Soil and Water Management Sub-plan

Western Sydney Airport – Surface and Civil Alignment Works

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Distribution and Authorisation

Document Control

The CPBUI JV Project Director is responsible for ensuring this plan is reviewed and approved. The Project Director is responsible for updating this plan to reflect changes to the project, legal and other requirements, as required.

The controlled master version will be maintained on TeamBinder. All circulated hard copies are deemed to be uncontrolled.

Amendments

The implementation of this Plan is under the authority of the CPBUI Delegated Authority Matrix. All Contract personnel will perform their duties in accordance with this Plan, supporting plans, and related procedures.

Revision Details

Rev.	Details
A	First Draft
B	In response to Sydney Metro and ER comments
C	In response to Sydney Metro, Independent Certifier and ER comments
D	In response to final ER comments prior to endorsement
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02	Update following internal audit, minor administrative changes and inclusion of updated Unexpected Contaminated Land and Asbestos Procedure.
03	Update in response to ER and Sydney Metro Comment.

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Abbreviations and definitions

Refer to Definitions, Abbreviations and Acronyms, Sydney Metro – Western Sydney Airport Surface Civil and Alignment Works Package, Schedule C1 General Specification.

Table 1 – Abbreviations and definitions

Abbreviation	Description
AHD	Australian height datum
ANZECC	Australian and New Zealand Environment and Conservation Council
ARI	Average recurrence interval
ASS	Acid sulfate soils
CEMF	Sydney Metro Construction Environment Management Framework
CEMP	Construction Environmental Management Plan
CLM Act	*Contaminated Land Management Act 1997*
CMS	CPB Management System
CoA	Conditions of Approval
CPB	CPB Contractors Pty Ltd
CPBUI	CPB Contractors and United Infrastructure Joint Venture
CSSI	Critical State Significant Infrastructure
DPE	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
DPIE	The former NSW Department of Planning, Industry and Environment
DSI	Detailed investigation report
EIS	Environmental Impact Statement
EMS	Environmental Management System
Environmental aspect or hazard	Defined by AS/NZS ISO 14001 as an element of an organisation's activities, products or services that can interact with the environment. The term 'hazard' is used throughout this CEMP and has the same meaning as 'aspect' for the purposes of compliance with ISO14001 requirements.
Environmental impact	Defined by AS/NZS ISO 14001 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects.
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environment Protection Licence
ER	Environmental Representative nominated by the Proponent and approved by the Planning Secretary in accordance with CoA A27
ESCP	Erosion and sediment control plan
EWMS	Environmental Work Method Statement
EY	Exceedances per Year
Hold point	A verification point that prevents work from commencing prior to approval from the appointed authority.

Abbreviation	Description
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 CEMP or supporting documentation
PESCP	Progressive Erosion and Sediment Control Plan
POEO Act	*Protection of the Environment Operations Act 1997*
RAP	Remedial Action Plan
REMM	Revised Environmental Mitigation Measures
SEP	Site Environment Plan(s)
SMWSA	Sydney Metro – Western Sydney Airport
WQO	Water Quality Objectives

Part A Overview

1. Introduction

1.1. Purpose and application

This Construction Soil and Water Management Sub-plan (this Sub-plan) forms part of the Construction Environmental Management Plan (CEMP) within the NSW state jurisdiction for the Sydney Metro - Western Sydney Airport Surface Civil and Alignment Works (SCAW). CPB Contractors and United Infrastructure Joint Venture (herein referred to as CPBUI JV) were awarded the design and construction of the SCAW project by Sydney Metro in March 2022.

This Sub-plan describes how CPBUI will minimise and manage impacts from Soil and Water throughout the delivery of SCAW off-airport project. These potential impacts will require management and mitigation in accordance with relevant legislation and government policies.

This Sub-plan and Monitoring Program are to be endorsed by the project Environmental Representative (ER) and submission to DPE one month prior to Construction commencing for approval in accordance with C9 and C19. Construction is not to commence until the CEMP and all required Sub-plans and Monitoring Programs have been endorsed by the ER and/or approved by DPE and will be implemented for the duration of construction.

