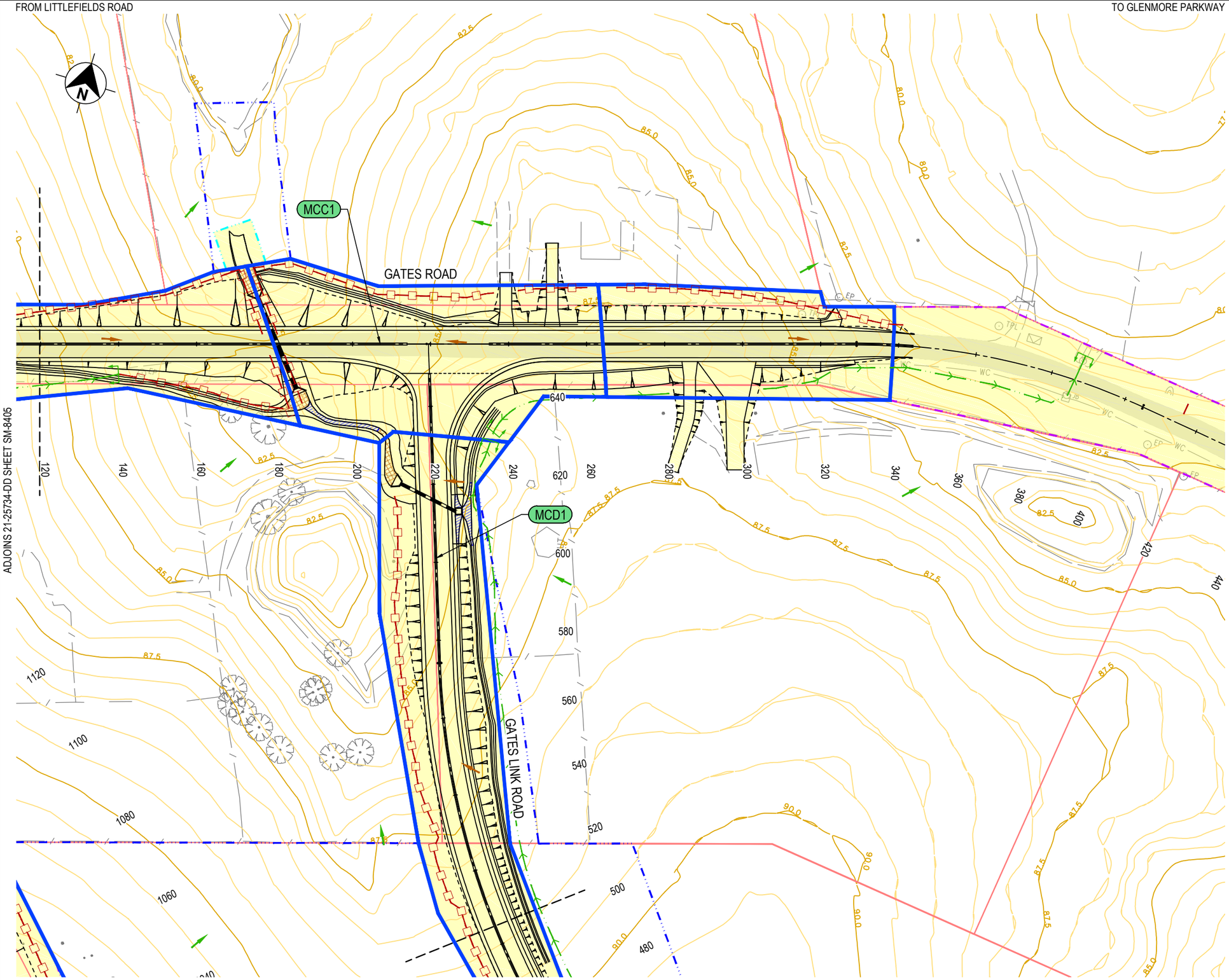
SHEET 28 OF 36

RMS REGISTRATION No. DS2016/002687
PART 8

ISSUE STATUS: ISSUED FOR INFORMATION
EDMS No.
SHEET No. SM-8428
ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY



ADJOINS 21-25734-DD SHEET SM-9405

FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- 910 — DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
- EXISTING SURFACE MINOR CONTOURS (0.2m)
- Ø375 — PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
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- * SEDIMENT BASIN DISCHARGE POINT

NOTES

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FROM LITTLEFIELDS ROAD — ADJOINS 21-25734-DD SHEET SM-8428 — TO GLENMORE PARKWAY

NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

0 5 10 15 25 35 45 50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
G:\21\25734\CADD\Drawings\21-25734-DD-SM-8400.dwg

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

PLOT DATE / TIME: 4/10/2018 2:25 PM — PLOT BY: jcleary

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20) AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
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E SYDMAIL@GHD.COM.AU
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TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT: NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN — SHEET 29 OF 36

A3

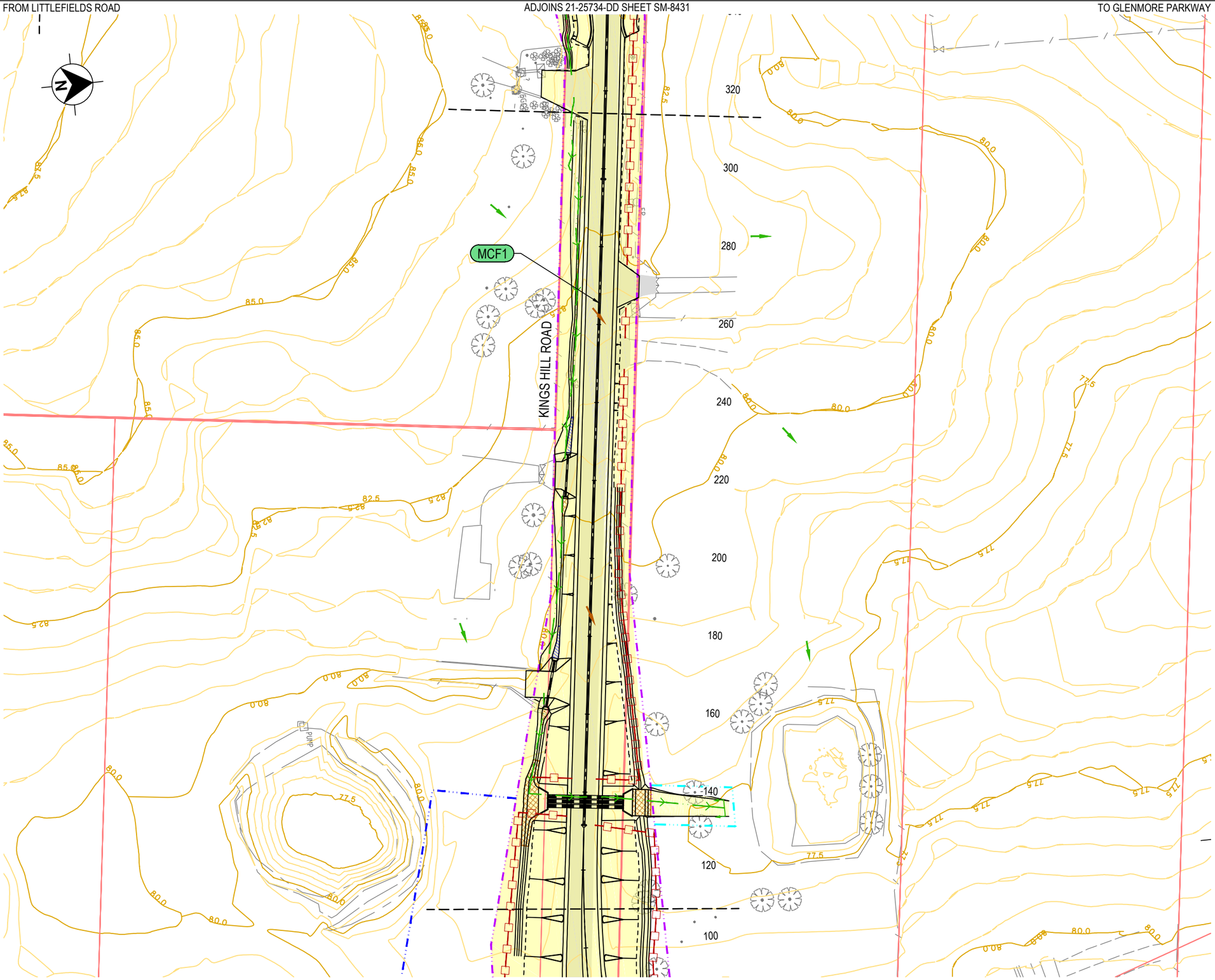
RMS REGISTRATION No. DS2016/002687 — PART 8

ISSUE STATUS: ISSUED FOR INFORMATION — EDMS No. — SHEET No. SM-8429 — ISSUE 0

FROM LITTLEFIELDS ROAD

ADJOINS 21-25734-DD SHEET SM-8431

TO GLENMORE PARKWAY



FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

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- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
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- OFF-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- ON-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- SEDIMENT CONTROL, FOR EXAMPLE REFER BLUE BOOK STD DRG SD6-7 / SD 6-8
- CATCHMENT AREA
- ON-SITE WATER FLOW DIRECTION
- OFF-SITE WATER FLOW DIRECTION
- DISTURBED AREA
- RIP RAP SCOUR PROTECTION
- CONCRETE SCOUR PROTECTION
- TEMPORARY SEDIMENTATION BASIN
- * — SEDIMENT BASIN DISCHARGE POINT

NOTES

1. FOR EROSION AND SEDIMENT CONTROL NOTES REFER TO DRAWING SM-8451
2. FOR EROSION AND SEDIMENT CONTROL DETAILS REFER TO DRAWINGS SM-8452 AND SM-8453 AND "THE BLUE BOOK" STANDARDS DRAWINGS AS NOMINATED
3. ENSURE ACCESS IS MAINTAINED WHERE SEDIMENT CONTROLS CROSS DRIVEWAYS THROUGH PROVISION OF A TEMPORARY PIPE OR EQUIVALENT MEANS

NOT FOR CONSTRUCTION

FROM LITTLEFIELDS ROAD

ADJOINS 21-25734-DD SHEET SM-8410

TO GLENMORE PARKWAY

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50mm ON A3 SIZE ORIGINAL

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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

PLOT DATE / TIME: 4/10/2018 2:25 PM — PLOT BY: jcleary

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0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20 AT A3)

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

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PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT: NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN — SHEET 30 OF 36

A3

RMS REGISTRATION No. DS2016/002687 — PART 8

ISSUE STATUS: ISSUED FOR INFORMATION — EDMS No. — SHEET No. SM-8430 — ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
- EXISTING SURFACE MINOR CONTOURS (0.2m)
- Ø375 — PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
- OFF-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- ON-SITE WATER DIVERSION, REFER THE BLUE BOOK STD DRG SD5-5 / SD5-6
- SEDIMENT CONTROL, FOR EXAMPLE REFER BLUE BOOK STD DRG SD6-7 / SD 6-8
- CATCHMENT AREA
- ON-SITE WATER FLOW DIRECTION
- OFF-SITE WATER FLOW DIRECTION
- DISTURBED AREA
- RIP RAP SCOUR PROTECTION
- CONCRETE SCOUR PROTECTION
- TEMPORARY SEDIMENTATION BASIN
- * — SEDIMENT BASIN DISCHARGE POINT

MCF1
MCF2
MCI1
KINGS HILL ROAD
VINEYARD ROAD
CONSTRUCT PIPE AS PART OF EARLY WORKS TO CONVEY OFF-SITE WATER
CONSTRUCT PIPE AS PART OF EARLY WORKS TO CONVEY OFF-SITE WATER

NOTES

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2. FOR EROSION AND SEDIMENT CONTROL DETAILS REFER TO DRAWINGS SM-8452 AND SM-8453 AND "THE BLUE BOOK" STANDARDS DRAWINGS AS NOMINATED
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ADJOINS 21-25734-DD SHEET SM-8432

FROM LITTLEFIELDS ROAD

ADJOINS 21-25734-DD SHEET SM-8430

TO GLENMORE PARKWAY

NOT FOR CONSTRUCTION

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FILE NAME ; DESN TNR5

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0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 10 0 10 20 AT A3

CO-ORDINATE SYSTEM MGA ZONE 56
HEIGHT DATUM AHD

DRAWINGS / DESIGN PREPARED BY

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PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

	TITLE	NAME	DATE
DRAWN		J.CLEARY	
DRG CHECK		K.RANDELL	
DESIGN		M.RAJU	
DESIGN CHECK		B.LUFFMAN	
DESIGN MNGR		A.PENN	
PROJECT MNGR		D.KINNIBURGH	

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NSW GOVERNMENT Transport Roads & Maritime Services

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PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY
STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

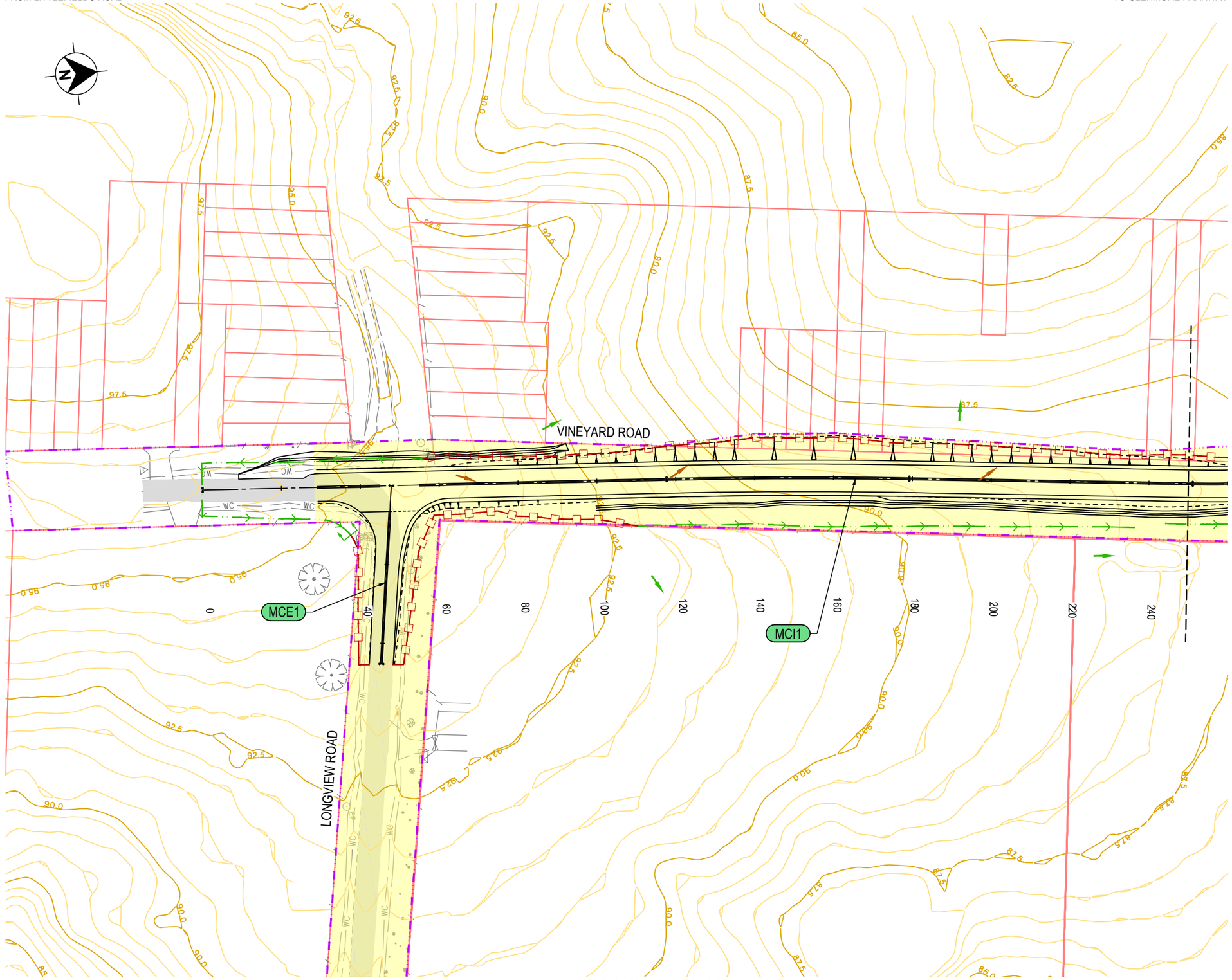
SHEET 31 OF 36

RMS REGISTRATION No. DS2016/002687
PART 8

ISSUE STATUS ISSUED FOR INFORMATION
EDMS No.
SHEET No. SM-8431
ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY



ADJOINS 21-25734-DD SHEET SM-8431

FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE (910)
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
- EXISTING SURFACE MINOR CONTOURS (0.2m)
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- DISTURBED AREA
- RIP RAP SCOUR PROTECTION
- CONCRETE SCOUR PROTECTION
- TEMPORARY SEDIMENTATION BASIN
- * SEDIMENT BASIN DISCHARGE POINT

NOTES

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2. FOR EROSION AND SEDIMENT CONTROL DETAILS REFER TO DRAWINGS SM-8452 AND SM-8453 AND "THE BLUE BOOK" STANDARDS DRAWINGS AS NOMINATED
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FROM LITTLEFIELDS ROAD

ADJOINS 21-25734-DD SHEET SM-8409

TO GLENMORE PARKWAY

NOT FOR CONSTRUCTION

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0 5 10 15 25 35 45 50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
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REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20 AT A3)

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

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PO BOX 788 PARRAMATTA NSW 2124
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E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

PLOT DATE / TIME: 4/10/2018 2:25 PM
PLOT BY: jcleary

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

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WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 32 OF 36

RMS REGISTRATION No. DS2016/002687

PART 8

ISSUE STATUS: ISSUED FOR INFORMATION

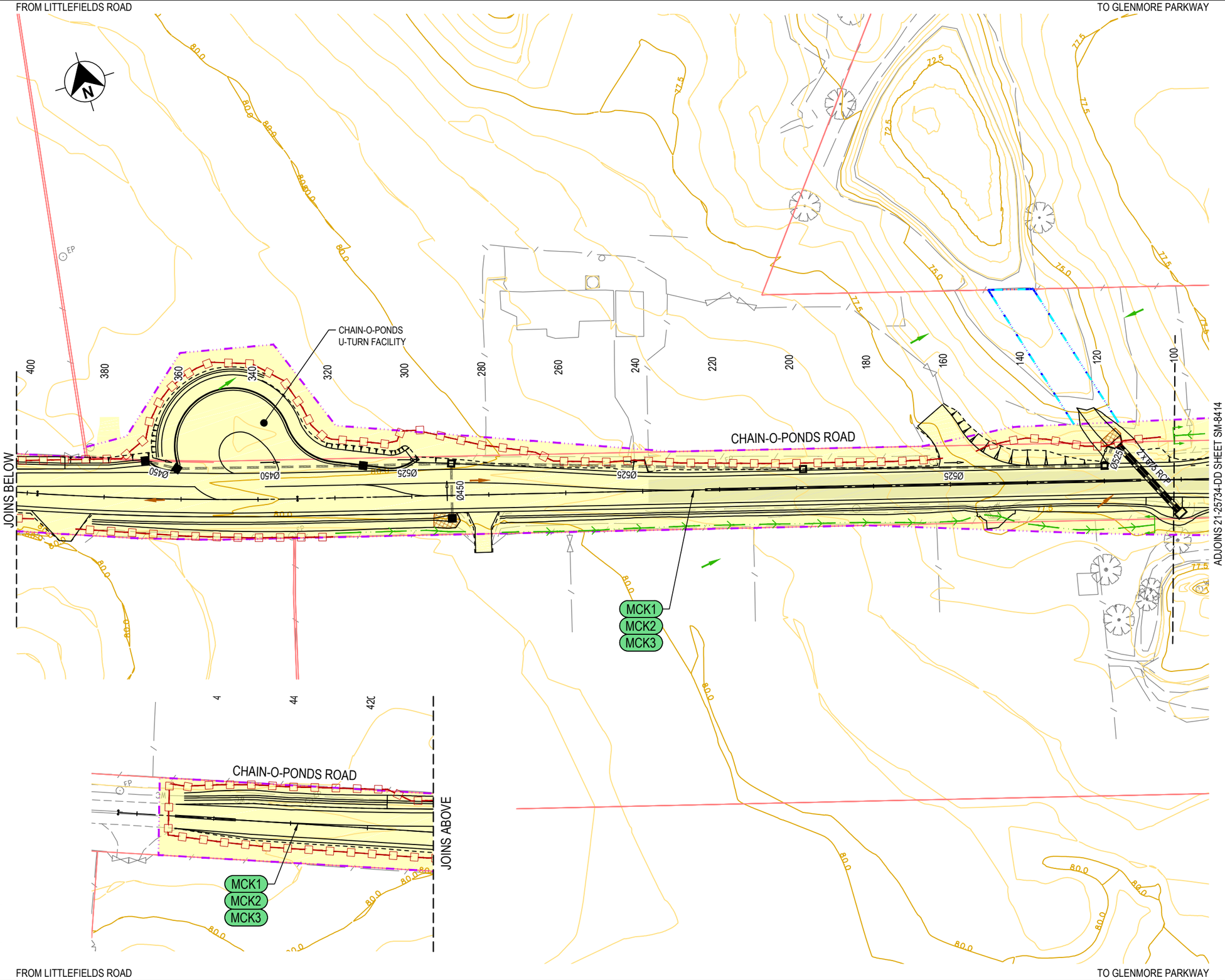
EDMS No.