This Sub-plan has been prepared to address the requirements of the:

- Critical State Significant Infrastructure (CSSI) 10051 Planning Approval (dated 23 July 2021)
- Sydney Metro Western Sydney Airport – CSSI Staging Report (Revision 6.0) (Staging Report)
- *AS/NZS ISO 14001:2016 Environmental Management Systems – Requirements with guidance for use*
- Sydney Metro Construction Environmental Management Framework (CEMF)
- Environmental Impact Statement (EIS) and Revised Environmental Mitigation Measures (REMMs) from Section 7 of the Submissions Report
- Contractual requirements, including the SCAW Design and Construction Deed and General and Particular Specifications
- The Environmental Protection Licence (EPL) 21695
- Applicable legislation.

1.2. Background

The Sydney Metro Western Sydney Airport will become the transport spine for Greater Western Sydney, connecting communities and travellers with the new Western Sydney International (Nancy-Bird Walton) Airport (referred to as Western Sydney International) and the growing region.

The Sydney Metro Western Sydney Airport EIS was prepared in October 2020 to assess the impacts of construction and operation of the Project and was placed on public exhibition between 21 October 2020 and 2 December 2020. The Project was declared a Critical State Significant Infrastructure (CSSI) Project and is listed in Schedule 5 of *State Environmental Planning Policy (State and Regional Development)*.

The Sydney Metro Western Sydney Airport was approved by the Minister for Planning and Public Spaces on 23 July 2021 (SSI 10051) under section 5.19 of the *NSW Environmental Planning and Assessment Act 1997* (EP&A Act).

1.3. Project description

The Project will be undertaken on Darug Country and will form part of the future Western Parkland City. The Project involves the construction and operation of a new 23km metro rail line that extends from the existing Sydney Trains suburban T1 western line (at St Marys) in the north to the Aerotropolis (at Bringelly) in the south. The alignment includes a combination of tunnels and civil structures, including viaducts, bridges, and surface and open-cut troughs between the two tunnel sections. The Project also includes six new metro stations, and a stabling and maintenance facility and operational control centre at

Orchard Hills. The SCAW package is the second major contract package to be procured for the Project. The successful and timely completion of the SCAW package is critical to the subsequent construction activities and ultimate completion of the entire Project.

1.3.1. SCAW scope of works

The scope for the SCAW package includes approximately 10.6km of alignment up to the underside of track formation from Orchard Hills to the Western Sydney International (WSI) airport. This includes approximately:

- 3.6km of viaduct
  - 400 metres of viaduct over Blaxland Creek
  - 660 metres of viaduct over the Patons Lane area and un-named creek
  - 2.5km of viaduct in the Luddenham Road area including across the Warragamba pipeline, at Luddenham Station, across Luddenham Road and across Cosgrove Creek
- 209 metres of bridges
  - A bridge, approximately 187m long, over the proposed M12 Motorway
  - A bridge, approximately 22m long, over the drainage swale on the WSI airport site
- 6.9km of at-grade alignment
  - 600m at Orchard Hills, south of Lansdowne Road
  - 1.6km alongside the stabling maintenance facility in Orchard Hills
  - 900m to the north of the Warragamba pipelines
  - 1.1km north of the proposed M12 motorway
  - 1.4km south of the proposed M12 Motorway on Elizabeth Derive
  - 1.3km within the Airport site from the northern boundary to the Airport Business Park Station
- Temporary and permanent access roads.

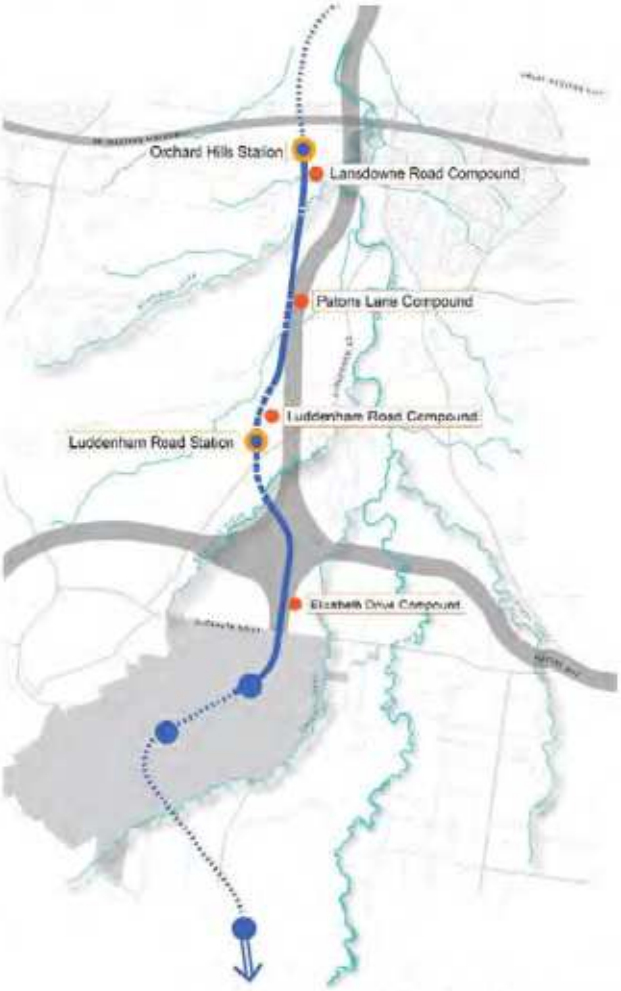

Figure 1 – SCAW Project scope

1.3.2. SCAW construction methodology

Activities that will be undertaken during construction are summarised in Table 2.

Table 2 – Activities during construction

Works	Activities
Early works	▪ Investigation works – survey, geotechnical, contamination and utilities ▪ Establishment of temporary ancillary facilities, construction site fencing, signage and lighting ▪ Pre-clearing vegetation surveys and setting up environmental 'no-go' zones ▪ Temporary stockpiling of imported spoil for the stabling and maintenance facility
Earth works	▪ Installation of environmental controls ▪ Vegetation clearing ▪ Stripping, temporarily stockpiling and management of topsoil and unsuitable material

Works	Activities
	▪ Embankment and cutting construction, including the improvement layers/treatments, general fill, structural fill zone and capping layers ▪ Importation and reuse of fill materials ▪ Placing, compacting and finishing of rail alignment sub-base and base layers ▪ Dewatering and backfilling farm dams ▪ Preparation of piling pads.
Bridge works	▪ Installation of environmental controls ▪ Substructure construction from cast in-situ construction with the general sequence of: – Bored pile construction (mono pile) – Pile cap (four) construction with localised excavation at Luddenham Station – Pier and headstock construction ▪ Construction of the viaduct structures through the placement of precast concrete segments using a crawler crane ▪ Construction of two bridges using precast Super T
Drainage works	▪ Construction of table drains ▪ Installation of culverts and other drainage structures ▪ Construction of temporary diversion channels ▪ Construction of temporary watercourse crossings such as causeways ▪ Installation of scour protection measures.

2. Structure of this Plan

2.1. Plan Purpose and Objectives

This CEMP Sub-plan forms part of the Project Management System (PMS). It is part of a suite of plans that together outline how the SCAW package will manage Soil and Water during construction to ensure an integrated approach to meeting contract requirements.

In addition to the Project Management Plan, other Project Plans that interface with this Sub-plan include:

- CEMP
- Quality Management Plan
- Sustainability Management Plan
- Erosion and Sediment Control Plans
- Spoil Management Sub-plan
- Waste Management Sub-plan
- Emergency Response Plan

This plan has the following structure:

Part A: Overview	This section clearly defines: ▪ Section 1: Introduction ▪ Section 2: Structure of this Plan ▪ Section 3: Legal and Other Requirements ▪ Section 4: Roles and Responsibilities with regards to soil and water management ▪ Section 5: Existing Environment ▪ Section 6: Aspects and Impacts ▪ Section 7: Soil and Water Management ▪ Section 8: Compliance Management
Part B: Implementation Plan	This section outlines in detail the key processes and systems to support implementation of environmental management outcomes for the project: ▪ Element 1: Training ▪ Element 2: Monitoring and Reporting ▪ Element 3: Auditing, Review and Improvement ▪ Element 4: Project Specific Requirements
Part C: Appendices	This section includes appendices and annexures providing additional detail that support this Sub-plan.

2.1.1. Other Related Documents

As a sub-plan to the CEMP, Table 3 shows the interrelationships with other project plans and documents.