SHEET No. SM-8432

ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY



FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
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- Ø375 — PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
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- RIP RAP SCOUR PROTECTION
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- TEMPORARY SEDIMENTATION BASIN
- * — SEDIMENT BASIN DISCHARGE POINT

NOTES

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2. FOR EROSION AND SEDIMENT CONTROL DETAILS REFER TO DRAWINGS SM-8452 AND SM-8453 AND "THE BLUE BOOK" STANDARDS DRAWINGS AS NOMINATED
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0 5 10 15 25 35 145 150mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
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0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME ; DESN TNR5

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 10 0 10 20 AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

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T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

PLOT DATE / TIME: 4/10/2018 2:25 PM
PLOT BY: jcleary

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT
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PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

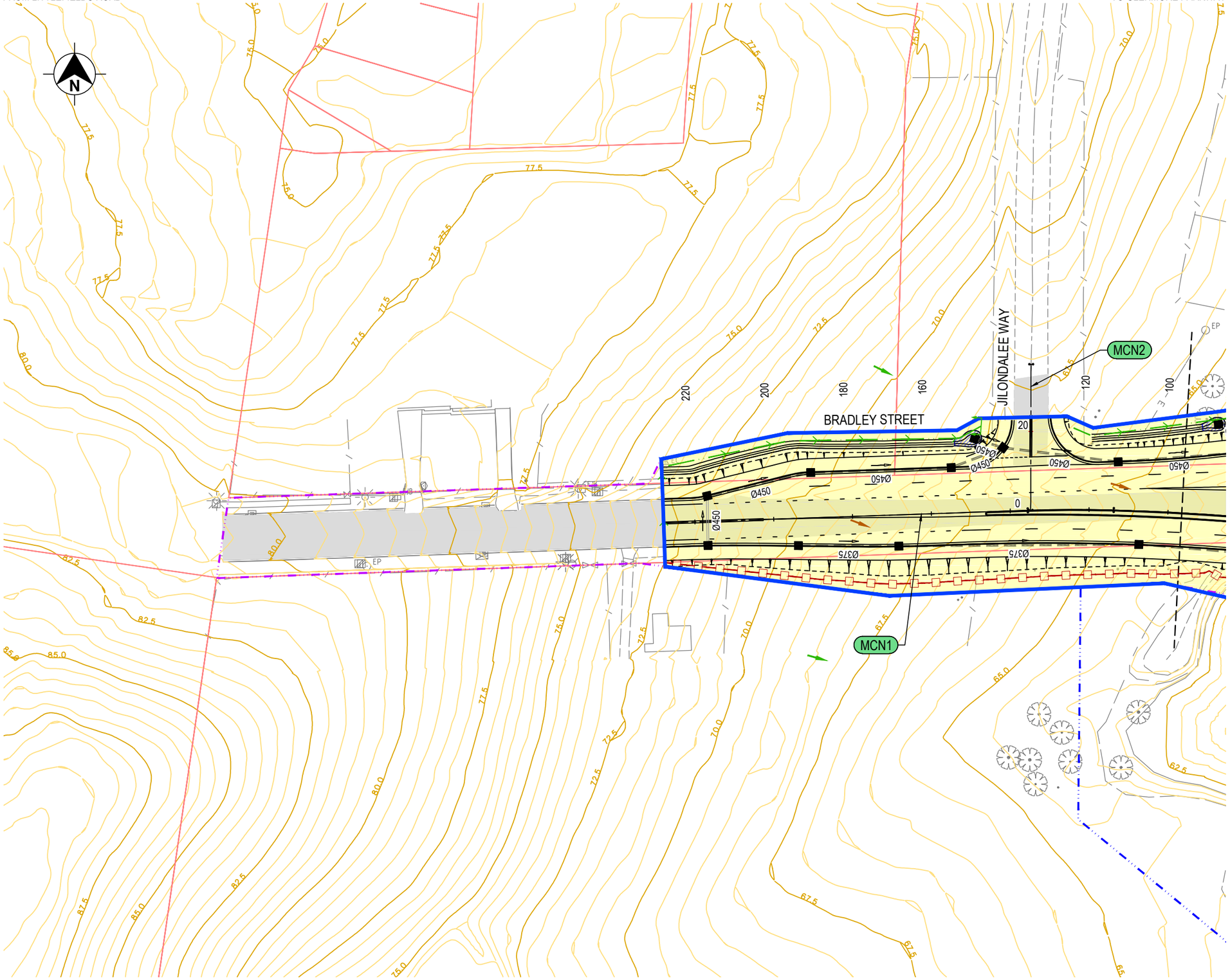
A3

SHEET 33 OF 36

RMS REGISTRATION No. DS2016/002687
PART 8
ISSUE STATUS: ISSUED FOR INFORMATION
EDMS No.
SHEET No. SM-8433
ISSUE 0

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY



FOR ALL GENERAL PROJECT NOTES, STRING TABLE REFERENCE AND RMS MODEL DRAWING LIST, REFER TO DRG'S **GE-1051 TO GE-1055**.

LEGEND

- DESIGN CONTROL LINE
- MCXX — DESIGN CONTROL LINE LABEL
- PROPOSED BOUNDARY
- LEASE BOUNDARY
- EASEMENT BOUNDARY
- CADASTRAL BOUNDARY
- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
- EXISTING BOUNDARY FENCE
- EXISTING SURFACE MAJOR CONTOURS (1m)
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- Ø375 — PIPE BETWEEN PITS, WITH DIAMETER AND DIRECTION OF FLOW
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- CATCHMENT AREA
- ON-SITE WATER FLOW DIRECTION
- OFF-SITE WATER FLOW DIRECTION
- DISTURBED AREA
- RIP RAP SCOUR PROTECTION
- CONCRETE SCOUR PROTECTION
- TEMPORARY SEDIMENTATION BASIN
- * SEDIMENT BASIN DISCHARGE POINT

ADJOINS 21-25734-DD SHEET SM-8421

NOTES

1. FOR EROSION AND SEDIMENT CONTROL NOTES REFER TO DRAWING SM-8451
2. FOR EROSION AND SEDIMENT CONTROL DETAILS REFER TO DRAWINGS SM-8452 AND SM-8453 AND "THE BLUE BOOK" STANDARDS DRAWINGS AS NOMINATED
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NOT FOR CONSTRUCTION

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

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50mm ON A3 SIZE ORIGINAL

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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING: FILE NAME ; DESN TNR5					
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CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

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TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
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DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT: NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

A3

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN — SHEET 34 OF 36

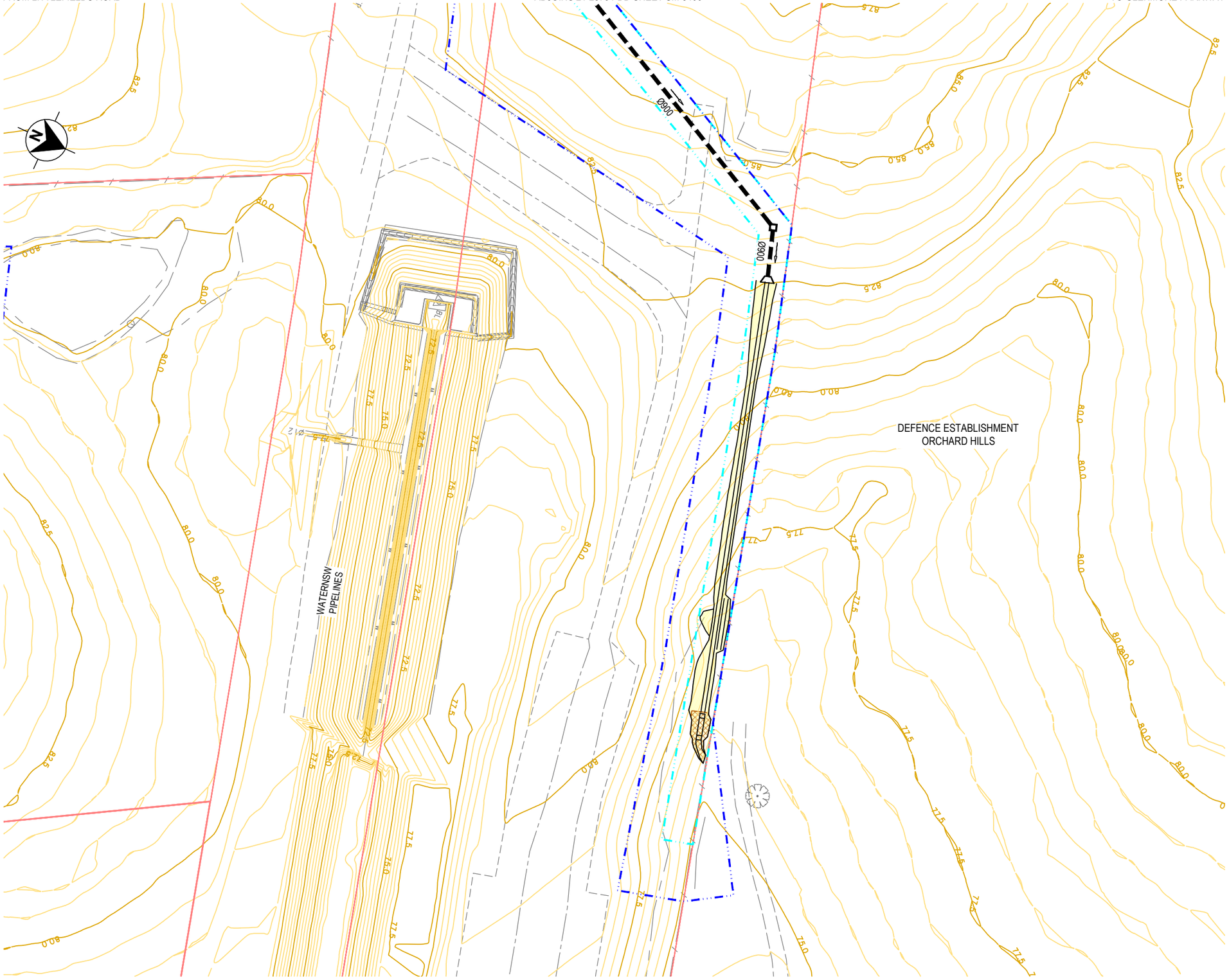
RMS REGISTRATION No. DS2016/002687 — PART 8

ISSUE STATUS: ISSUED FOR INFORMATION — EDMS No. — SHEET No. SM-8434 — ISSUE 0

FROM LITTLEFIELDS ROAD

ADJOINS 21-25734-DD SHEET SM-8406

TO GLENMORE PARKWAY



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LEGEND

- DESIGN CONTROL LINE
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- CADASTRAL BOUNDARY
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SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
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NOTES

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DRAWING FILE LOCATION / NAME
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SCALE 1:1000 10 0 10 20 AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

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STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

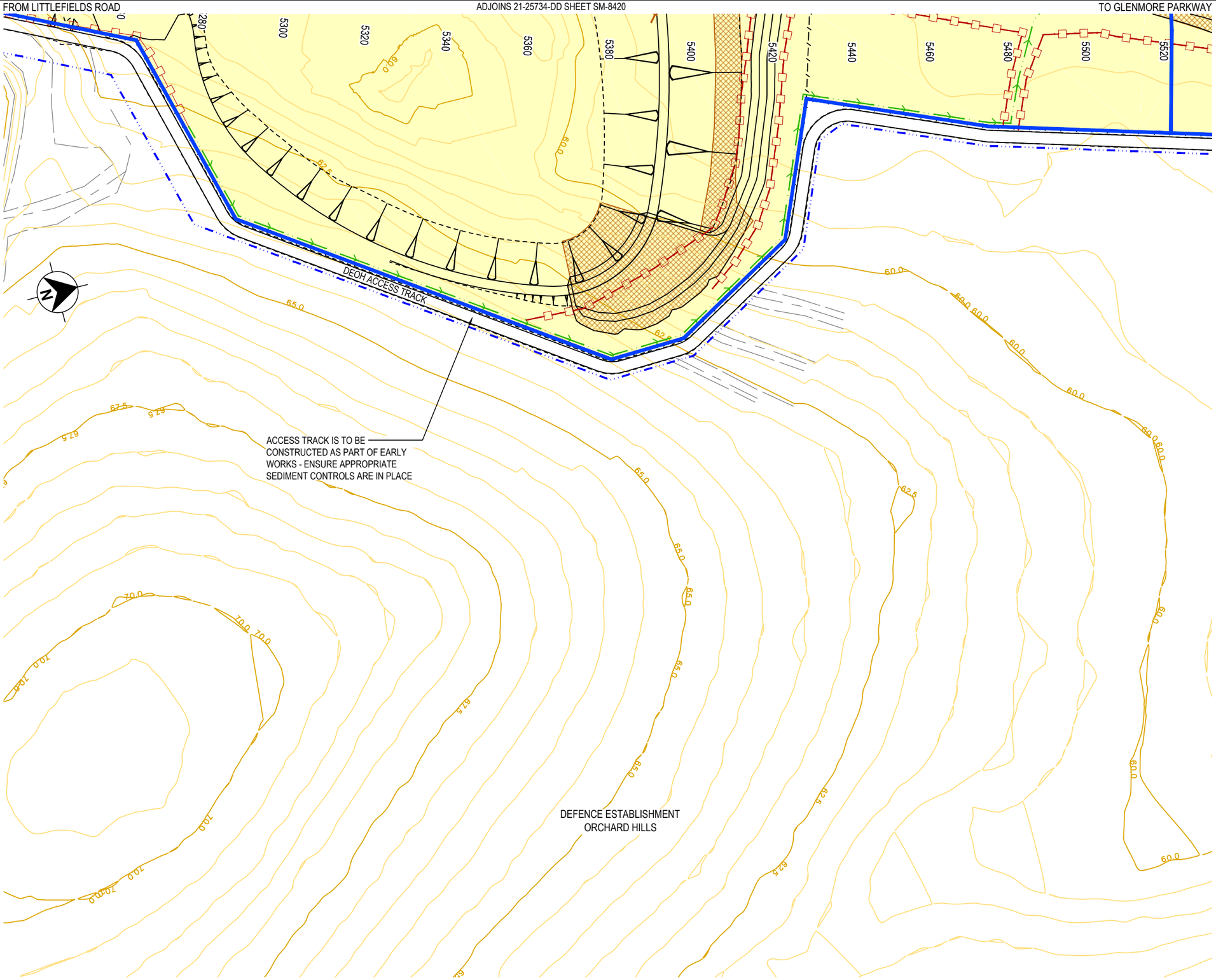
SHEET 35 OF 36

RMS REGISTRATION No. DS2016/002687
PART 8
ISSUE STATUS: ISSUED FOR INFORMATION
EDMS No.
SHEET No. SM-8435
ISSUE 0

FROM LITTLEFIELDS ROAD

ADJOINS 21-25734-DD SHEET SM-8420

TO GLENMORE PARKWAY



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LEGEND

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- MCXX — DESIGN CONTROL LINE LABEL
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- TOPOGRAPHICAL SURVEY

SEDIMENT AND EROSION CONTROL

- EXISTING PAVEMENT
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- CATCHMENT AREA
- ON-SITE WATER FLOW DIRECTION
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- DISTURBED AREA
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- TEMPORARY SEDIMENTATION BASIN
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NOTES

1. FOR EROSION AND SEDIMENT CONTROL NOTES REFER TO DRAWING SM-8451
2. FOR EROSION AND SEDIMENT CONTROL DETAILS REFER TO DRAWINGS SM-8452 AND SM-8453 AND "THE BLUE BOOK" STANDARDS DRAWINGS AS NOMINATED
3. ENSURE ACCESS IS MAINTAINED WHERE SEDIMENT CONTROLS CROSS DRIVEWAYS THROUGH PROVISION OF A TEMPORARY PIPE OR EQUIVALENT MEANS

NOT FOR CONSTRUCTION

FROM LITTLEFIELDS ROAD

TO GLENMORE PARKWAY

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

0 5 15 25 35 45 50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
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REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	10.04.18	ISSUED FOR INFORMATION	N/A	DK

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FILE NAME ; DESN TNR5

SCALES ON A3 SIZE DRAWING
SCALE 1:1000 (10 0 10 20) AT A3

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

PLOT DATE / TIME: 4/10/2018 2:26 PM
PLOT BY: jcleary

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	B.LUFFMAN	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

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PREPARED FOR
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WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

PENRITH CITY COUNCIL AREA
MR 154 - THE NORTHERN ROAD UPGRADE
STAGE 5 BETWEEN LITTLEFIELDS ROAD AND GLENMORE PARKWAY
STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION CONTROL PLAN

A3

SHEET 36 OF 36

RMS REGISTRATION No. DS2016/002687
PART 8

ISSUE STATUS: ISSUED FOR INFORMATION
EDMS No.
SHEET No. SM-8436
ISSUE 0

EROSION AND SEDIMENT CONTROL NOTES

1. THE SEQUENCE OF CONSTRUCTION SHALL BE AS FOLLOWS
   a) IDENTIFY LOCATION OF ALL YOUR PROPOSED EROSION AND SEDIMENT CONTROL MEASURES.
   b) INSTALLATION OF BARRIER AND SEDIMENT FENCES.
   c) INSTALLATION OF SEDIMENT BASIN AND ENERGY DISSIPATOR AT OUTLET WITH SEDIMENT FENCES AT DOWN SLOPE.
   d) INSTALLATION OF ALL DIVERSION DRAINS AND LEVEL SPREADERS.
   e) INSTALLATION OF ALL REMAINING EROSION AND SEDIMENT CONTROLS.
   f) CLEARING AND REGRADING OF SITE FOR ROAD CONSTRUCTION.
2. DRAWINGS ARE ISSUED AS EXAMPLE ONLY. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH THE RMS QA SPECIFICATION G36, G38, G39,THE REQUIREMENTS OF THE 'BLUE BOOK', SOILS AND CONSTRUCTION LANDCOM 2004 VOLUME 1 AND DEC VOLUME 2D AND OTHER ENVIRONMENTAL PRACTICES.
3. REFER TO THE RMS TYPICAL DRAWINGS MD.G38.A01.A TO MD.G38.A09 AND MD.G38.B02 TO MD.G38.B03.A AND THE 2008 'BLUE BOOK' TYPICAL DETAILS SD 4-1 TO SD 6-15.
4. LOCATION OF TOPSOIL STOCKPILES TO BE DETERMINED BY YOU AND STABILISED IN ACCORDANCE WITH SD4.1 AND SD6.8.
5. DETAILS ON THESE PRIMARY EROSION AND SEDIMENT CONTROL PLANS (ESCP'S) ARE SCHEMATIC ONLY. ADDITIONAL CONTROLS AND CHANGES TO THIS PLAN WILL BE NECESSARY DURING THE PROCESS OF IMPLEMENTATION OF THE ESCP. IN CONJUNCTION WITH THE CONSTRUCTION STAGING PLANS AND SPECIFIC ON SITE CONSTRUCTION METHODOLOGY THE CONTRACTOR SHALL PREPARE PROGRESSIVE ESCP. THE ESCP IDENTIFY THE EROSION AND SEDIMENT CONTROLS NEEDED ON SITE, BUT ARE NOT CONSTRUCTION DRAWINGS AND ARE ISSUED FOR INFORMATION ONLY. ALTERNATIVE APPROVED PRIMARY EROSION SEDIMENT CONTROLS CAN BE USED TO SUIT THE METHOD AND SEQUENCE OF CONSTRUCTION.
6. AFTER REGRADING THE SITE, SEDIMENT FENCES SHALL BE LAID ALONG THE CONTOURS AT INTERVALS NOT EXCEEDING 80m. THIS INTERVAL SHALL BE REDUCED TO 20m ON BATTERS STEEPER THAN H.V=4.1. THESE SEDIMENT FENCES ARE NOT SHOWN ON THE PLAN FOR CLARITY PURPOSES.
7. ALL DISTURBED AND REGRADED AREAS SHALL BE REHABILITATED WITHIN 20 DAYS IN ACCORDANCE WITH RMS SPECIFICATION R178 AND REQUIREMENTS OF THE BLUE BOOK.
8. THE SEDIMENT BASINS SHALL NOT HAVE A LOW FLOW PIPE OUTLET.
9. FOR DETAILS OF SEDIMENT BASIN REFER TO BLUE BOOK REFER TO TYPICAL DETAIL SD 6-4 IN DRAWING VOLUME 1.
10. RUNOFF CAPTURED IN THE SEDIMENT BASIN SHALL NEED TO BE EMPTIED AFTER EACH STORM EVENT FOR REUSE ON SITE FOR DUST SUPPRESSION OR OTHER PURPOSES OR DISCHARGED DOWNSTREAM WITH APPROVAL IF IT MEETS THE 50mg/L SUSPENDED SOLIDS WATER QUALITY STANDARDS. GYPSUM FLOCCULATION MAY BE REQUIRED IF THE SETTLEMENT OF SOIL PARTICLES DOES NOT OCCUR. PROVISION FOR GYPSUM FLOCCULATION IS REQUIRED ON SITE AT THE COMPLETION OF THE SEDIMENT BASIN CONSTRUCTION.
11. ALL SEDIMENT BASINS TO BE FENCED WITH TEMPORARY FENCING TO RESTRICT PUBLIC ACCESS DURING THE CONSTRUCTION PHASE.
12. ACCESS TO SEDIMENT BASINS (INCLUDING SPILLWAY) FOR INSPECTIONS AND MAINTENANCE IS TO BE PROVIDED.
13. NEW OR EXISTING INFRASTRUCTURE USED TO CONVEY SITE RUNOFF DURING CONSTRUCTION SHALL BE FLUSHED CLEAN OF SEDIMENT AT COMPLETION OF THE PROJECT.
14. FIELD INSPECTIONS ARE TO BE UNDERTAKEN FOR ALL OPEN TRENCHES ON SITE TO ENSURE THAT ADEQUATE PROTECTION AGAINST EROSION IS PROVIDED AND THAT SAFETY MEASURES ARE ALSO PROVIDED IN PLACE AT THE END OF EACH DAY.
15. YOU ARE TO CONFIRM LOCATION OF ALL SERVICES PRIOR TO COMMENCING WORK AND MANAGE THE COORDINATION OF TEMPORARY DRAINAGE AND OTHER EROSION AND SEDIMENT CONTROLS WITH THE EXISTING AND NEW UTILITIES.
16. ANY WORKS TO INSTALL UTILITIES OUTSIDE OF THE CONSTRUCTION AREAS SHOWN ON THESE PLANS ARE TO IMPLEMENT LOCAL EROSION AND SEDIMENT CONTROLS TO ENSURE ADEQUATE PROTECTION.
17. THE PROVISION OF ALL EROSION AND SEDIMENT CONTROL MEASURES REQUIRED FOR THE INSTALLATION OF ALL UTILITIES SHALL BE IN ACCORDANCE WITH VOLUME 2A 'INSTALLATION OF SERVICES" OF THE BLUE BOOK.
18. ALL EXPOSED BATTER FACES AND DIVERSION DRAINS WILL REQUIRE STABILISATION WITH BIODEGRADABLE ORGANIC FIBRE MESH, HYDRO SEEDING AND ANIONIC BITUMEN EMULSION SPRAY AT A RATE OF 3 L/m^2.
19. BASINS AND ASSOCIATED DIVERSION DRAINS MUST BE FULLY OPERATIONAL PRIOR TO ANY DISTURBANCE ON SITE.
20. TEMPORARY DIVERSION DRAINS SHOULD BE CONSTRUCTED TO AVOID TREES AND FENCES AND SHOULD BE WITHIN THE RMS LAND ACQUISITION BOUNDARY.
21. USE WOVEN POLYPROPYLENE AND COTTON/GEOTEXTILE THREAD WITH A FLOW RATE OF 15 L/s/m^2 TO AUSTRALIAN STANDARD AS 3706.9 AS THE FABRIC WHEN INSTALLING SEDIMENT FENCES.
22. ALL BARRIER FENCES (PARAWEBBING) ARE TO BE INSTALLED BY YOU TO AVOID SOIL DISTURBANCE OUTSIDE THE CONSTRUCTION AREA.
23. EARTH WINDROWS ARE TO BE PROVIDED AT EDGE OF FILL EMBANKMENTS TO CONTROL WATER FLOW DOWN FILL BATTERS. STABILISED BATTER CHUTES ARE TO BE PROVIDED WHERE REQUIRED TO CONVEY RUNOFF TO SEDIMENT RETENTION STRUCTURES. REFER RMS TECHNICAL GUIDELINE 'TEMPORARY STORMWATER DRAINAGE FOR ROAD CONSTRUCTION' FOR DETAILS AND GUIDANCE.
24. INSTALLATION / EXTENSION OF CULVERTS IS TO BE UNDERTAKEN / STAGED TO ENSURE THE SEPARATION OF OFF-SITE RUNOFF FROM AND THROUGH THE WORK AREA. ONSITE RUNOFF FROM CULVERT CONSTRUCTION WORKS TO BE TREATED AND DISCHARGED IN ACCORDANCE WITH RMS SPECIFICATION G36, G38 AND THE 'BLUE BOOK'. FOR STAGING CONSIDERATIONS OF CULVERT CONSTRUCTION REFER RMS TECHNICAL GUIDELINE 'TEMPORARY STORMWATER DRAINAGE FOR ROAD CONSTRUCTION' FOR DETAILS AND GUIDANCE.