Table 3 – Interaction with other project documents

Document	Description
Sustainability Management Plan	Sets out the sustainability targets and management framework for SCAW including water balance assessment and water conservation and reuse requirements.
Erosion and Sediment Control Plans	Will be progressively developed for each SCAW project work area. Erosion and sediment control plans (ESCP) define all the site-specific requirements for managing erosion and sediment according to the Blue Book Volumes 1 and 2D (Landcom, 2004 and DECC, 2008).
Spoil Management Sub-plan	Details the management strategy for spoil. Sets out the spoil sourcing and reuse strategy to be adopted during SCAW.
Waste Management Sub-plan	Details the management strategy for waste including any contaminated materials that may be encountered during works.
Emergency Response Plan	Details requirements for management of sites during a flood or significant storm event.
On Airport CEMP and Sub-plans	Details requirements for environmental management on the Western Sydney Airport. This is a Sydney Metro document produced for the works being undertaken on Commonwealth Land.
Cumulative Impacts Plan	Provides a high-level identification of construction activities and associated potential cumulative impacts that may result from concurrent construction activities and the consultation requirements.

2.1.2. Objectives and Targets

CPBUI JV's objectives for management of Soil and Water during the delivery of the SCAW package are aligned with those established through the EIS and set out in the CEMF.

The environmental performance outcomes in relation to Soil and Water in the EIS and Staging Report, as amended are:

- Contamination risks to human health and ecological receivers are minimised.
- Contaminated land and soil within the project's footprint would be remediated to suit future intended land use.
- Land and property surrounding the project would not be impacted by construction for the 0.5 Exceedances per Year (EY) storm event.
- No aspect of construction will materially adversely affect existing water quality in receiving waters to a minimum 0.5 EY or in line with the 'Blue Book' Volume 1 (Landcom 2004).
- No material change to channel shape within the construction footprint for the 0.5 EY storm event for streams classified first order or higher.
- Water discharged from the project, including runoff from hardstand areas, surface and ground water storages would:
  - contribute towards achieving ANZECC guideline water quality trigger values for physical and chemical stressors for slightly disturbed ecosystems in lowland rivers in southeast NSW, or
  - meet any water quality criteria determined in consultation with the NSW Environment Protection Authority (off-airport) where an EPL is required or in consultation with Western Sydney Airport in accordance with the *Airports (Environmental Protection) Regulations 1997* (on-airport)
- The project would protect or contribute to achieving the Australian and New Zealand Environment and Conservation Council (ANZECC) Guidelines water quality trigger values and NSW Water Quality Objectives, during construction or operation.
- Construction water quality discharge would comply with the requirements of an EPL issued to the project.
- Drainage from the project would be designed in accordance with local council requirements for managing urban stormwater quality and quantity.
- Changes to flood characteristics during construction would aim to meet the following criteria:
  - Not worsen existing flood water velocities
  - No change to flood hazard vulnerability classification for residential and commercial buildings or roads
  - Maintain existing flow regimes and velocities to preserve and minimise changes to the watercourses.
- The use of potable water for non-potable purposes is avoided where non-potable water is available.
- Water reuse is maximised.

The soil and water management objectives relevant to SCAW from Section 12.1 of the CEMF are provided in Table 4. CPBUI will implement the project requirements detailed in Element 4: Project Specific Requirements to achieve targets related to the management of soil and water. Tracking against objectives/KPIs is included in Monthly Progress reporting to Sydney Metro.

In accordance with Condition C14 the Surface Water Quality Monitoring Program will compare actual performance of construction against the predicted performance.

Table 4 – CEMF objectives and targets

Objective	Target (KPI)	Measurement Tool
Minimise pollution of surface water through appropriate erosion and sediment control	Soil erosion and sediment controls are implemented throughout the site in	Environment and Sustainability Inspection Checklists Site Diary entries ER Reports

Objective	Target (KPI)	Measurement Tool
	accordance with the approved ESCPs and 100% of inspections are completed on the following basis: ▪ Weekly during environmental inspection ▪ Prior to a rainfall of >20mm in a 24 hour period, where forecasted ▪ Following a rainfall event of >20mm in a 24 hour period.	Audit reports Weather monitoring records
Minimise leaks and spills from construction activities	100% of plant on site to have maintenance records and pre delivery inspection report 100% of daily pre starts reference the need for operators to conduct regular Prestart plant checks. 100% of ancillary facilities have spill kits on site	Pre delivery inspection report Prestart inspection records Environment and Sustainability Inspection Checklists
Maintain existing water quality of surrounding surface watercourses	The sampling frequency in Appendix C1 – Surface Water Quality Monitoring Program is adhered to during construction No pollution incidents resulting in environmental harm or regulatory action.	Monitoring program and associated reporting
Source construction water from non-potable sources, where feasible and reasonable.	No more than 1000KL of potable water is used for the SCAW project.	Water tracking records Water reuse strategy