DESIGN PARAMETERS

DESIGN PARAMETER	VALUE	REFERENCE
SOIL LANDSCAPE	BLACKTOWN / SOUTH CREEK / LUDDENHAM	SOIL LANDSCAPES OF SYDNEY
SLOPE	80m AT VARIABLE SLOPE	TABLE A.1 OF APPENDIX A BLUE BOOK VOLUME 1
RAINFALL EROSIVITY (R-FACTOR)	2210	APPENDIX A OF BLUE BOOK VOL. 1 (EQUATION #2)
SOIL ERODIBILITY FACTOR (K-FACTOR)	0.038/0.05/0.038 (0.05 USED FOR SOIL LOSS CALCULATIONS)	TAKEN FROM TABLE C19 AND C21 OF APPENDIX C BLUE BOOK VOL. 1
SEDIMENT TYPE	TYPE D / TYPE F	TAKEN FROM TABLE C19 AND C21 OF APPENDIX C BLUE BOOK VOL. 1
RAINFALL INTESITY (2 YEAR, 6 HOUR STORM) (mm/HR)	10.0	FROM IFD TABLE GENERATED 24.7.13 FOR 33.775S/150.750E (BOM 2013)
DESIGN RAINFALL DEPTH (DURATION)	5 DAY	SECTION 6.3.4 (D) BLUE BOOK VOL. 1
DESIGN RAINFALL DEPTH (PERCENTILE)	85TH	SECTION 6.3.4 (F) BLUE BOOK VOL. 1
5 DAY 85TH PERCENTILE RAINFALL (mm)	36.6 (WALLACIA)	SECTION 6.3.4 (H) BLUE BOOK VOL. 1
EROSION CONTROL PRACTICE (P-FACTOR)	1.3	APPENDIX A5 OF BLUE BOOK VOL. 1
GROUND COVER (C-FACTOR)	0.7	APPENDIX A6 OF BLUE BOOK VOL. 1
SOIL HYDROLOGIC GROUP	C / D	TAKEN FROM TABLE C19 AND C21 OF APPENDIX C BLUE BOOK VOL. 1
VOLUMETRIC RUNOFF COEFFICIENT (Cv)	0.64 (SOIL HYDROLOGIC GROUP D)	TABLE F2, APPENDIX F OF BLUE BOOK VOL. 1
SEDIMENT BASIN WALL CONSTRUCTION (EARTH)	G / A / B	TAKEN FROM TABLE C19 AND C21 OF APPENDIX C BLUE BOOK VOL. 1

SEDIMENT BASIN NOT SPECIFIED WHERE PREDICTED SOIL LOSS FROM CATCHMENT AREA IS LESS THAN 150 m^3/YEAR

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GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
E SYDMAIL@GHD.COM.AU
W WWW.GHD.COM.AU

TITLE	NAME	DATE
DRAWN	J.CLEARY	
DRG CHECK	K.RANDELL	
DESIGN	M.RAJU	
DESIGN CHECK	P. CAMPBELL	
DESIGN MNGR	A.PENN	
PROJECT MNGR	D.KINNIBURGH	

CLIENT: NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT WESTERN SYDNEY INFRASTRUCTURE PROGRAM - PROJECT DELIVERY

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STORMWATER MANAGEMENT (SM)
SEDIMENT AND EROSION DRAINAGE DETAILS — SHEET 1 OF 3

A3

RMS REGISTRATION No.: DS2016/002687 — PART: 8

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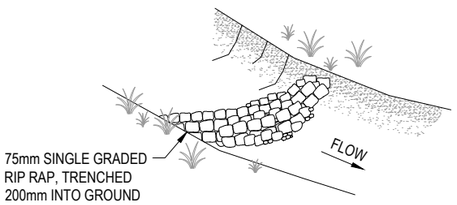
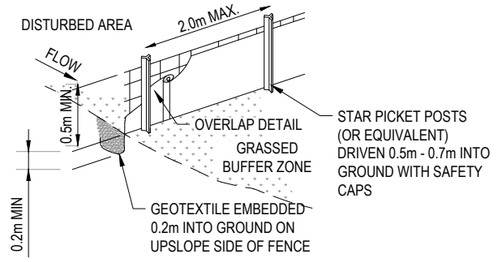


CHECK DAM (SD 5-4) - PERSPECTIVE
NTS



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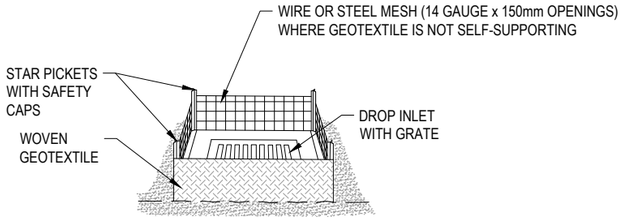

GEOTEXTILE INLET FILTER (SD 6-12) - PERSPECTIVE
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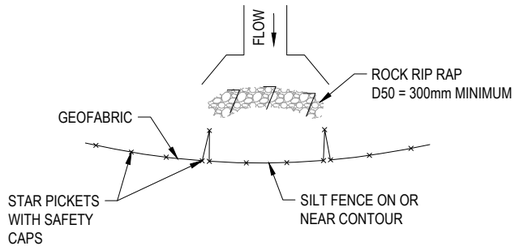

STABILISED CHECK DAM AND SEDIMENT FENCING
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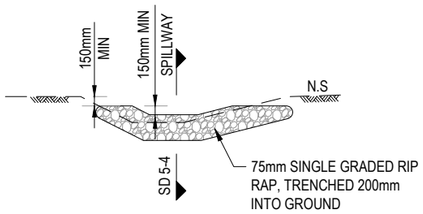

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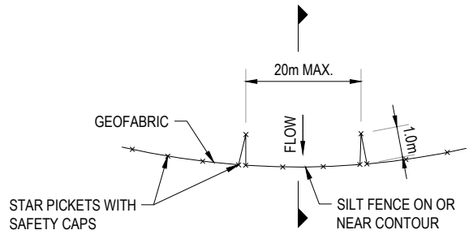

GEOFABRIC SILT FENCE (SD 6-8) - PLAN
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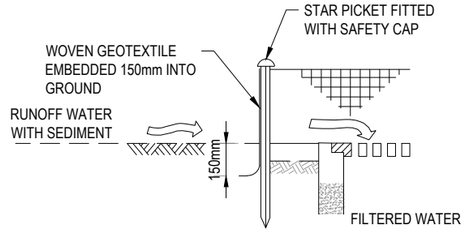

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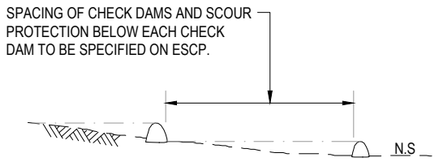

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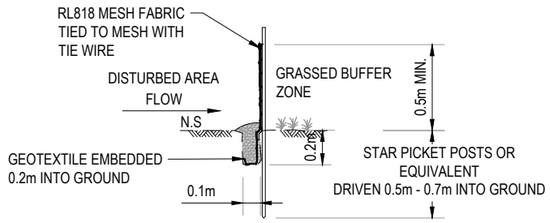

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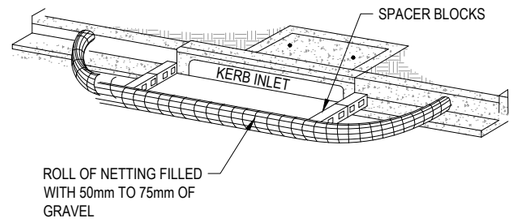

SEDIMENT BARRIER FOR KERB INLET PITS (SD 6-11)
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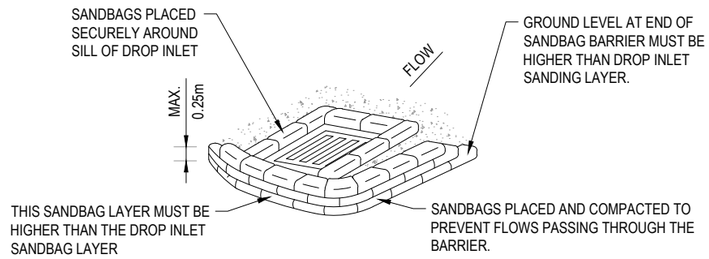

SEDIMENT BARRIER (SD 5-4) DETAIL
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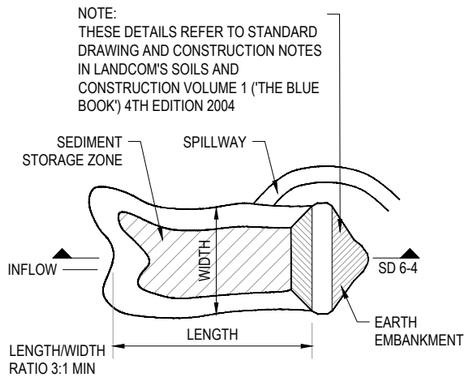

TYPE D BASIN (SD 6-4) PLAN
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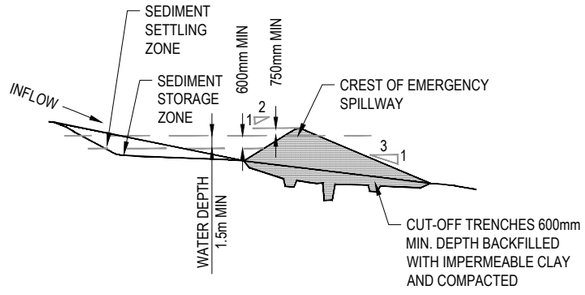

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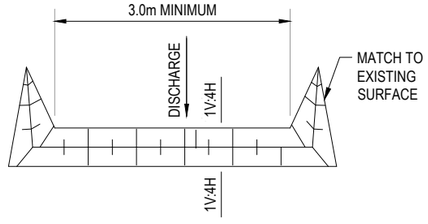

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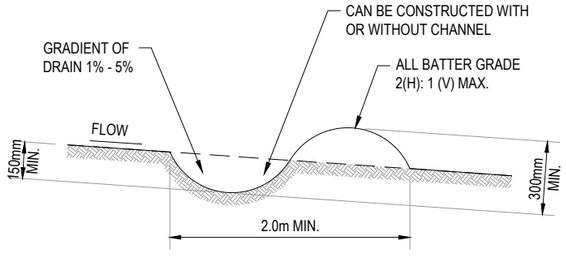

EARTH BANK (LOW FLOW) (SD 5-5)
NTS
NOTE: ONLY TO BE USED AS TEMPORARY BANK WHERE MAXIMUM UPSLOPE LENGTH IS 80m

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50mm ON A3 SIZE ORIGINAL
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GHD
LEVEL 6, 20 SMITH STREET
PARRAMATTA NSW 2150 AUSTRALIA
PO BOX 788 PARRAMATTA NSW 2124
T 61 2 8898 8800 F 61 2 8898 8810
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SEDIMENT AND EROSION DRAINAGE DETAILS
A3
SHEET 2 OF 3

RMS REGISTRATION No. DS2016/002687
PART 8
ISSUE STATUS: ISSUED FOR INFORMATION
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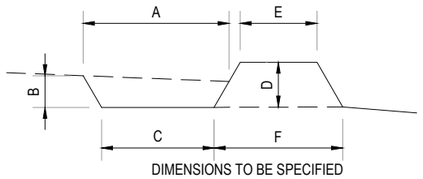
ISSUE 0



DIMENSIONS TO BE SPECIFIED ON SWMP

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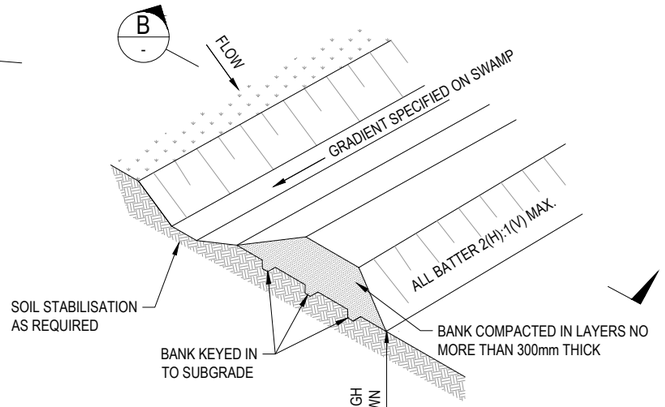

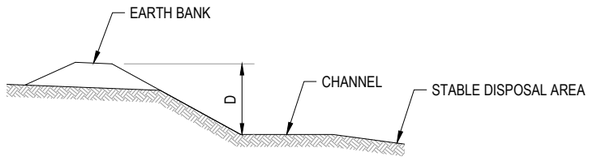

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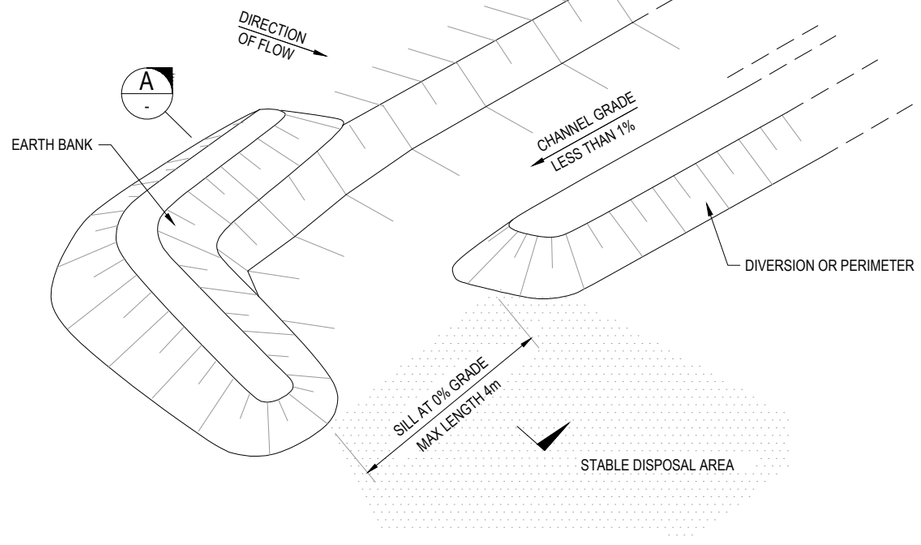

LEVEL SPREADER (OR SILL)
NTS

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SHEET 3 OF 3

A3

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ISSUE 0

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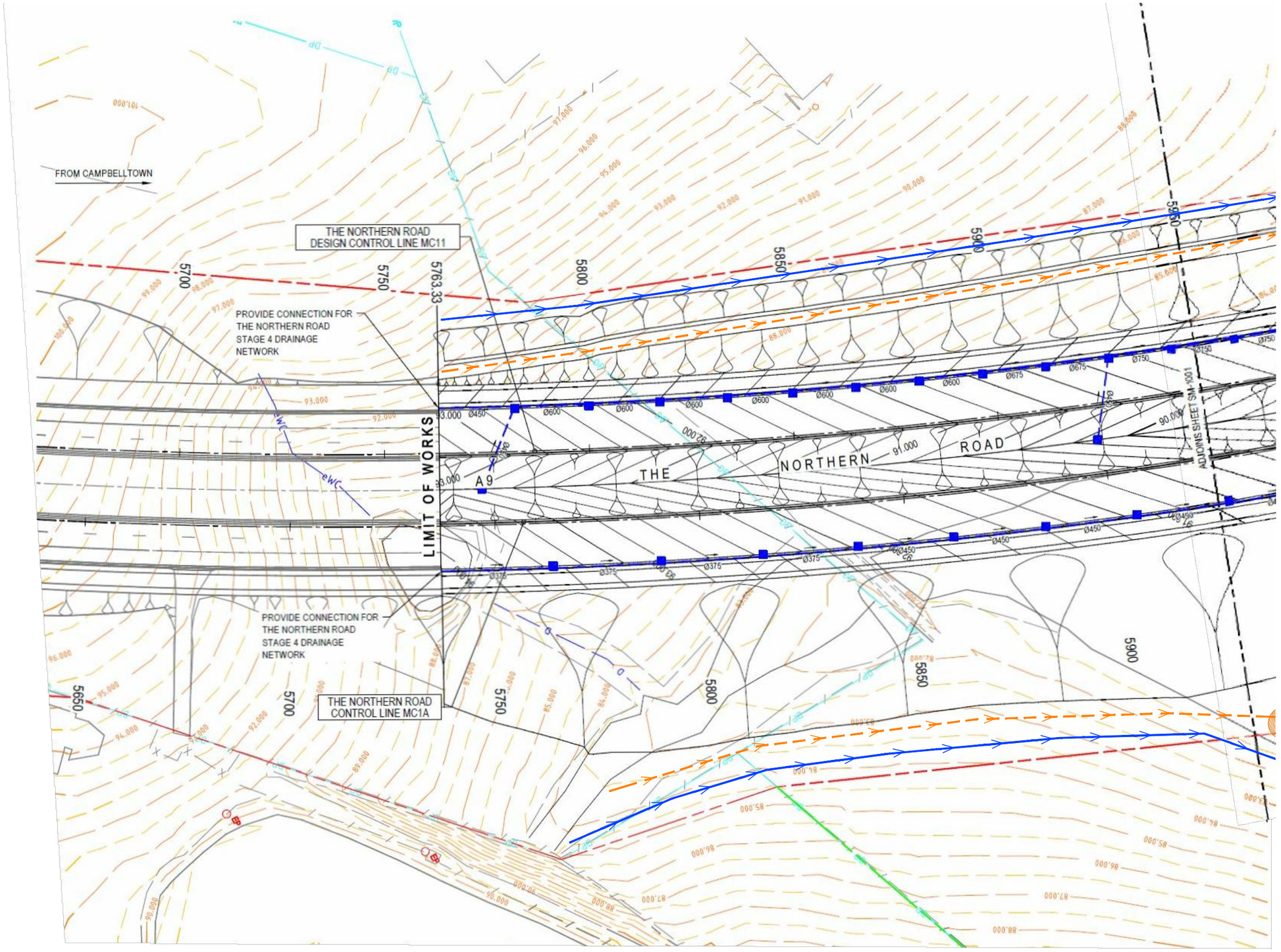
Stage 6 Concept ERSED Plans



LEGEND

- LINED OFFSITE (CLEAN) WATER DIVERSION [1]
- OFFSITE (DIRTY) WATER DIVERSION [1]
- PROJECT CONSTRUCTION BOUNDARY
- PROJECT OPERATIONAL BOUNDARY
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A	21/02/17	A.M.	L.O.	A.M.	DRAFT

DRAWING STATUS

DESIGN BY	A. MACLEOD
DRAWN BY	L.O.
FINAL APPROVAL	A. MACLEOD
SCALE: (on A3 Original)	1:1000

PRELIMINARY

North

CLIENT

MOTT MACDONALD

Level 10
383 Kent Street
Sydney NSW 2000
PO Box Q1678, QVB Sydney, NSW 1230
Australia
T +61 (0)2 9098 6800
W https://www.mottmac.com/

SEEC

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PROJECT TITLE

THE NORTHERN ROAD
STAGE 6

DRAWING TITLE

ESCP
CONTROL LINE MC11
SHEET 1

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP01	C

Plot Date: 28 February 2017 8:58:37 AM

CAD File Name: N:\16000228 Northern Road Upgrade - Mott MacDonald\Drawings\16000228_P01_ESCP_REV C.dwg

POTENTIAL TO USE PART OF EXISTING DAMS AS BASINS EITHER SIDE OF CULVERT.

CLEAN WATER INTO EXISTING ADAMS RD TABLE DRAIN UNTIL NEW 2 X 675 PIPES ARE IN, OR TEMPORARY PIPE UNDER ADAMS RD.

ANTICIPATE EXTENSIVE EXCAVATION TO REMOVE UNSUITABLE SOIL FROM UNDER NEW CULVERT FOOTPRINT. CLEAN WATER DIVERSION PATHWAY MIGHT BE FAIRLY WIDE. LIKELY TO NEED MORE ROOM HERE.

SB6150W

SB6200W

3 X 1800 X 1200 REINFORCED CONCRETE BOX CULVERT

PUT CLEAN WATER FLOWPATH ON NORTHSIDE - LIKELY THAT CULVERT ACCESS WILL BE FROM ADAMS RD.

ADAMS ROAD

THE NORTHERN ROAD DESIGN CONTROL LINE MC11

TWIN BRIDGES OVER ADAMS ROAD
RMS BRIDGE No. 12108
REFER TO BRIDGE DRAWING PACKAGE DS2016/XXXX FOR DETAILS

TEMPORARY DIRTY WATER BERM DURING STRIPPING AND INTIAL EARTHWORKS.

ADJOINS SHEET SM-1001

ADJOINS SHEET SM-2001

THE NORTHERN ROAD

2 X Ø675 PIPE

THE NORTHERN ROAD CONTROL LINE MC1A

SB6050E

OPPURTUNITY TO USE PART OF EXISTING DAM AS A SEDIMENT BASIN BUT WILL BE OUTSIDE BOUNDARY AND WILL NECESITATE EARLY DRAINAGE OF EXISTING DAM.

SB6200E

IF THIS CAN NOT OUTLET TO BASIN ON SOUTHSIDE OF ADAMS RD BECAUSE OF LEVELS, UNDERBORE A TEMPORARY PIPE FOR DIRTY WATER TO SB6200E ON NORTHSIDE.

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DRAWN BY	L.O.
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Level 10
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PROJECT TITLE
THE NORTHERN ROAD
STAGE 6

DRAWING TITLE
ESCP
CONTROL LINE MC11
SHEET 2

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP02	C

Plot Date: 28 February 2017 8:58:37 AM
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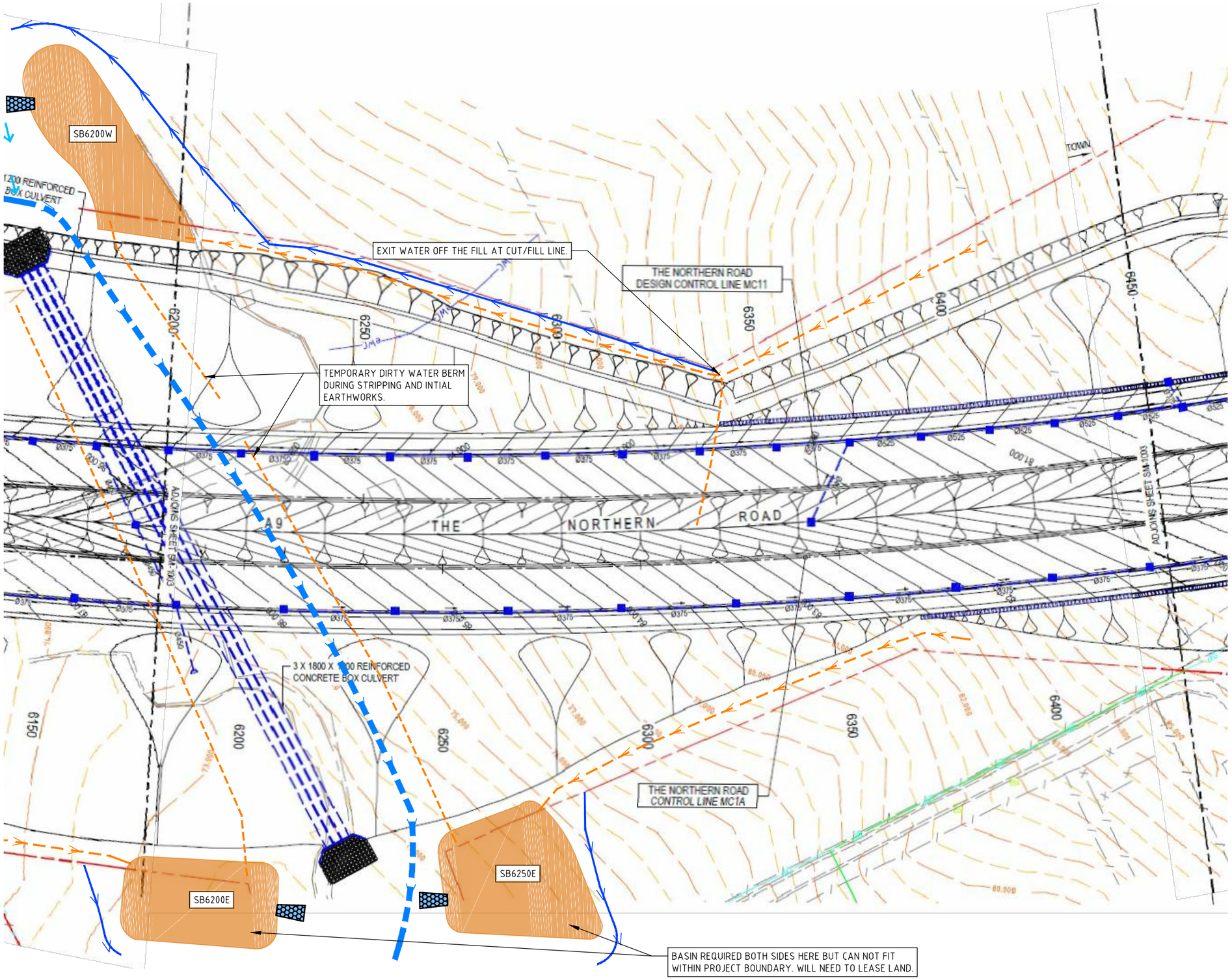

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PROJECT TITLE
THE NORTHERN ROAD
STAGE 6

DRAWING TITLE
ESCP
CONTROL LINE MC11
SHEET 3

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP03	C

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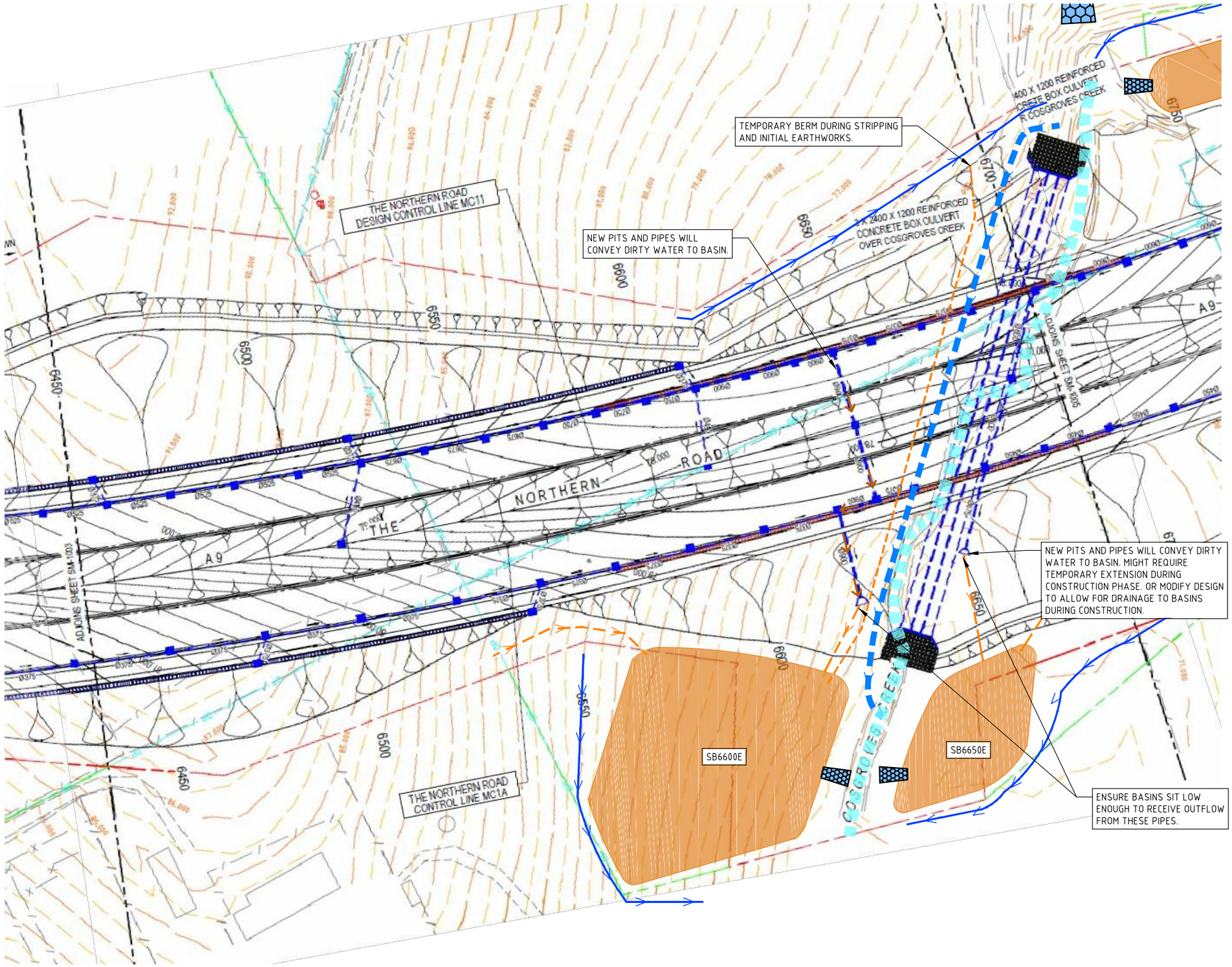

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PROJECT TITLE

THE NORTHERN ROAD
STAGE 6

DRAWING TITLE

ESCP
CONTROL LINE MC11
SHEET 4

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP04	C

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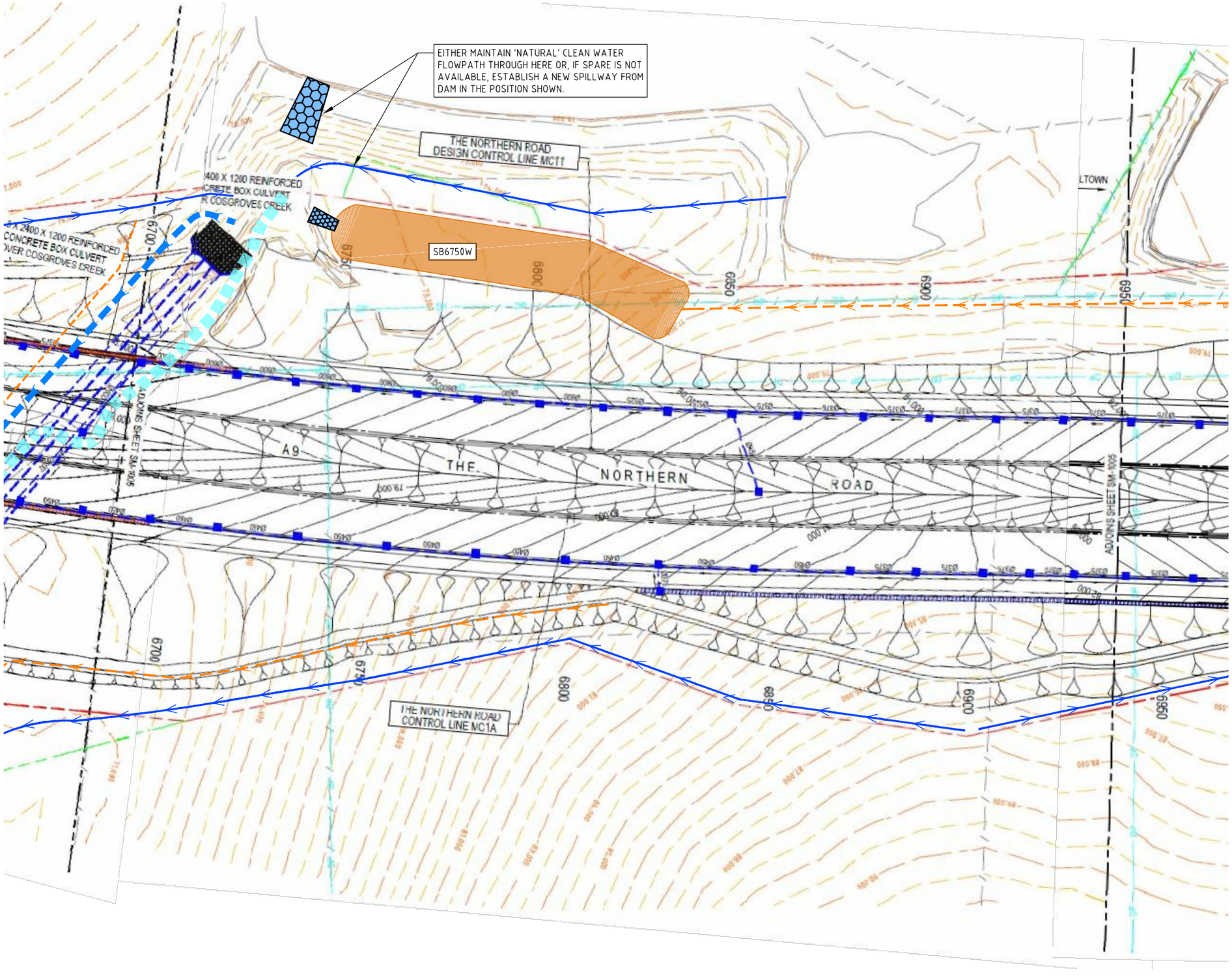

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PROJECT TITLE

THE NORTHERN ROAD
STAGE 6

DRAWING TITLE

ESCP
CONTROL LINE MC11
SHEET 5

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP05	C

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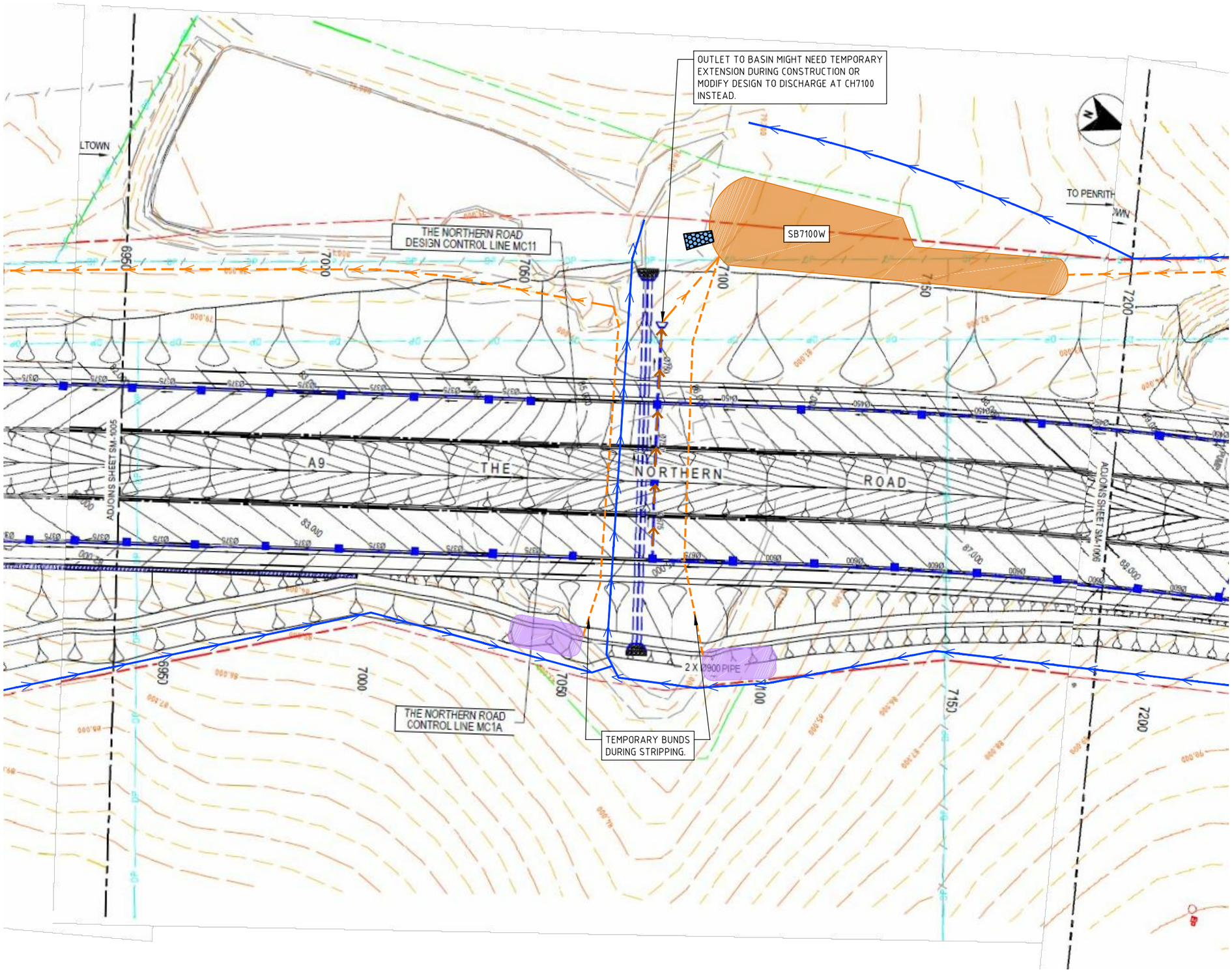

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PROJECT TITLE
THE NORTHERN ROAD
STAGE 6

DRAWING TITLE
ESCP
CONTROL LINE MC11
SHEET 6

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP06	C

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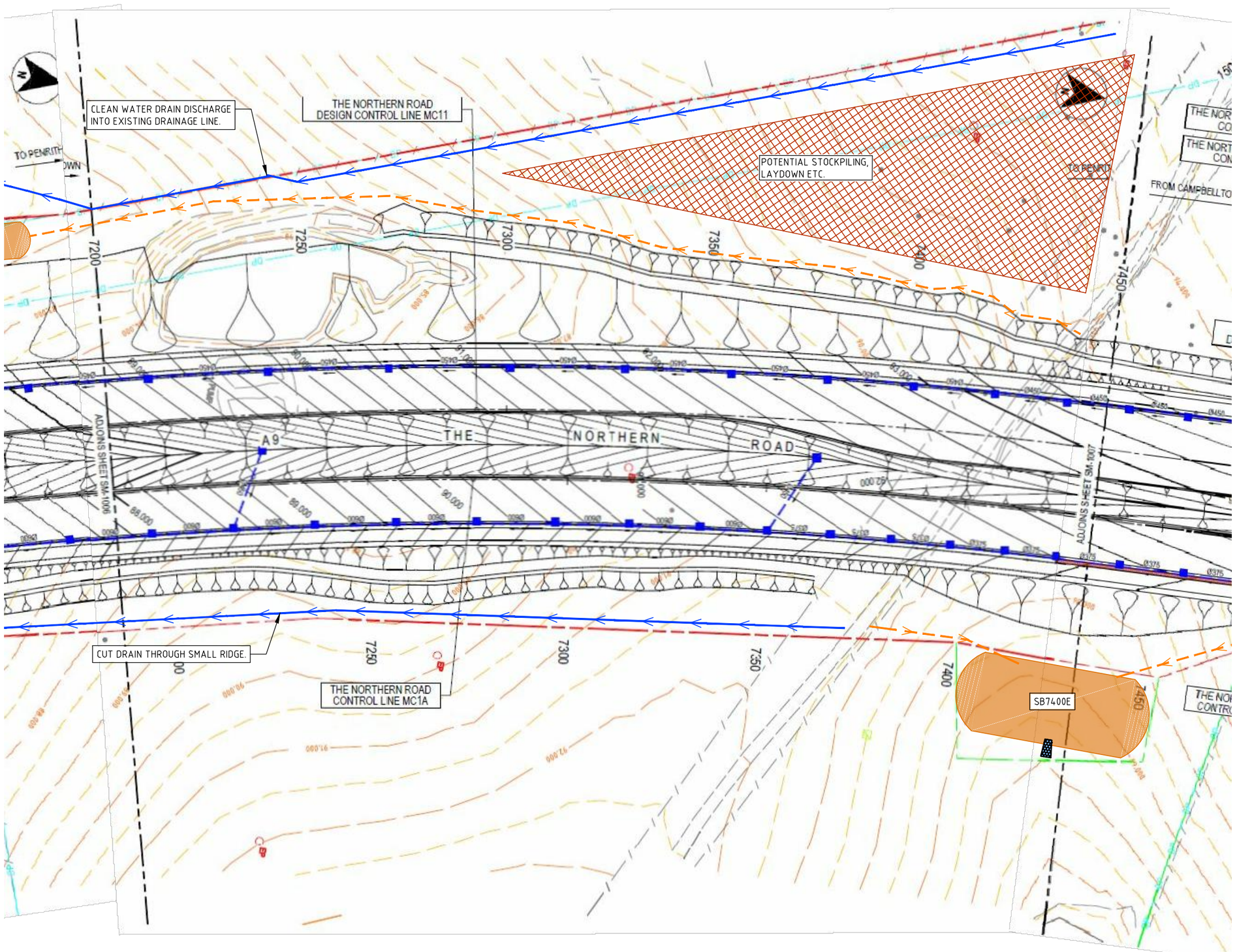