2.1.3. Agency Consultation

Agencies to be consulted for this Sub-plan, incorporating the water quality and groundwater monitoring programs are detailed in Table 5.

Table 5 – Sub-plan and Monitoring Program Agency Consultation

Subject	Agency Consultation
Soil and Water Management Sub-plan (CoA C5)	DPI Fisheries, Relevant Councils (Penrith City Council, Liverpool City Council)
Surface Water Quality Monitoring Program (CoA C13)	NSW Department of Planning and Environment (DPE) Water, DPI Fisheries, Relevant Councils (Penrith City Council, Liverpool City Council)

CPBUI JV have engaged with these agencies in developing and finalising this Sub-plan. Records of consultation in accordance with CoA A6 are provided in Table 6 and Appendix B. Any major amendments proposed to this Sub-plan (as determined by the ER) will be provided to the agencies listed in Table 5 for further consultation.

Table 6 – Log of engagement or attempted engagement with relevant stakeholders (NSW CoA A6(b)

Agency	Date	Person Contacted	Comment	CPBUI Response
Penrith City Council	10/06/2022	Penrith City Council representative	Received 8/07/2022. Penrith City Council staff had no comment on the Soil and Water Management Sub-plan or Surface Water Monitoring Program	Noted. No further action required.
Liverpool City Council	10/06/2022	Liverpool City Council representative	No written response received from Liverpool City Council as of 27/07/2022.	A meeting held with representatives of Liverpool City Council, CPBUI and Sydney Metro on 28/06/2022 to discuss the SCAW project and environmental management. No issues were raised during the meeting that required addressing in the Soil and Water Management Sub-plan or Surface Water Quality Monitoring Program
DPI Fisheries	10/06/2022	DPI Fisheries representative	Received 22/06/2022. DPI Fisheries staff had no comment on the Surface Water Monitoring Program	Noted. No further action required.
DPE Water	10/06/2022	DPE Water representative	Received 28/06/2022. DPE Water staff had no comment on the Surface Water Monitoring Program	Noted. No further action required.

In accordance with the Staging Report this Sub-plan will be first endorsed by the SCAW project independent Environmental Representative (ER) as required by CoA C2 and C7, and then submitted to the Planning Secretary for approval at least one month before commencement of construction in accordance with CoA C9 and CoA C17 for the Surface Water Quality Monitoring Program.

3. Legal and Other Requirements

3.1. Legislation

Key legislation relevant to Soil and Water management includes:

- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *Environmental Planning and Assessment Regulation 2021*
- *Contaminated Land Management Act 1997* (CLM Act)
- *Protection of the Environment Operations Act 1997* (POEO Act)
- *Protection of the Environment Operations (General) Regulation 2021*
- *Water Management Act 2000*
- *Water Management (General) Regulation 2018*

Refer to the CEMP for further details of the relevant legislation.

3.2. Project Compliance Requirements

All works to be delivered for SCAW have been assessed and approved under the EP&A Act for the Critical State Significant Infrastructure (CSSI) application number 10051. The on-airport works are a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act) relating to approval EPBC 2019/8541.

There are three (3) principal statutory schemes that govern the planning and assessment process for the SM-WSA project:

- Commonwealth:
  - SCAW works have been assessed and approved under the *Airports Act 1996* for works located on Commonwealth land within the boundary of the Western Sydney International Airport (on-airport).
  - SCAW works have been assessed and approved as a controlled action by the Department of Agriculture, Water and the Environment (DAWE) under Part 9 of the EPBC Act and approval was obtained by Sydney Metro on 3 June 2021 (EPBC2020/8687) for the impacts on threatened species and communities and Commonwealth Land (off-airport).
- State:
  - SCAW works have been assessed and approved via number of applications under Division 5.2 of the EP&A Act and are classified as Critical State Significant Infrastructure (SSI 10051) (off-airport).