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DESIGN BY	A. MACLEOD
DRAWN BY	L.O.
FINAL APPROVAL	A. MACLEOD
SCALE: (on A3 Original)	1:1000

PRELIMINARY

North

CLIENT

MOTT MACDONALD

Level 10
383 Kent Street
Sydney NSW 2000
PO Box Q1678, QVB Sydney, NSW 1230
Australia
T +61 (0)2 9098 6800
W https://www.mottmac.com/

SEEC

P.O.Box 1098, Bowral, NSW. 2576
Suites 7 & 8, 68-70 Station Street
Bowral NSW 2576.
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(f) 02 4862 3088
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WWW.SEEC.COM.AU

PROJECT TITLE

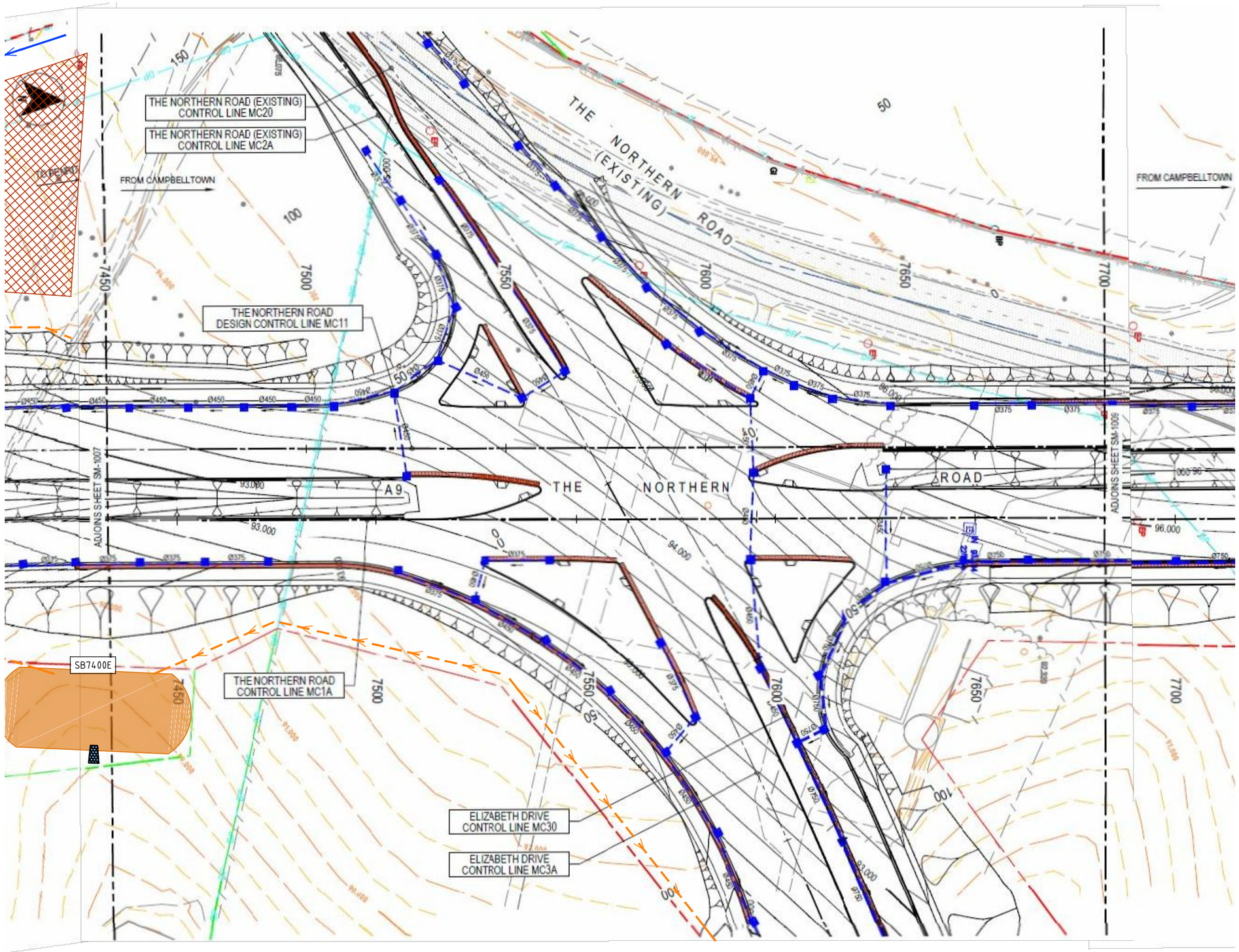
THE NORTHERN ROAD
STAGE 6

DRAWING TITLE

ESCP
CONTROL LINE MC11
SHEET 7

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP07	C

Plot Date: 28 February 2017 8:58:40 AM CAD File Name: N:\16000228 Northern Road Upgrade – Mott MacDonald\Drawings\16000228_P01_ESCP_REV C.dwg



LEGEND

- LINED OFFSITE (CLEAN) WATER DIVERSION [1]
- OFFSITE (DIRTY) WATER DIVERSION [1]
- PROJECT CONSTRUCTION BOUNDARY
- PROJECT OPERATIONAL BOUNDARY
- SEDIMENT TRAP (E.G. SUMP, ROCK FILTER DAM, U-TRAP OR SIMILAR) [1]
- SEDIMENT BASIN [2]
- CLEAN FLOW DIRECTION
- DIRTY FLOW DIRECTION
- TEMPORARY PIPE
- ENERGY DISSIPATER / SPILLWAY [3] (NOT TO SCALE)
- ANCILLARY / STOCKPILE AREA (SD 4-1)
- TEMPORARY DIVERSION [5]
- TEMPORARY DIVERSION ACROSS WORKS AND/OR AROUND CULVERT WORKS [1]
- EXISTING WATERWAY

[1] DETAILS TO BE PROVIDED WITHIN PROGRESSIVE ESCPs. ALSO REFER TO THIS PLAN.
[2] REFER TO TABLE ON ESCP00 FOR DETAILS.
[3] DISSIPATER TO EXTEND TO WATERWAY OR WELL VEGETATED LANDS - LINE WITH GEOFABRIC (BIDIM A34 OR EQUIVALENT) + ROCK Ø200MIN. OR ALTERNATIVELY CONCRETE LINE.
[4] CONTOUR BERMS ARE TO BE FORMED AS EARTH BUNDS MIN. 300mm HIGH (ALTERNATIVELY SANDBAG BUNDS OR SIMILAR CAN BE USED). THEY ARE TO BE INSTALLED PRIOR TO RAINFALL AND PRIOR TO SITE CLOSURE (>2 DAYS). THEY ARE NOT REQUIRED DURING DRY WEATHER. LOCATIONS MAY CHANGE AS WORKS PROCEED.
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SD - BLUE BOOK STANDARD DRAWING (LANDCOM, 2004)
IECA SD - IECA STANDARD DRAWING (IECA, 2008)
(REFER TO SEEC DRAWINGS 16000228_P01_ESCP101-102)

REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
C	27/02/17	A.M.	L.O.	A.M.	PRELIMINARY
B	22/02/17	A.M.	L.O.	A.M.	PRELIMINARY
A	21/02/17	A.M.	L.O.	A.M.	DRAFT

DRAWING STATUS

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PROJECT TITLE
THE NORTHERN ROAD
STAGE 6

DRAWING TITLE
ESCP
CONTROL LINE MC11
SHEET 8

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP08	C

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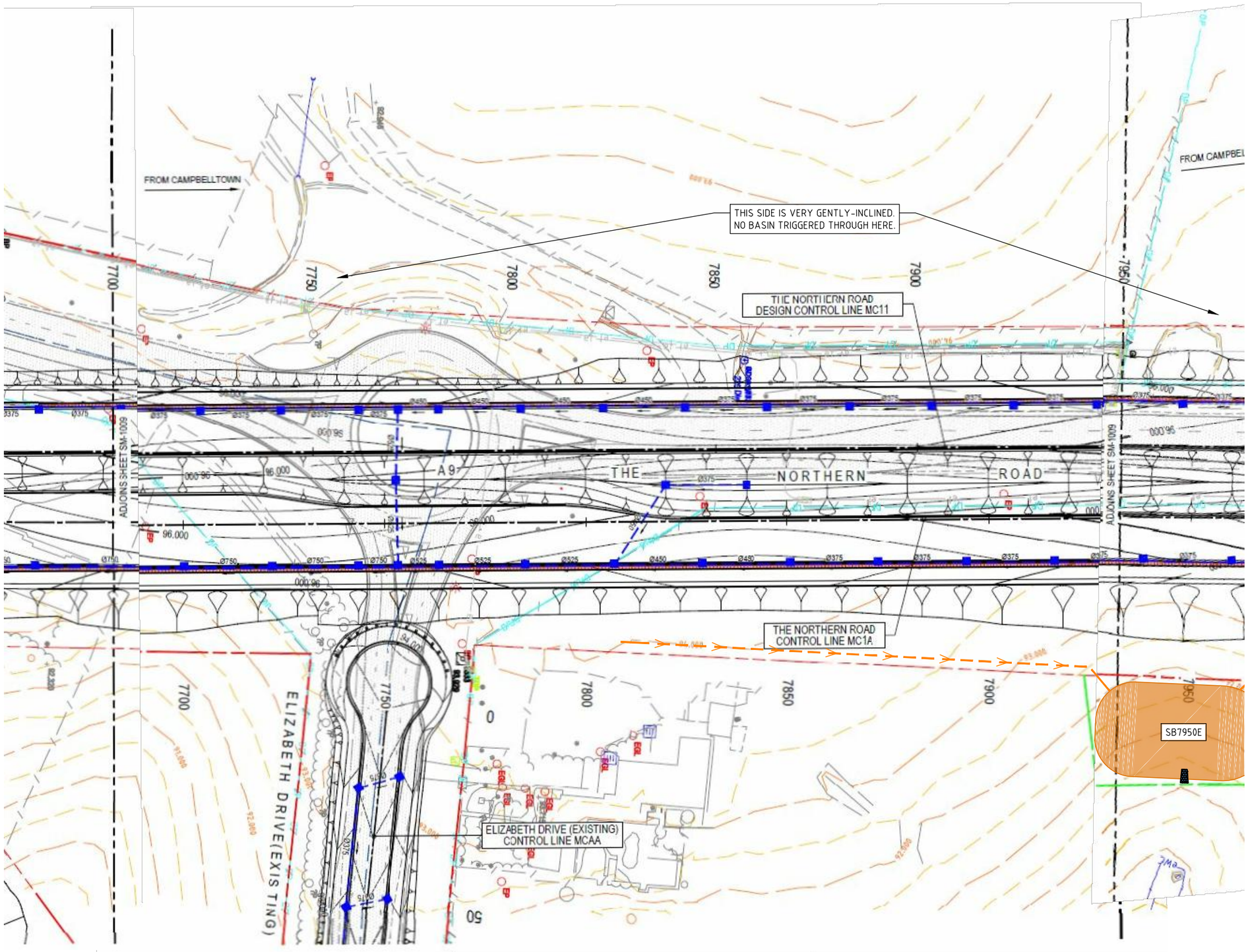

LEGEND

- LINED OFFSITE (CLEAN) WATER DIVERSION [1]
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- PROJECT CONSTRUCTION BOUNDARY
- PROJECT OPERATIONAL BOUNDARY
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- TEMPORARY DIVERSION ACROSS WORKS AND/OR AROUND CULVERT WORKS [1]
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DRAWING STATUS

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PROJECT TITLE
THE NORTHERN ROAD
STAGE 6

DRAWING TITLE
ESCP
CONTROL LINE MC11
SHEET 9

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP09	C

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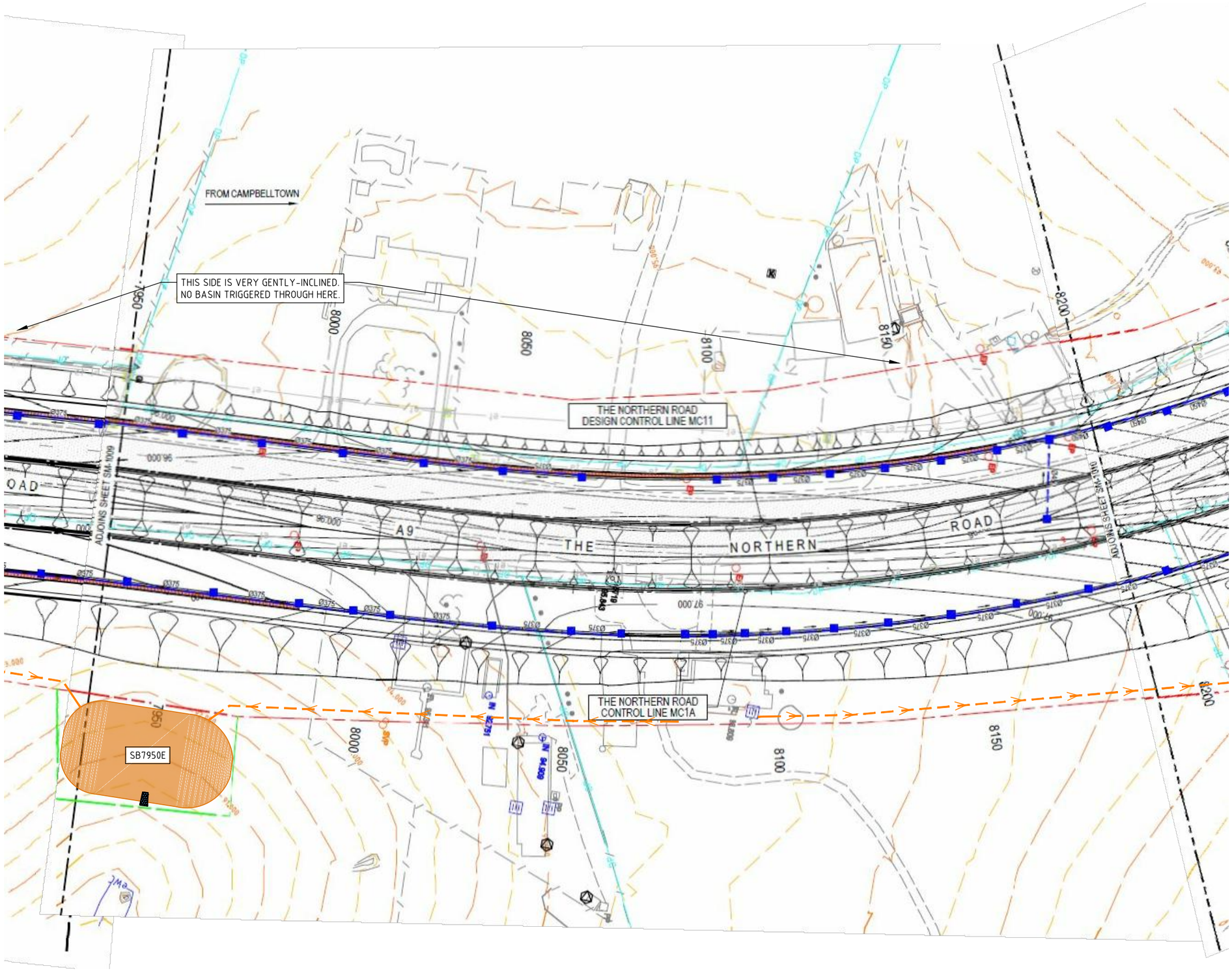

LEGEND

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- OFFSITE (DIRTY) WATER DIVERSION [1]
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- PROJECT OPERATIONAL BOUNDARY
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- TEMPORARY DIVERSION [5]
- TEMPORARY DIVERSION ACROSS WORKS AND/OR AROUND CULVERT WORKS [1]
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A	21/02/17	A.M.	L.O.	A.M.	DRAFT

DRAWING STATUS

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DRAWN BY	L.O.
FINAL APPROVAL	A. MACLEOD
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PROJECT TITLE
THE NORTHERN ROAD
STAGE 6

DRAWING TITLE
ESCP
CONTROL LINE MC11
SHEET 10

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP10	C

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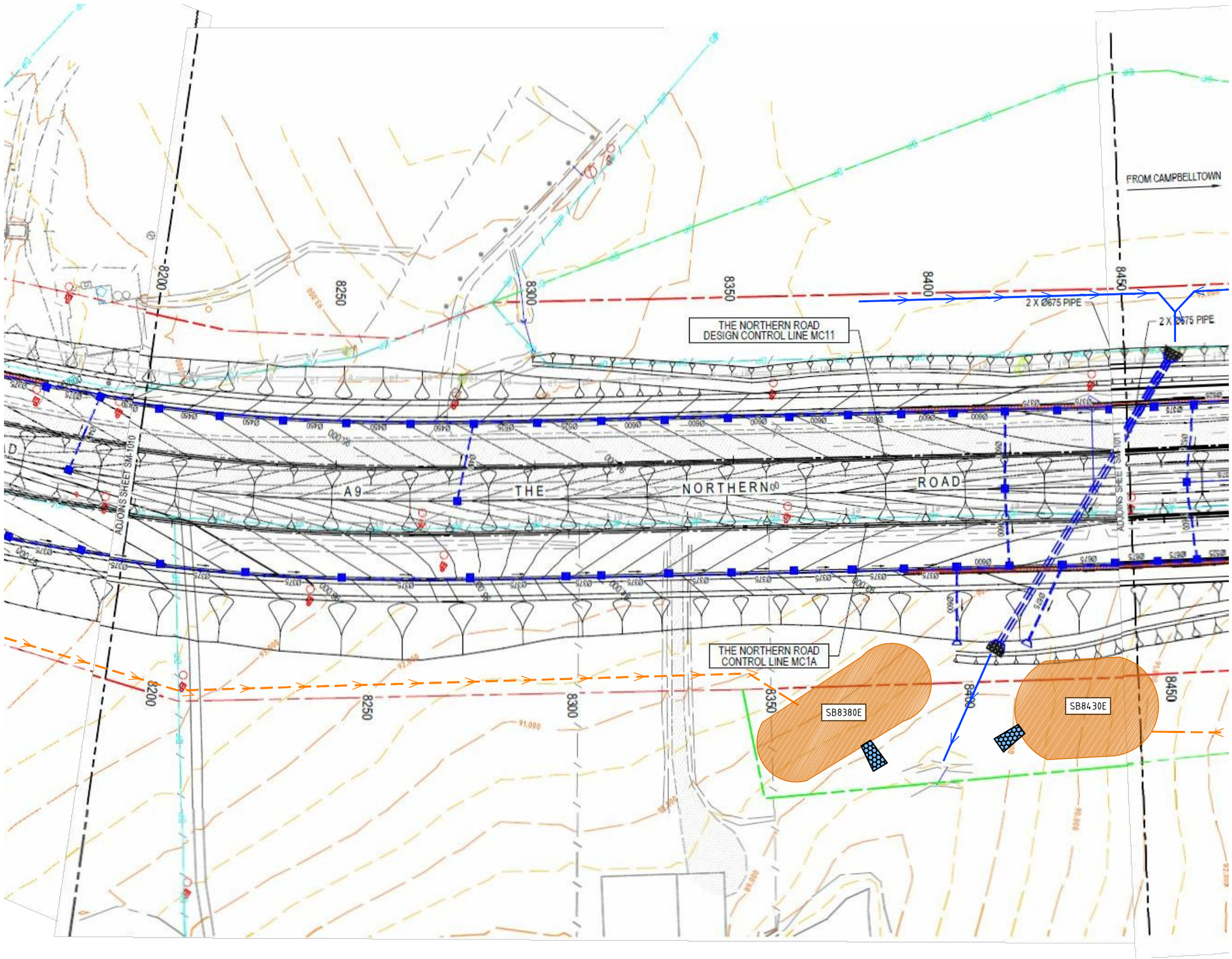

LEGEND

- LINED OFFSITE (CLEAN) WATER DIVERSION [1]
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- PROJECT CONSTRUCTION BOUNDARY
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- TEMPORARY DIVERSION ACROSS WORKS AND/OR AROUND CULVERT WORKS [1]
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A	21/02/17	A.M.	L.O.	A.M.	DRAFT