Detailed environmental assessments have been carried out to gain the necessary Commonwealth and State planning approvals.

Section 120 of the POEO Act states that it is an offence to pollute waters. Under the Act, 'water pollution' includes introducing litter, sediment, oil, grease, wash water, debris, and flammable liquids such as paint etc. into waters or placing such material where it is likely to be washed or blown into waters or the stormwater system or percolate into groundwater. All practicable steps should be taken to minimise the risk of pollution of waters.

The POEO Act defines waters as the whole or any part of:

- Any river, stream, lake, lagoon, swamp, wetlands, unconfined surface water, natural or artificial watercourse, dam or tidal waters (including the sea), or
- Any water stored in artificial works, any water in water mains, water pipes or water channels, or any underground or artesian water.

Element 4: Project Specific Requirements contains a summary of the key compliance requirements relevant to Soil and Water management which are applicable to SCAW. This includes relevant CoA, REMMs, CEMF requirements, EPBC Act, EIS performance outcomes and contractual requirements.

3.3. Environmental Protection Licence

CPBUI Has an EPL for SCAW (Licence Number 21695), issued under the POEO Act. The EPL includes conditions applicable to soil and water management, which may be varied during construction, and which includes conditions covering:

- Approved water discharge points
- Pollutant concentration limits (water discharge criteria)
- Permitted exceedances of pollution concentration limits
- Turbidity and Total Suspended Solids (TSS) correlation
- Erosion and control requirements
- Monitoring of water discharges
- Weather monitoring
- Monitoring records
- Monitoring reports
- Reporting of pollution incidents.

All applicable monitoring and reporting conditions of the EPL will be included in the Compliance Tracking (refer to Appendix C6 of the CEMP) and compliance tracked and reported as part of the Sydney Metro Compliance Monitoring and Reporting Program (SM-WSA-SCAW-GS-338). An annual return will be prepared within 60 days of the EPL anniversary date.

Routine inspections will be undertaken in accordance with the Monitoring, Inspections, Reporting, Review and Audit (MIRRA) schedule (refer to Section 7.9 and Element 3 (Section 7.4) and Element 4 (Section 7.13) of the CEMP) which will include a review of conditions relating to the EPL.

3.4. Guidelines and Standards

Guidelines and standards relating to the management of soil and water include:

- Acid Sulfate Soils Assessment Guidelines (ASSMAC 1998)
- Acid Sulfate Soil Manual. Acid Sulfate Soil Management Advisory Committee, NSW (ASSMAC 1998).
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (collectively known as the 'ANZECC Guidelines') (ANZECC 2000).
- Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting (collectively known as the 'ANZECC Guidelines') (ANZECC 2000).
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2018 (ANZG 2018).
- Australian/New Zealand Standard 4452:1997 – The storage and handling of toxic substances
- Australian/New Zealand Standard 5026:2012 – The storage and handling of Class 4 dangerous goods
- Australian/New Zealand Standard 1547:2012 – On-site domestic wastewater management
- Australian Standard 1940-2004 – The storage and handling of flammable and combustible liquids
- Cooperative Research Centre for Contamination Assessment and Remediation of the Environment: Technical Report No. 10, Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater Part 1: Technical development document, 2011 (CRC Care 2011)
- Contaminated Land Guidelines - Consultants reporting on contaminated land (NSW EPA 2020)
- Contaminated Sites: Sampling Design Guidelines (NSW EPA 1995)
- Floodplain Development Manual – The management of flood liable land (NSW Department of Infrastructure, Planning and Natural Resources 2005)
- Guidelines for Controlled Activities on Waterfront Land Riparian Corridors (Department of Primary Industry 2012).
- Guidelines on the Duty to Report Contamination under the *Contaminated Land Management Act 1997* (EPA 2015)
- Guidelines for Consultants Reporting on Contaminated Land (EPA, 2020)

- Guidelines for the NSW Site Auditor Scheme (3rd edition) (EPA, 2017)
- Managing Urban Stormwater: Soils and Construction (the 'Blue Book') (Landcom (2004).
- Managing Urban Stormwater: Soils and Construction. Volume 2D: Main Road Construction (the 'Blue Book') (DECC, 2008).
- Managing asbestos in or on soil (SafeWork NSW, 2014)
- Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land (Department of Urban Affairs and Planning & Environment Protection Authority 1998)
- National Environment Protection (Assessment of Site Contamination) Measure 1999 (as revised 2013) (NEPM, 2013)
- PFAS - National Environmental Management Plan Version 2.0 (HEPA, January 2020)
- Waste Classification Guidelines (NSW EPA 2014)

4. Roles and Responsibilities

4.1. CPBUI Staff

The roles and responsibilities of key CPBUI JV project personnel with respect to Soil and Water are detailed in Table 7 and are further detailed in Section 5.2.1 of the CEMP.

Table 7 – Key roles, authority and responsibility

Role	Authority and Responsibility
Project Director	▪ Managing the delivery of SCAW including overseeing planning approval and environmental management ▪ Authority to direct personnel and/or subcontractors to carry out actions to avoid or minimise unintended environmental impacts ▪ Act as the Contractor's Representative
Environment Manager	▪ Oversee the implementation of all soil, water and groundwater management initiatives ▪ Prepare and implement this Sub-plan ▪ Oversee monitoring, inspections and auditing ▪ Have the ability to stop works on environmental grounds ▪ Report any incidents or non-compliances to Sydney Metro and the ER ▪ Preparing environment reports and submitting to Sydney Metro and ER
Environment Advisor / Coordinator	▪ Assist the Environment Manager in the day-to-day environmental management of SCAW ▪ Manage the on-ground application of soil, water and groundwater management measures during construction (e.g. dust suppression using water, application of dust suppressants, covering stockpiles) ▪ Monitor and report on soil, water and groundwater management during construction ▪ Undertake environment inspections and prepare environment reporting ▪ Have the ability to stop works on environmental grounds
Commercial Manager	▪ Ensure that relevant soil, water and groundwater management requirements are considered in procuring materials and services
Senior Engineering Manager	▪ Ensure relevant soil, water and groundwater management requirements are addressed in design development
Construction Manager and delegates	▪ Manage the delivery of the construction process in relation to soil, water and groundwater management for their work activity in conjunction with the Environment Manager and Environment Advisors/Coordinators ▪ Ensure compliance with this Sub-plan and associated procedures
Sustainability Manager/ Coordinator	▪ Track and report soil, water and groundwater elements against sustainability targets
Superintendents/ Site Supervisors	▪ Construction delivery in relation to environment management and compliance in conjunction with the Environment Manager ▪ Authority to direct personnel and/or subcontractors to carry out actions to avoid or minimize unintended environmental impacts
Project Manager Civil/Structures Project Engineers Site Engineers Supervisors	▪ Implement and monitor onsite environment management and compliance measures across all sites in conjunction with environment coordinators ▪ Undertake site inspections

Role	Authority and Responsibility
Stakeholder and Community Engagement Manager	▪ Assist in response to and management of complaints relating to soil, water and groundwater

4.2. Soil Conservationist

A specialist soil conservationist is engaged to provide expert advice which has been incorporated into this plan. They will continue to provide specialist advice and services in the development and implementation of this plan to ensure that impacts can be avoided, minimised or appropriately mitigated including:

- Development and sign-off as a Certified Professional in Erosion and Sediment Control (CPESC) of a Primary ESCP, from which Progressive ESCPs will be generated.
- Providing input into design of erosion and sediment controls.
- Providing input into the design and implementation of surface cover, surface treatments and on stabilisation controls.
- Reviewing ESCPs and advising on the proposed strategy for erosion and sediment control and use of new technologies (where appropriate) regarding construction-phase soil and water management.
- Conducting regular site inspection with environmental and construction personnel to review performance, recommend improvements and advise on potential enhancements.
- Providing training to all key staff regarding erosion and sediment control. This will include legislative requirements, the application of best-practice (i.e. Blue Book Volumes 1 and 2), correct use, maintenance and installation of erosion and sediment control techniques.

4.3. Contamination Specialist

A consultancy specialising in the fields of contamination management and materials identification is engaged to undertake contamination assessments and provide advice on contamination management. They will also prepare:

- Detailed investigation reports (DSI) – required by CoA E92,
- Remedial Action Plan (RAPs) – as required by CoA E93; and
- Validation reports (where required) as required by CoA E95.