DRAWING STATUS

DESIGN BY	A. MACLEOD
DRAWN BY	L.O.
FINAL APPROVAL	A. MACLEOD
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PROJECT TITLE

THE NORTHERN ROAD
STAGE 6

DRAWING TITLE

ESCP
CONTROL LINE MC11
SHEET 11

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP11	C

Plot Date: 28 February 2017 8:58:42 AM

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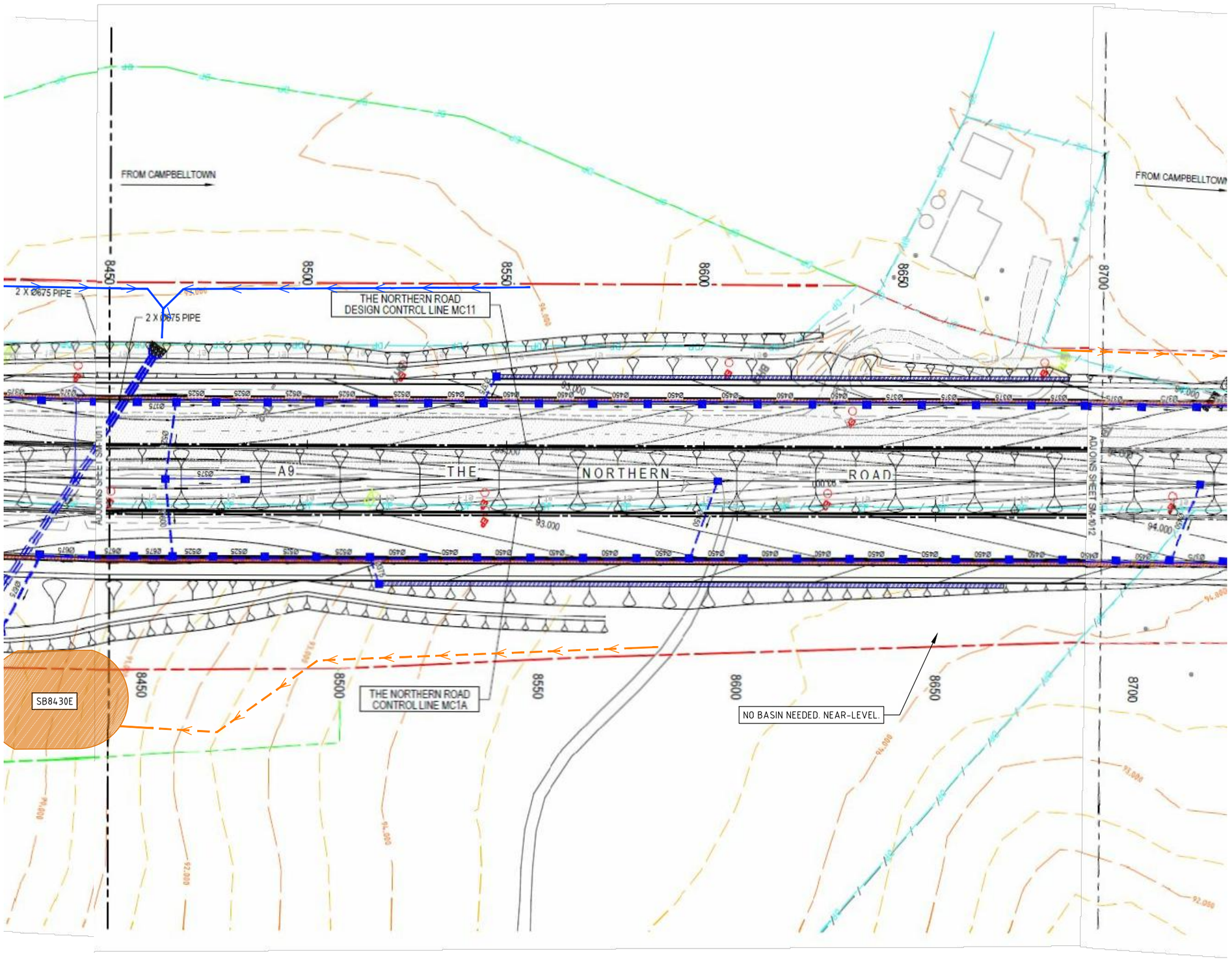

LEGEND

- LINED OFFSITE (CLEAN) WATER DIVERSION [1]
- OFFSITE (DIRTY) WATER DIVERSION [1]
- PROJECT CONSTRUCTION BOUNDARY
- PROJECT OPERATIONAL BOUNDARY
- SEDIMENT TRAP (E.G. SUMP, ROCK FILTER DAM, U-TRAP OR SIMILAR) [1]
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B	22/02/17	A.M.	L.O.	A.M.	PRELIMINARY
A	21/02/17	A.M.	L.O.	A.M.	DRAFT

DRAWING STATUS

DESIGN BY	A. MACLEOD
DRAWN BY	L.O.
FINAL APPROVAL	A. MACLEOD
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PROJECT TITLE

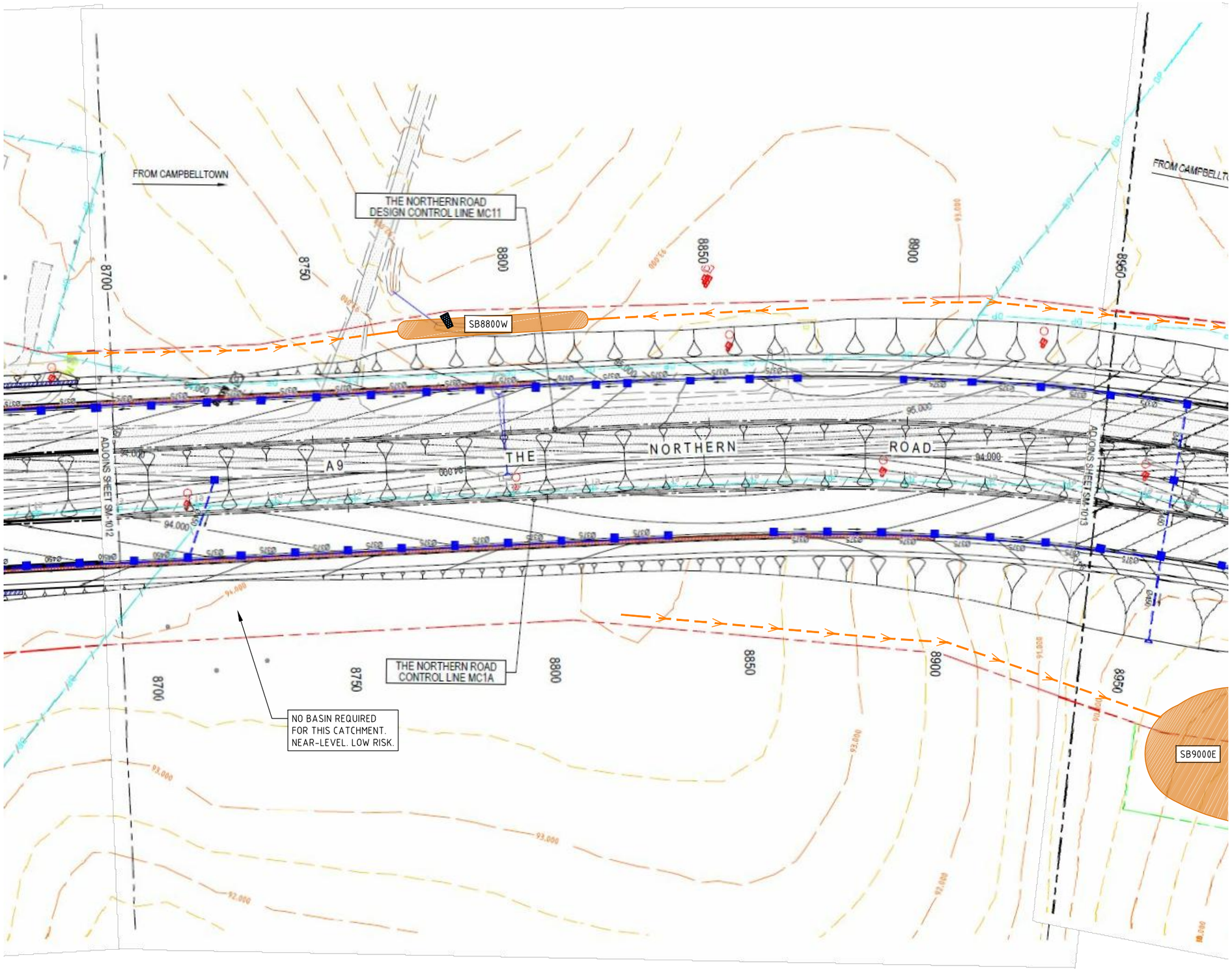
THE NORTHERN ROAD
STAGE 6

DRAWING TITLE

ESCP
CONTROL LINE MC11
SHEET 12

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP12	C

Plot Date: 28 February 2017 8:58:42 AM CAD File Name: N:\16000228 Northern Road Upgrade – Mott MacDonald\Drawings\16000228_P01_ESCP_REV C.dwg



LEGEND

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A	21/02/17	A.M.	L.O.	A.M.	DRAFT

DRAWING STATUS

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DRAWN BY	L.O.
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PROJECT TITLE

THE NORTHERN ROAD
STAGE 6

DRAWING TITLE

ESCP
CONTROL LINE MC11
SHEET 13

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP13	C

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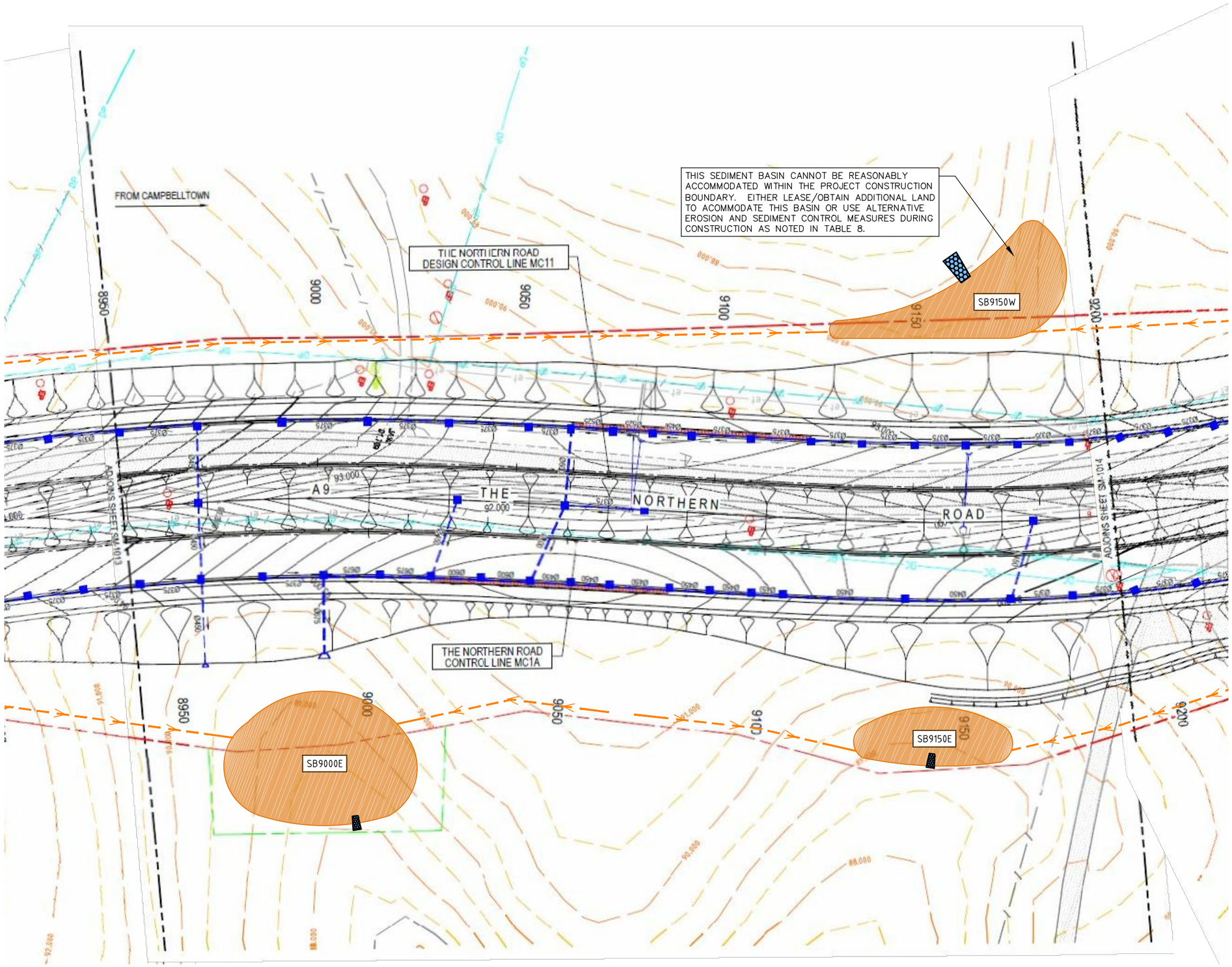

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IECA SD - IECA STANDARD DRAWING (IECA, 2008)
(REFER TO SEEC DRAWINGS 16000228_P01_ESCP101-102)

REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
C	27/02/17	A.M.	L.O.	A.M.	PRELIMINARY
B	22/02/17	A.M.	L.O.	A.M.	PRELIMINARY
A	21/02/17	A.M.	L.O.	A.M.	DRAFT

DRAWING STATUS

DESIGN BY	A. MACLEOD
DRAWN BY	L.O.
FINAL APPROVAL	A. MACLEOD
SCALE: (on A3 Original)	1:1000

PRELIMINARY

North

CLIENT

MOTT MACDONALD

Level 10
383 Kent Street
Sydney NSW 2000
PO Box Q1678, QVB Sydney, NSW 1230
Australia
T +61 (0)2 9098 6800
W https://www.mottmac.com/

SEEC

PO.Box 1098, Bowral, NSW. 2576
Suites 7 & 8, 68-70 Station Street
Bowral NSW 2576.
(t) 02 4862 1633
(f) 02 4862 3088
email: reception@seec.com.au

WWW.SEEC.COM.AU

PROJECT TITLE

THE NORTHERN ROAD
STAGE 6

DRAWING TITLE

ESCP
CONTROL LINE MC11
SHEET 14

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP14	C

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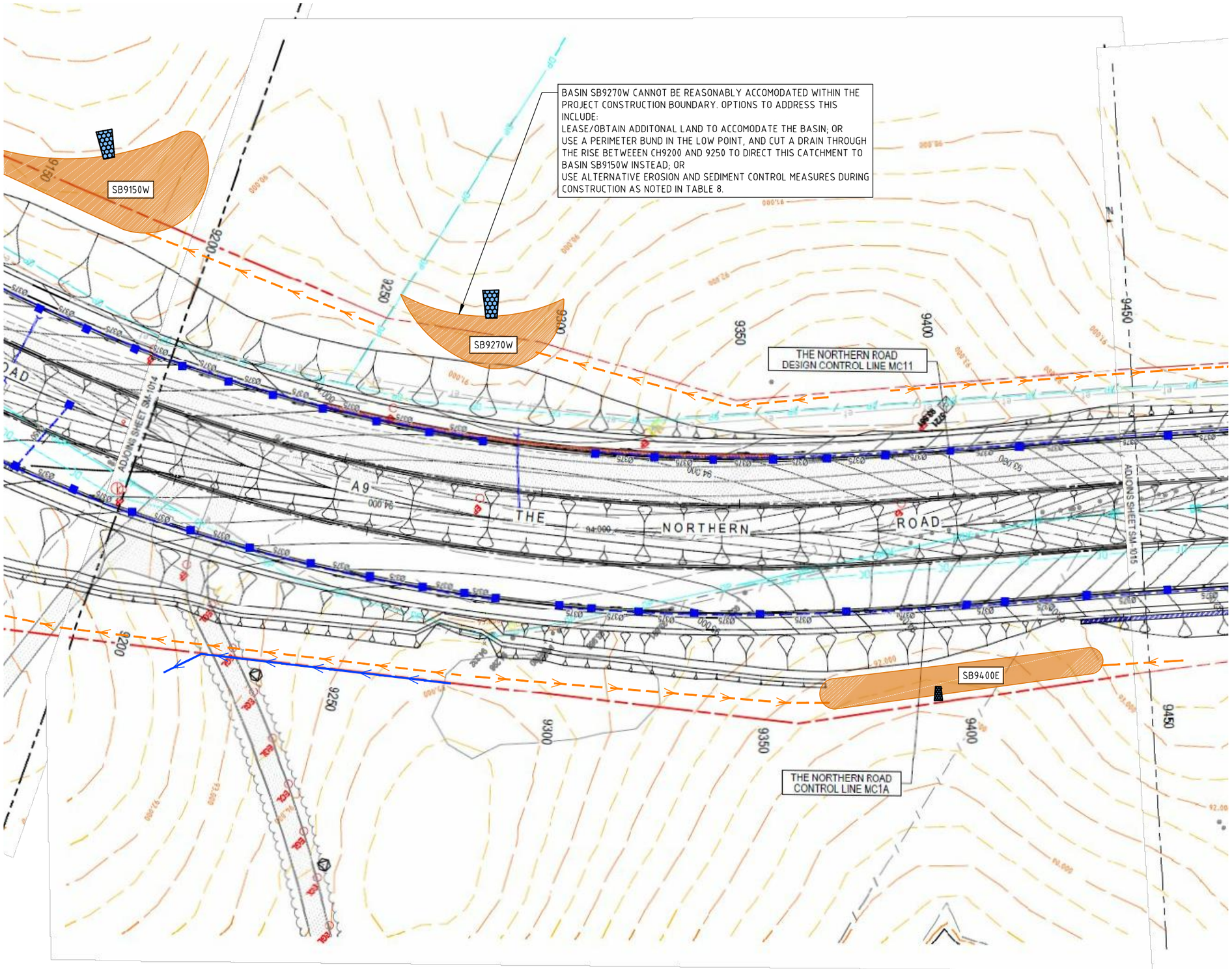

LEGEND

- LINED OFFSITE (CLEAN) WATER DIVERSION [1]
- OFFSITE (DIRTY) WATER DIVERSION [1]
- PROJECT CONSTRUCTION BOUNDARY
- PROJECT OPERATIONAL BOUNDARY
- SEDIMENT TRAP (E.G. SUMP, ROCK FILTER DAM, U-TRAP OR SIMILAR) [1]
- SEDIMENT BASIN [2]
- CLEAN FLOW DIRECTION
- DIRTY FLOW DIRECTION
- TEMPORARY PIPE
- ENERGY DISSIPATER / SPILLWAY [3] (NOT TO SCALE)
- ANCILLARY / STOCKPILE AREA (SD 4-1)
- TEMPORARY DIVERSION [5]
- TEMPORARY DIVERSION ACROSS WORKS AND/OR AROUND CULVERT WORKS [1]
- EXISTING WATERWAY

[1] DETAILS TO BE PROVIDED WITHIN PROGRESSIVE ESCPs. ALSO REFER TO THIS PLAN.
[2] REFER TO TABLE ON ESCP00 FOR DETAILS.
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[4] CONTOUR BERMS ARE TO BE FORMED AS EARTH BUNDS MIN. 300mm HIGH (ALTERNATIVELY SANDBAG BUNDS OR SIMILAR CAN BE USED). THEY ARE TO BE INSTALLED PRIOR TO RAINFALL AND PRIOR TO SITE CLOSURE (>2 DAYS). THEY ARE NOT REQUIRED DURING DRY WEATHER. LOCATIONS MAY CHANGE AS WORKS PROCEED.
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A	21/02/17	A.M.	L.O.	A.M.	DRAFT

DRAWING STATUS

DESIGN BY	A. MACLEOD
DRAWN BY	L.O.
FINAL APPROVAL	A. MACLEOD
SCALE: (on A3 Original)	1:1000

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Level 10
383 Kent Street
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SEEC

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(t) 02 4862 1633
(f) 02 4862 3088
email: reception@seec.com.au

WWW.SEEC.COM.AU

PROJECT TITLE

THE NORTHERN ROAD
STAGE 6

DRAWING TITLE

ESCP
CONTROL LINE MC11
SHEET 15

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP15	C

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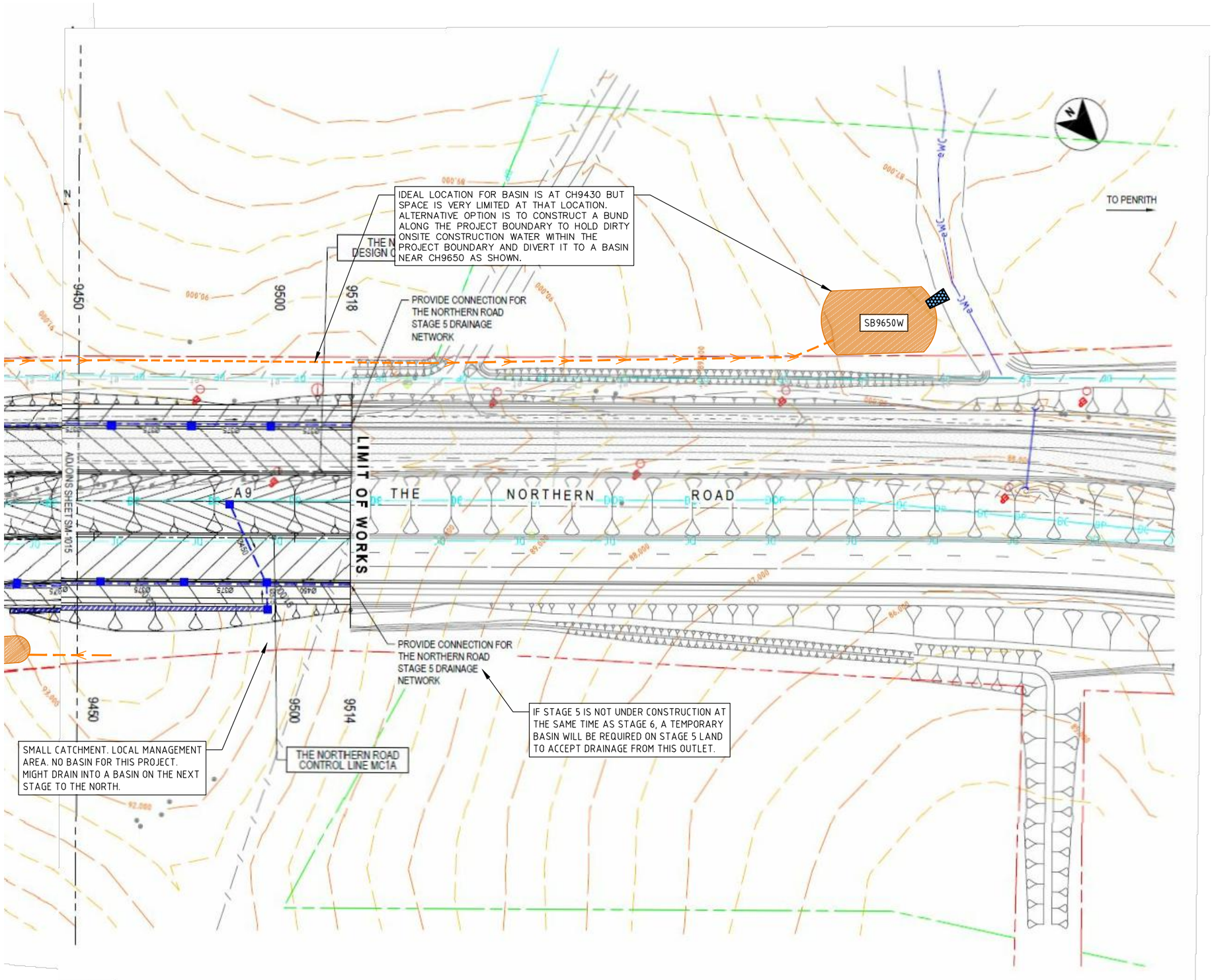

LEGEND

- LINED OFFSITE (CLEAN) WATER DIVERSION [1]
- OFFSITE (DIRTY) WATER DIVERSION [1]
- PROJECT CONSTRUCTION BOUNDARY
- PROJECT OPERATIONAL BOUNDARY
- SEDIMENT TRAP (E.G. SUMP, ROCK FILTER DAM, U-TRAP OR SIMILAR) [1]
- SEDIMENT BASIN [2]
- CLEAN FLOW DIRECTION
- DIRTY FLOW DIRECTION
- TEMPORARY PIPE
- ENERGY DISSIPATER / SPILLWAY [3] (NOT TO SCALE)
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- TEMPORARY DIVERSION [5]
- TEMPORARY DIVERSION ACROSS WORKS AND/OR AROUND CULVERT WORKS [1]
- EXISTING WATERWAY

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B	22/02/17	A.M.	L.O.	A.M.	PRELIMINARY
A	21/02/17	A.M.	L.O.	A.M.	DRAFT

DRAWING STATUS

DESIGN BY	A. MACLEOD
DRAWN BY	L.O.
FINAL APPROVAL	A. MACLEOD
SCALE: (on A3 Original)	1:1000

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SEEC

PO Box 1098, Bowral, NSW 2576
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email: reception@seec.com.au

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PROJECT TITLE

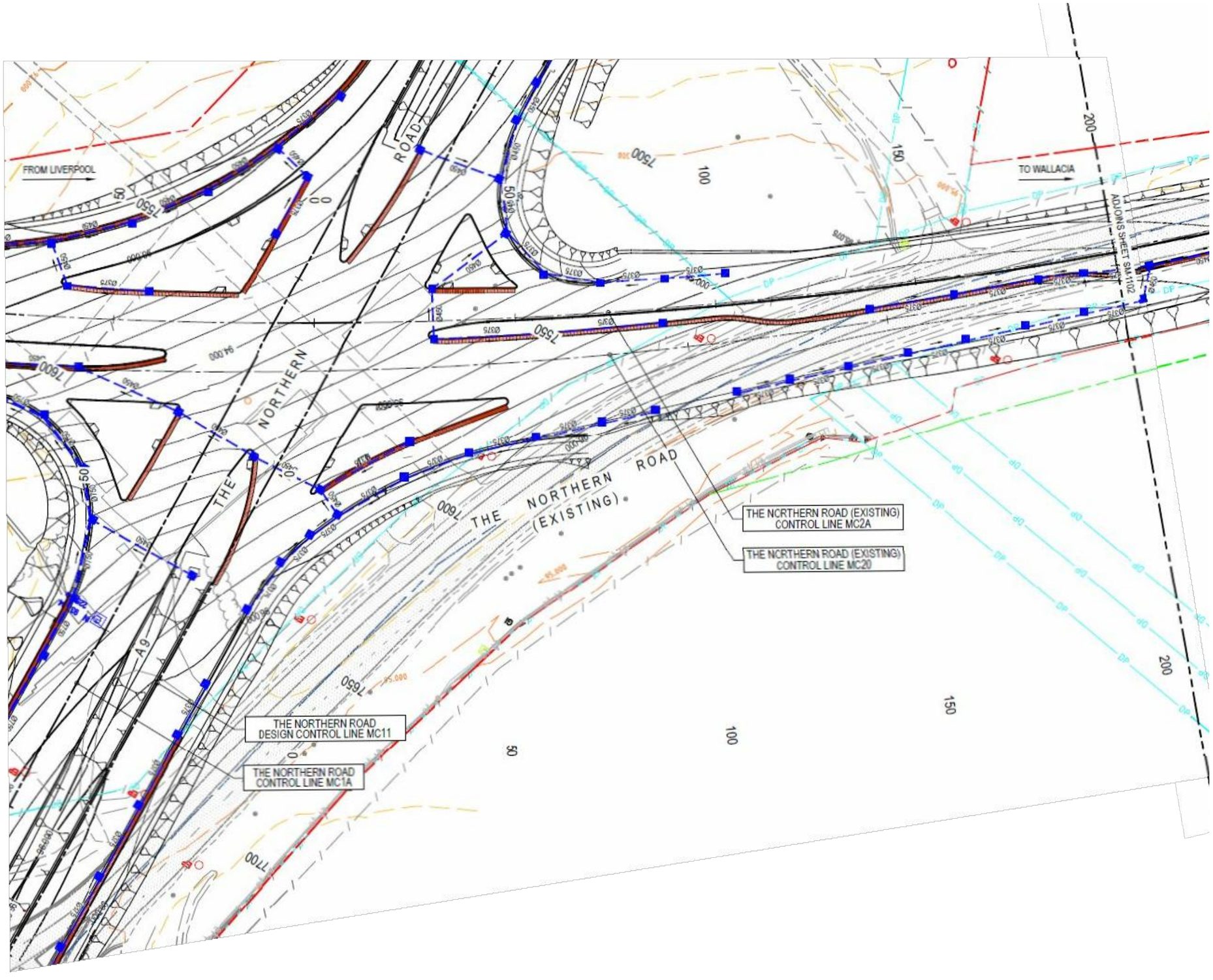
THE NORTHERN ROAD
STAGE 6

DRAWING TITLE

ESCP
CONTROL LINE MC11
SHEET 16

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP16	C

Plot Date: 28 February 2017 8:58:44 AM CAD File Name: N:\16000228 Northern Road Upgrade – Mott MacDonald\Drawings\16000228_P01_ESCP_REV C.dwg



LEGEND

- LINED OFFSITE (CLEAN) WATER DIVERSION [1]
- OFFSITE (DIRTY) WATER DIVERSION [1]
- PROJECT CONSTRUCTION BOUNDARY
- PROJECT OPERATIONAL BOUNDARY
- SEDIMENT TRAP (E.G. SUMP, ROCK FILTER DAM, U-TRAP OR SIMILAR) [1]
- SEDIMENT BASIN [2]
- CLEAN FLOW DIRECTION
- DIRTY FLOW DIRECTION
- TEMPORARY PIPE
- ENERGY DISSIPATER / SPILLWAY [3] (NOT TO SCALE)
- ANCILLARY / STOCKPILE AREA (SD 4-1)
- TEMPORARY DIVERSION [5]
- TEMPORARY DIVERSION ACROSS WORKS AND/OR AROUND CULVERT WORKS [1]
- EXISTING WATERWAY

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REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
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B	22/02/17	A.M.	L.O.	A.M.	PRELIMINARY
A	21/02/17	A.M.	L.O.	A.M.	DRAFT

DRAWING STATUS	
DESIGN BY	A. MACLEOD
DRAWN BY	L.O.
FINAL APPROVAL	A. MACLEOD
SCALE: (on A3 Original)	1:1000

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MOTT MACDONALD
Level 10
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Australia
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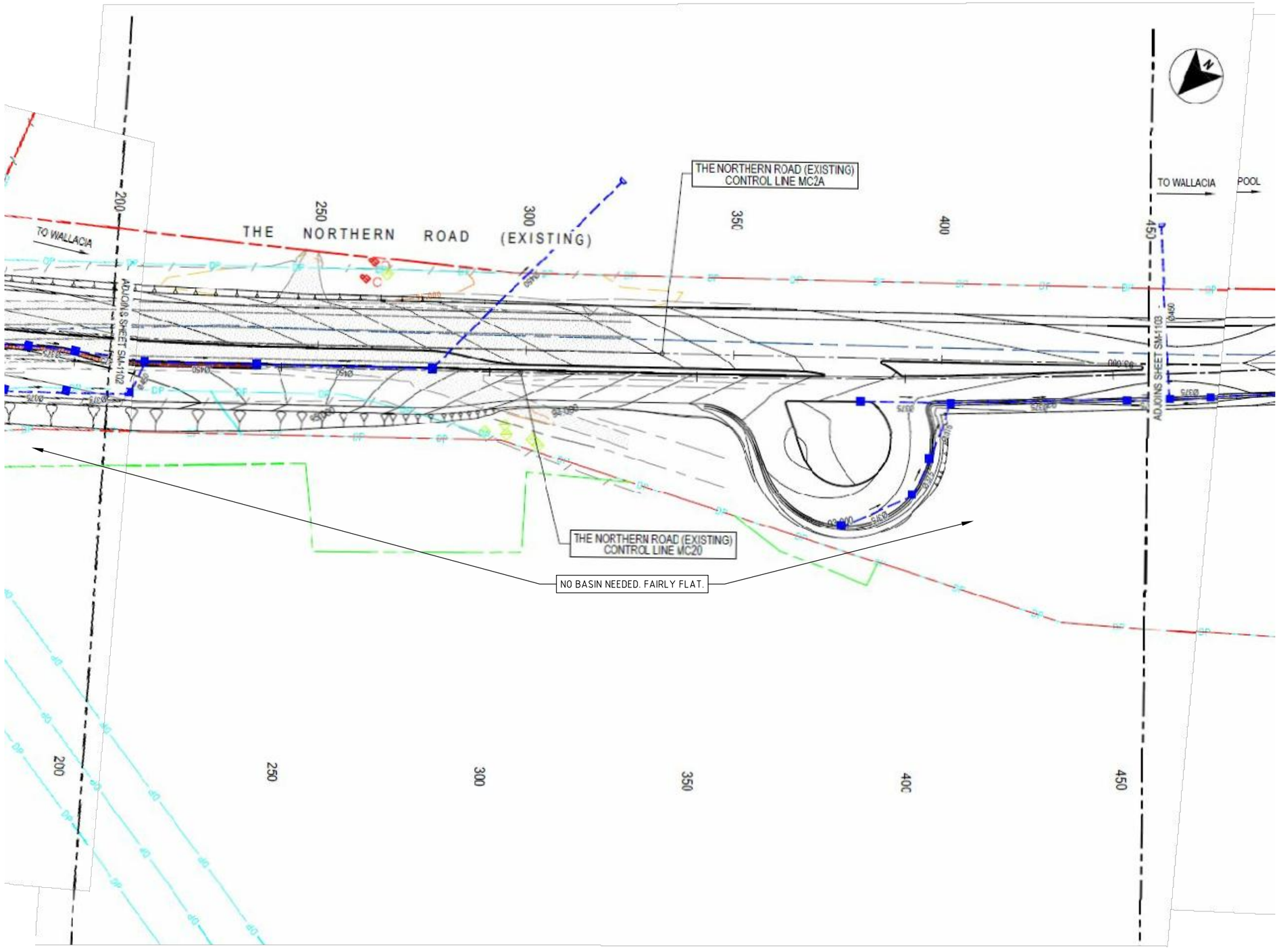
(f) 02 4862 3088
email: reception@seec.com.au
WWW.SEEC.COM.AU

PROJECT TITLE
THE NORTHERN ROAD
STAGE 6

DRAWING TITLE
ESCP
CONTROL LINE MC2A
SHEET 1

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP17	C

Plot Date: 28 February 2017 8:58:44 AM
CAD File Name: N:\16000228 Northern Road Upgrade - Mott MacDonald\Drawings\16000228_P01_ESCP_REV C.dwg



LEGEND

- LINED OFFSITE (CLEAN) WATER DIVERSION [1]
- OFFSITE (DIRTY) WATER DIVERSION [1]
- PROJECT CONSTRUCTION BOUNDARY
- PROJECT OPERATIONAL BOUNDARY
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- TEMPORARY DIVERSION ACROSS WORKS AND/OR AROUND CULVERT WORKS [1]
- EXISTING WATERWAY

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B	22/02/17	A.M.	L.O.	A.M.	PRELIMINARY
A	21/02/17	A.M.	L.O.	A.M.	DRAFT

DRAWING STATUS

DESIGN BY	A. MACLEOD
DRAWN BY	L.O.
FINAL APPROVAL	A. MACLEOD
SCALE: (on A3 Original)	1:1000

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CLIENT

MOTT MACDONALD

Level 10
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Sydney NSW 2000
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PROJECT TITLE

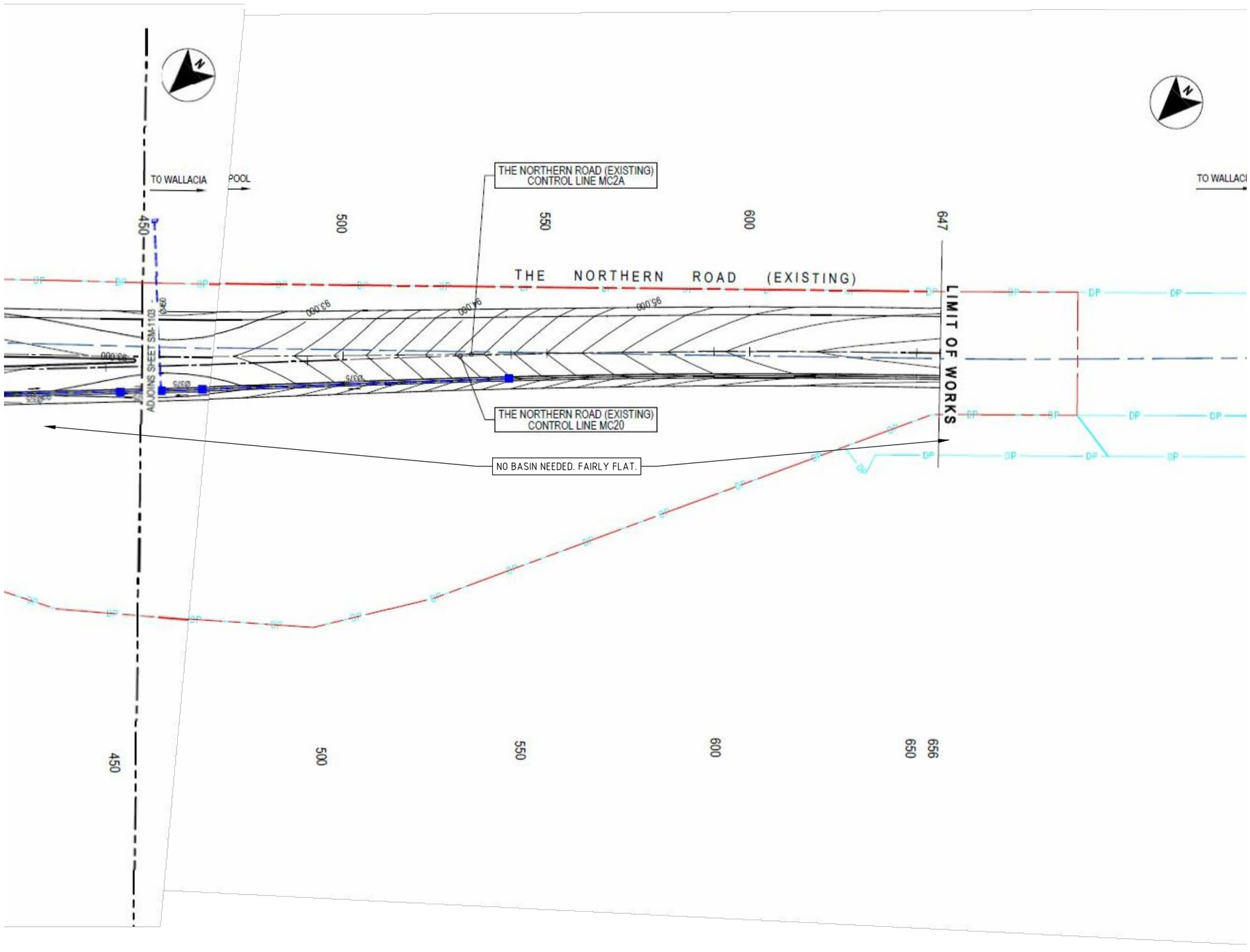
THE NORTHERN ROAD
STAGE 6

DRAWING TITLE

ESCP
CONTROL LINE MC2A
SHEET 2

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP18	C

Plot Date: 28 February 2017 8:58:45 AM CAD File Name: N:\16000228 Northern Road Upgrade - Mott MacDonald\Drawings\16000228_P01_ESCP_REV C.dwg



LEGEND

- LINED OFFSITE (CLEAN) WATER DIVERSION [1]
- OFFSITE (DIRTY) WATER DIVERSION [1]
- PROJECT CONSTRUCTION BOUNDARY
- PROJECT OPERATIONAL BOUNDARY
- SEDIMENT TRAP (E.G. SUMP, ROCK FILTER DAM, U-TRAP OR SIMILAR) [1]
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B	22/02/17	A.M.	L.O.	A.M.	PRELIMINARY
A	21/02/17	A.M.	L.O.	A.M.	DRAFT

DRAWING STATUS

DESIGN BY	A. MACLEOD
DRAWN BY	L.O.
FINAL APPROVAL	A. MACLEOD
SCALE: (on A3 Original)	1:1000

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Level 10
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PROJECT TITLE
THE NORTHERN ROAD
STAGE 6

DRAWING TITLE
ESCP
CONTROL LINE MC2A
SHEET 3

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP19	C

Plot Date: 28 February 2017 8:58:45 AM
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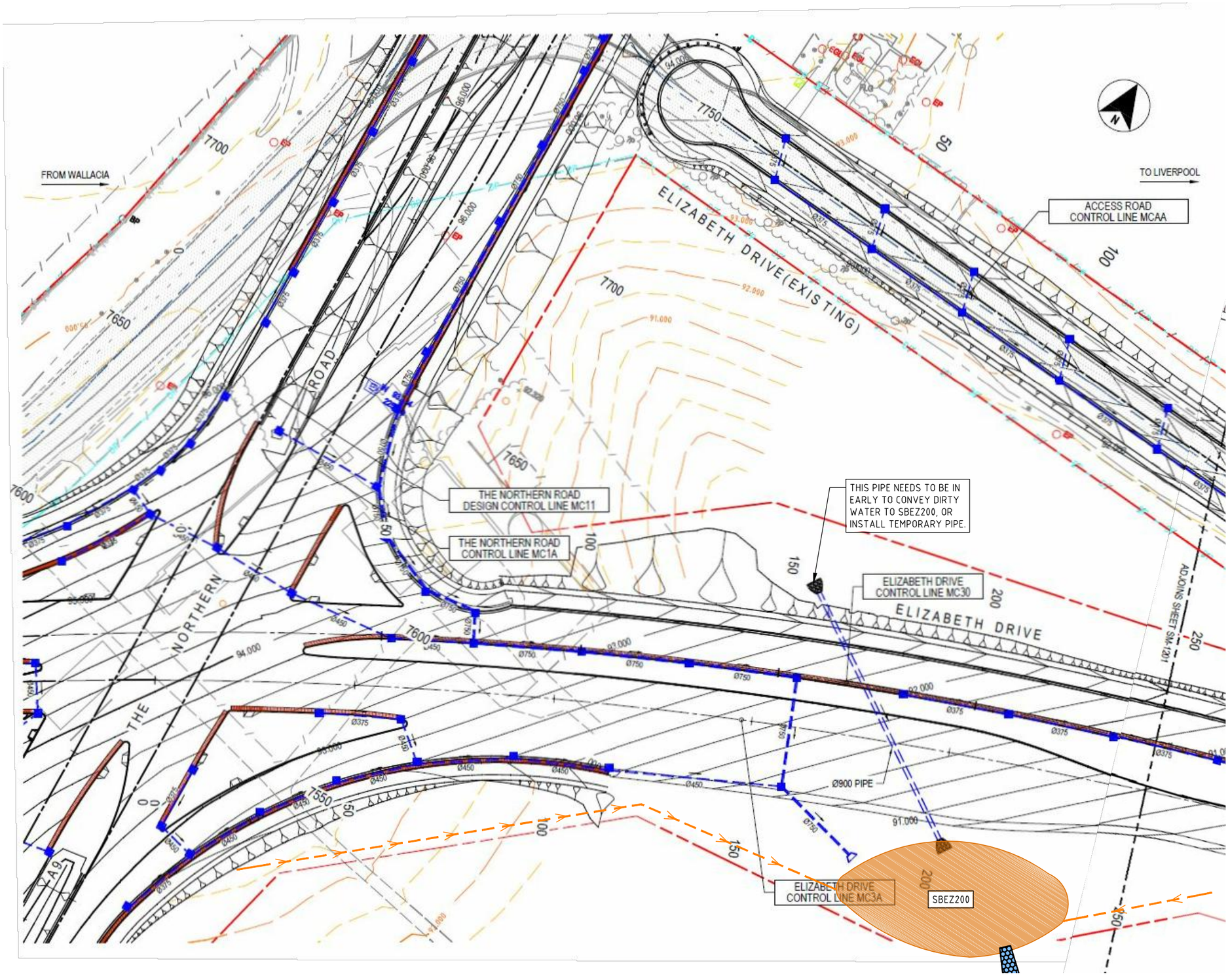

LEGEND

- LINED OFFSITE (CLEAN) WATER DIVERSION [1]
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- PROJECT CONSTRUCTION BOUNDARY
- PROJECT OPERATIONAL BOUNDARY
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- EXISTING WATERWAY

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A	21/02/17	A.M.	L.O.	A.M.	DRAFT

DRAWING STATUS

DESIGN BY	A. MACLEOD
DRAWN BY	L.O.
FINAL APPROVAL	A. MACLEOD
SCALE: (on A3 Original)	1:1000

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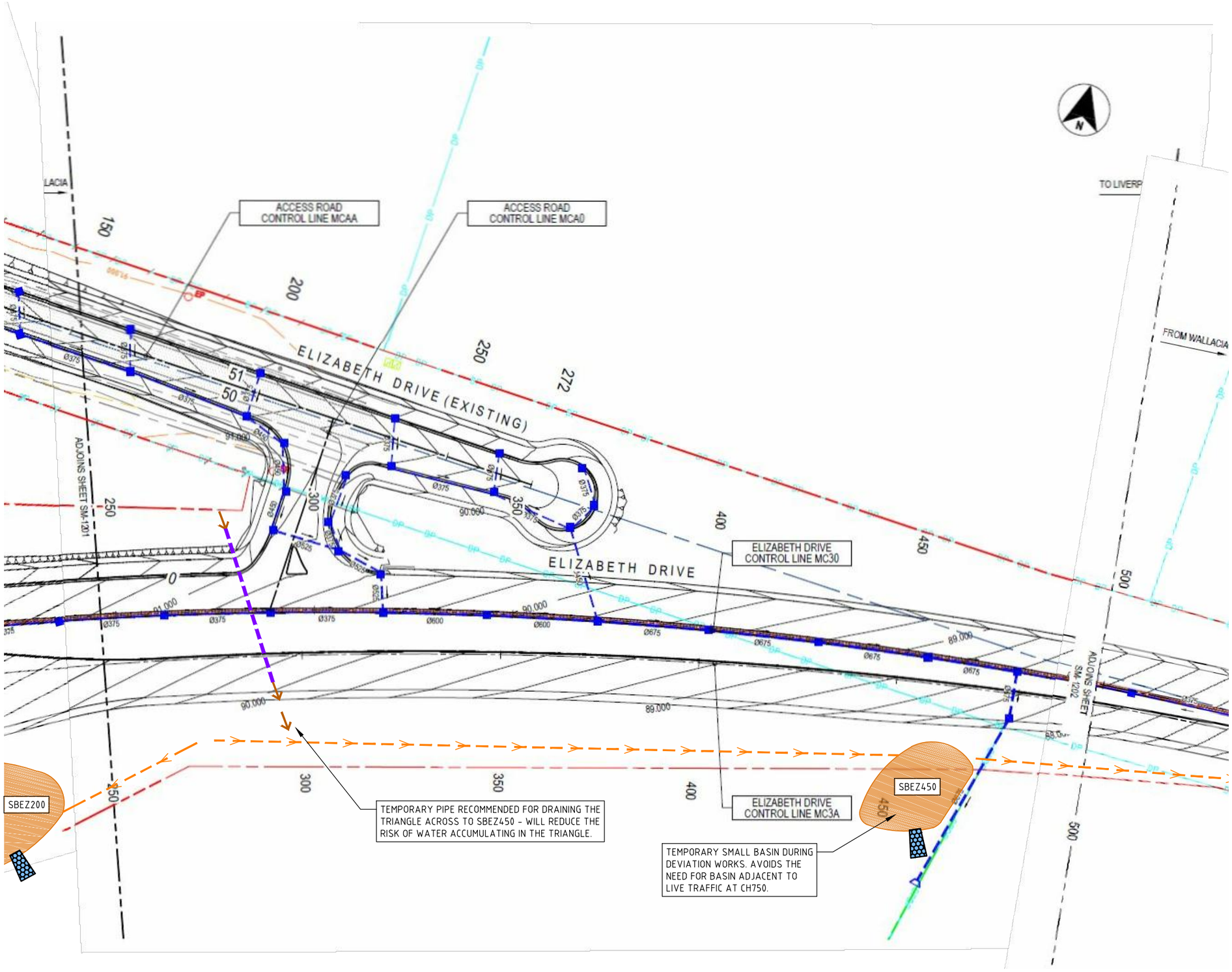
PROJECT TITLE
THE NORTHERN ROAD
STAGE 6

DRAWING TITLE
ESCP
CONTROL LINE MC3A
SHEET 1

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP20	C

Plot Date: 28 February 2017 8:58:46 AM
CAD File Name: N:\16000228 Northern Road Upgrade - Mott MacDonald\Drawings\16000228_P01_ESCP_REV C.dwg



LEGEND

- LINED OFFSITE (CLEAN) WATER DIVERSION [1]
- OFFSITE (DIRTY) WATER DIVERSION [1]
- PROJECT CONSTRUCTION BOUNDARY
- PROJECT OPERATIONAL BOUNDARY
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[3] DISSIPATER TO EXTEND TO WATERWAY OR WELL VEGETATED LANDS - LINE WITH GEOFABRIC (BIDIM A34 OR EQUIVALENT) + ROCK Φ200MIN. OR ALTERNATIVELY CONCRETE LINE.
[4] CONTOUR BERMS ARE TO BE FORMED AS EARTH BUNDS MIN. 300mm HIGH (ALTERNATIVELY SANDBAG BUNDS OR SIMILAR CAN BE USED). THEY ARE TO BE INSTALLED PRIOR TO RAINFALL AND PRIOR TO SITE CLOSURE (+2 DAYS). THEY ARE NOT REQUIRED DURING DRY WEATHER. LOCATIONS MAY CHANGE AS WORKS PROCEED.
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SD - BLUE BOOK STANDARD DRAWING (LANDCOM, 2004)
IECA SD - IECA STANDARD DRAWING (IECA, 2008)
(REFER TO SEEC DRAWINGS 16000228_P01_ESCP101-102)

REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
C	27/02/17	A.M.	L.O.	A.M.	PRELIMINARY
B	22/02/17	A.M.	L.O.	A.M.	PRELIMINARY
A	21/02/17	A.M.	L.O.	A.M.	DRAFT

DRAWING STATUS

DESIGN BY	A. MACLEOD
DRAWN BY	L.O.
FINAL APPROVAL	A. MACLEOD
SCALE: (on A3 Original)	1:1000

PRELIMINARY

North

CLIENT

MOTT MACDONALD
Level 10
383 Kent Street
Sydney NSW 2000
PO Box Q1678, QVB Sydney, NSW 1230
Australia
T +61 (0)2 9098 6800
W https://www.mottmac.com/

SEEC
PO.Box 1098, Bowral, NSW. 2576
Suites 7 & 8, 68-70 Station Street
Bowral NSW 2576.
(t) 02 4862 1633
(f) 02 4862 3088
email: reception@seec.com.au
WWW.SEEC.COM.AU

PROJECT TITLE
THE NORTHERN ROAD
STAGE 6

DRAWING TITLE
ESCP
CONTROL LINE MC3A
SHEET 2

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP21	C

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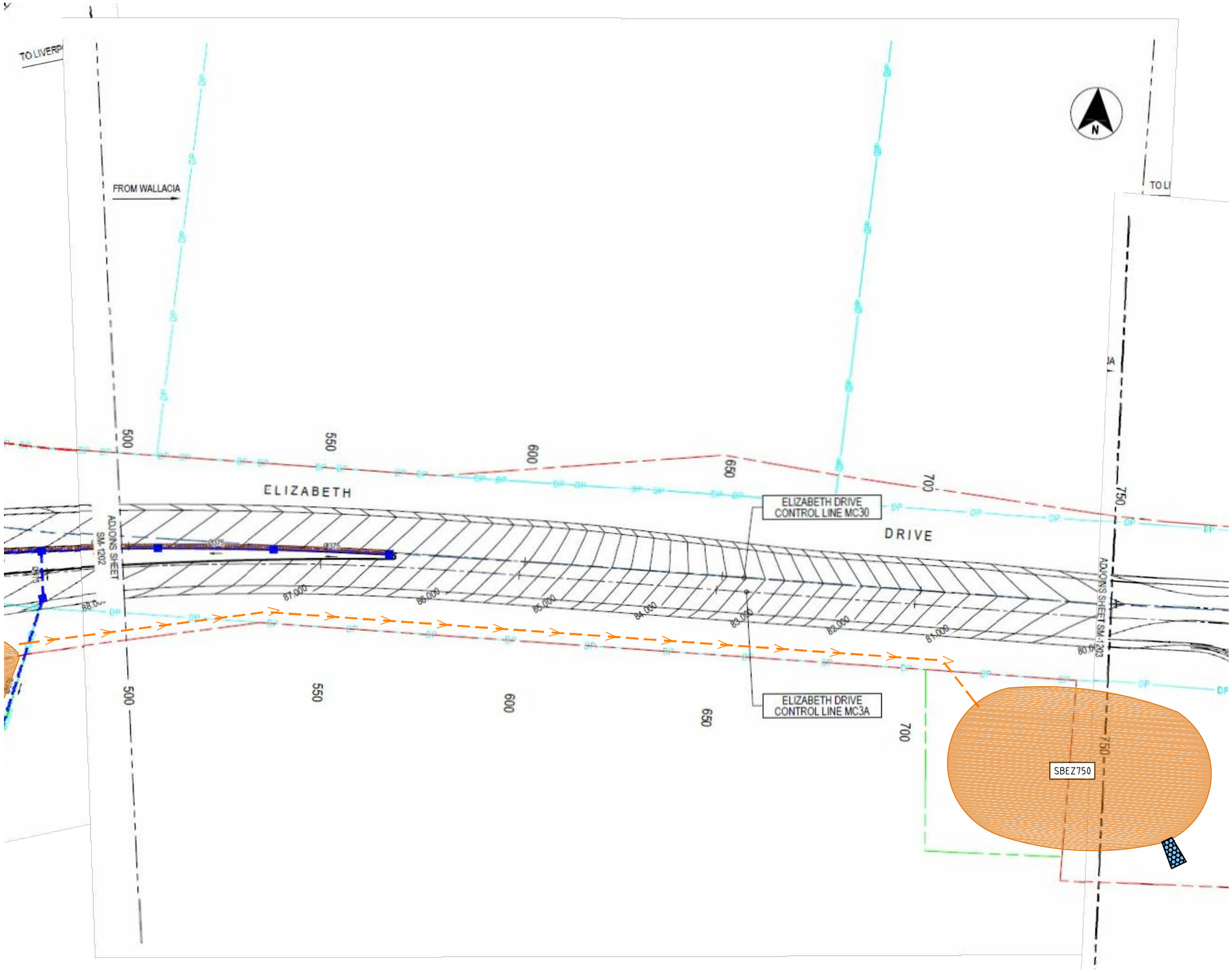

LEGEND

- LINED OFFSITE (CLEAN) WATER DIVERSION [1]
- OFFSITE (DIRTY) WATER DIVERSION [1]
- PROJECT CONSTRUCTION BOUNDARY
- PROJECT OPERATIONAL BOUNDARY
- SEDIMENT TRAP (E.G. SUMP, ROCK FILTER DAM, U-TRAP OR SIMILAR) [1]
- SEDIMENT BASIN [2]
- CLEAN FLOW DIRECTION
- DIRTY FLOW DIRECTION
- TEMPORARY PIPE
- ENERGY DISSIPATER / SPILLWAY [3] (NOT TO SCALE)
- ANCILLARY / STOCKPILE AREA (SD 4-1)
- TEMPORARY DIVERSION [5]
- TEMPORARY DIVERSION ACROSS WORKS AND/OR AROUND CULVERT WORKS [1]
- EXISTING WATERWAY

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A	21/02/17	A.M.	L.O.	A.M.	DRAFT

DRAWING STATUS

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DRAWN BY	L.O.
FINAL APPROVAL	A. MACLEOD
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SEEC

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(t) 02 4862 1633
(f) 02 4862 3088
email: reception@seec.com.au

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PROJECT TITLE

THE NORTHERN ROAD
STAGE 6

DRAWING TITLE

ESCP
CONTROL LINE MC3A
SHEET 3

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP22	C

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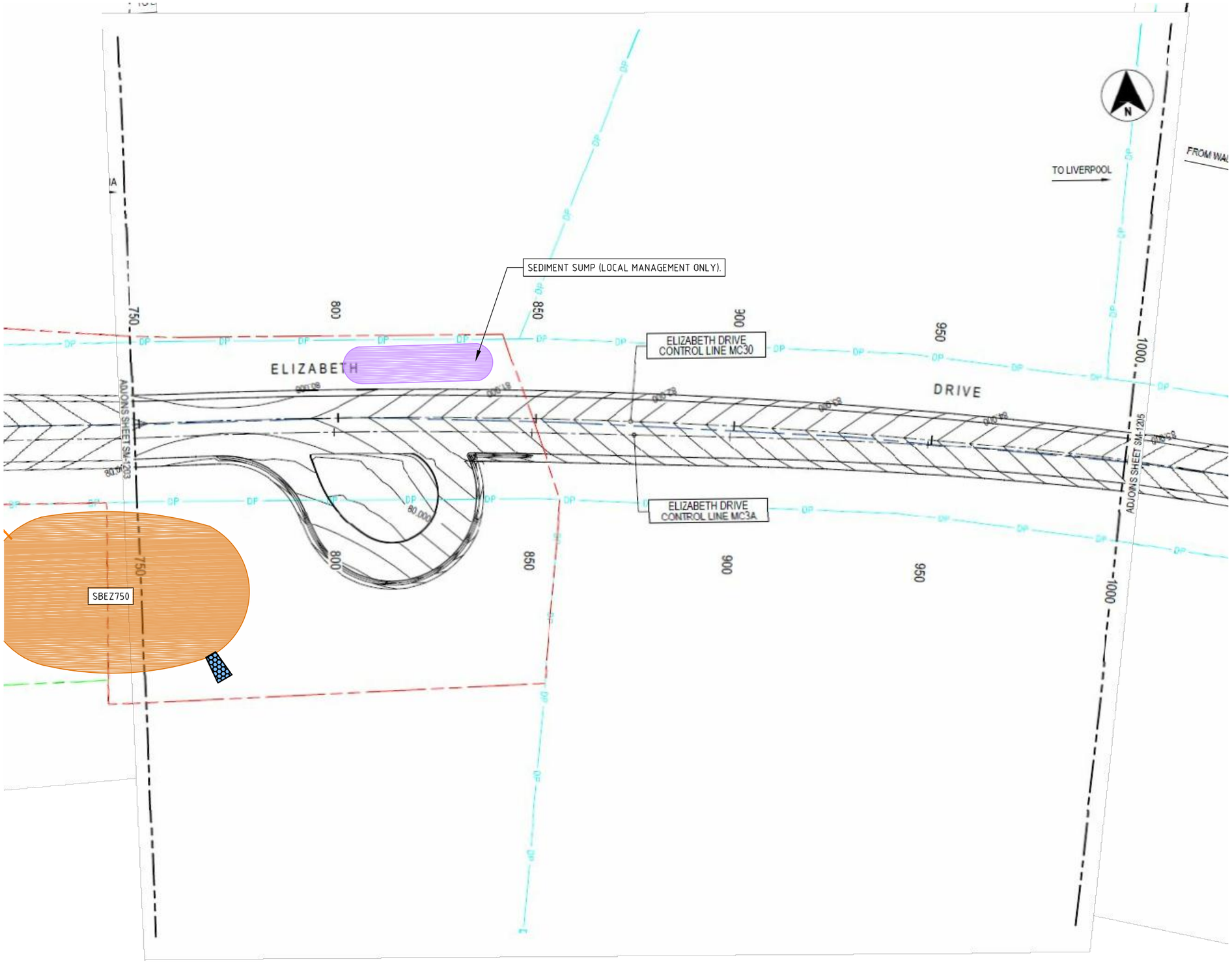

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PROJECT TITLE

THE NORTHERN ROAD
STAGE 6

DRAWING TITLE

ESCP
CONTROL LINE MC3A
SHEET 4

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP23	C

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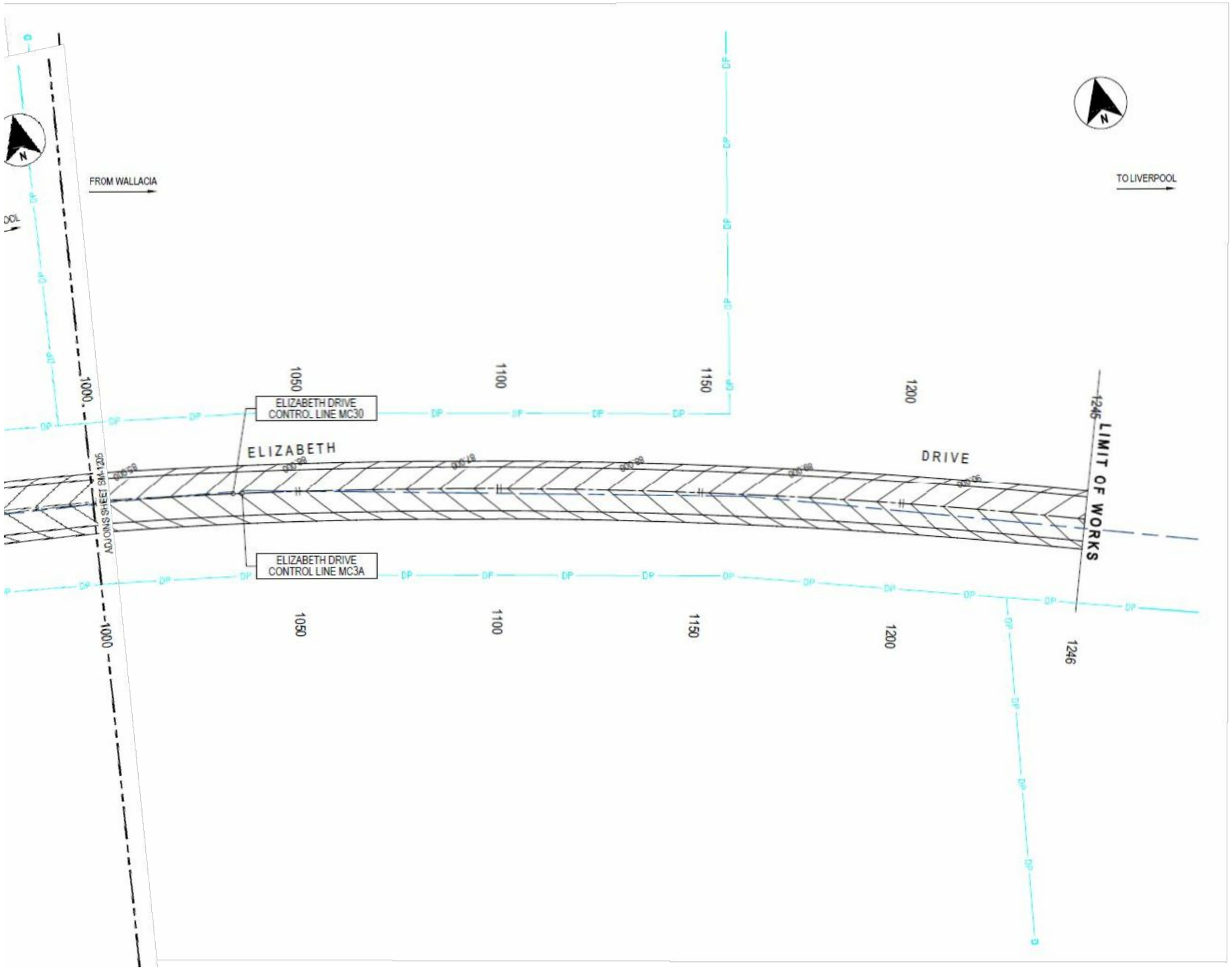

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PROJECT TITLE
THE NORTHERN ROAD
STAGE 6

DRAWING TITLE
ESCP
CONTROL LINE MC3A
SHEET 5

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
16000228	P01	ESCP24	C

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