The consultants will have within their team a person certified under either the Environment Institute of Australia and New Zealand's Certified Environmental Practitioner (Site Contamination) scheme (CenvP(SC)) or the Soil Science Australia Certified Professional Soil Scientist Contaminated Site Assessment and Management (CPSS CSAM) scheme to either prepare or review and approve the DSIs, RAPs and validation reports.

4.4. Site Auditor

Should contamination be found and remediation be required to make land suitable for the final intended land use, an accredited Site Auditor engaged under the NSW site auditor scheme (administered by the EPA under Part 4 of the CLM Act) will review investigation, remediation, and validation work done by the contamination specialist and prepare Site Audit Statements to determine:

- The RAP is appropriate and the site can be made suitable for the proposed use (Section B Site Audit Statement) – as required by CoA E94; and
- The remediation has been completed (Section A1 or A2 Site Audit Statement) – as required by CoA E96.

The Site Auditor will also review DSI reports as required by Clause 12.19 (c) (vi) of the Design and Construction Deed.

5. Existing Environment

5.1. Topography

The topography along the project alignment is gently undulating (elevations ranging from 30-80m Australian height datum (AHD)), dominated by the valley and floodplain of South Creek and its tributaries. Localised topographic lows are associated with Blaxland Creek and other tributaries of South Creek. The topography to the east and west of the project is more elevated.

5.2. Land Use

Existing land use in the areas surrounding the SCAW project is characterised by a mixture of rural industries, rural residential properties and agricultural land with native vegetation generally remaining only along the banks of the creeks, low lying areas and some roadsides. There are some interspersed stands of native vegetation, mostly located around waterways.

5.3. Geology

The project is located within the Cumberland Basin. The Western Sydney area is characterised by the Middle Triassic aged sedimentary rocks of the Wianamatta Group. The project is located in an area that is generally underlain by Bringelly Shale and Quaternary Alluvium. Bringelly Shale consists of claystone and siltstone, laminate, sandstone, coal and highly carbonaceous claystone and tuff and underlies the crests, slopes and drainage lines of the Project area. Quaternary Alluvium is present along the low-lying areas adjacent to South, Blaxland, Cosgrove and Badgerys Creeks and generally consists of fine-grained sand, silt and clay soils. The Quaternary alluvial deposits represent active and historic stream deposits associated with the active creeks in the area (eg. South, Blaxland, Cosgroves and Badgerys). These deposits are variable in nature however were found to be predominantly cohesive, comprising silts and clays with fine to coarse sand and trace fine gravel.

5.4. Soil Landscapes

Soils within the project environment consist primarily of the Blacktown and South Creek soil landscapes. The Blacktown soil landscape consists of shallow to moderately deep (>1m) sandy soils typical of eucalypt forests. The soils are characterised by seasonal waterlogging, low fertility, highly plastic and moderately reactive subsoils and localised surface movement potential.

The South Creek soil landscape comprises the present active floodplain of many drainage networks of the Cumberland Plain and consists of deep layered sediments over bedrock, including clays and loams. The soils are characterised by seasonal waterlogging, localised permanently high-water tables, localised water erosion hazard and localised surface movement potential.

5.5. Acid Sulfate Soils

The EIS identified that the likelihood of Acid Sulfate Soils (ASS) from coastal processes is low to extremely low given elevation is >10 metres AHD, mapping does not indicate a risk of ASS/PASS and the project is not within a coastal area. ASS/PASS soil testing was undertaken by GHD during design investigations at the Western Sydney International in 2018. Ninety-seven soil samples were tested for ASS/PASS and only two samples had a marginal presence of PASS, indicating that PASS are unlikely to be encountered. The EIS also identified that inland ASS can form within saline waterlogged soils with high quantities of organic matter. The EIS confirms that areas mapped as having high potential or known salinity risk (corresponding to the main watercourse crossings the project) as illustrated in Figure 2 have the potential to form ASS. The likelihood of inland Acid Sulfate Soils (ASS) occurs at three locations around the zones of Blaxland Creek, Unnamed Creek and Cosgroves Creek as detailed in Table16-3 of the EIS. The potential for ASS to be encountered comes from pilings and footing excavations for viaducts and surface disturbance for at-grade construction around the riparian zones.

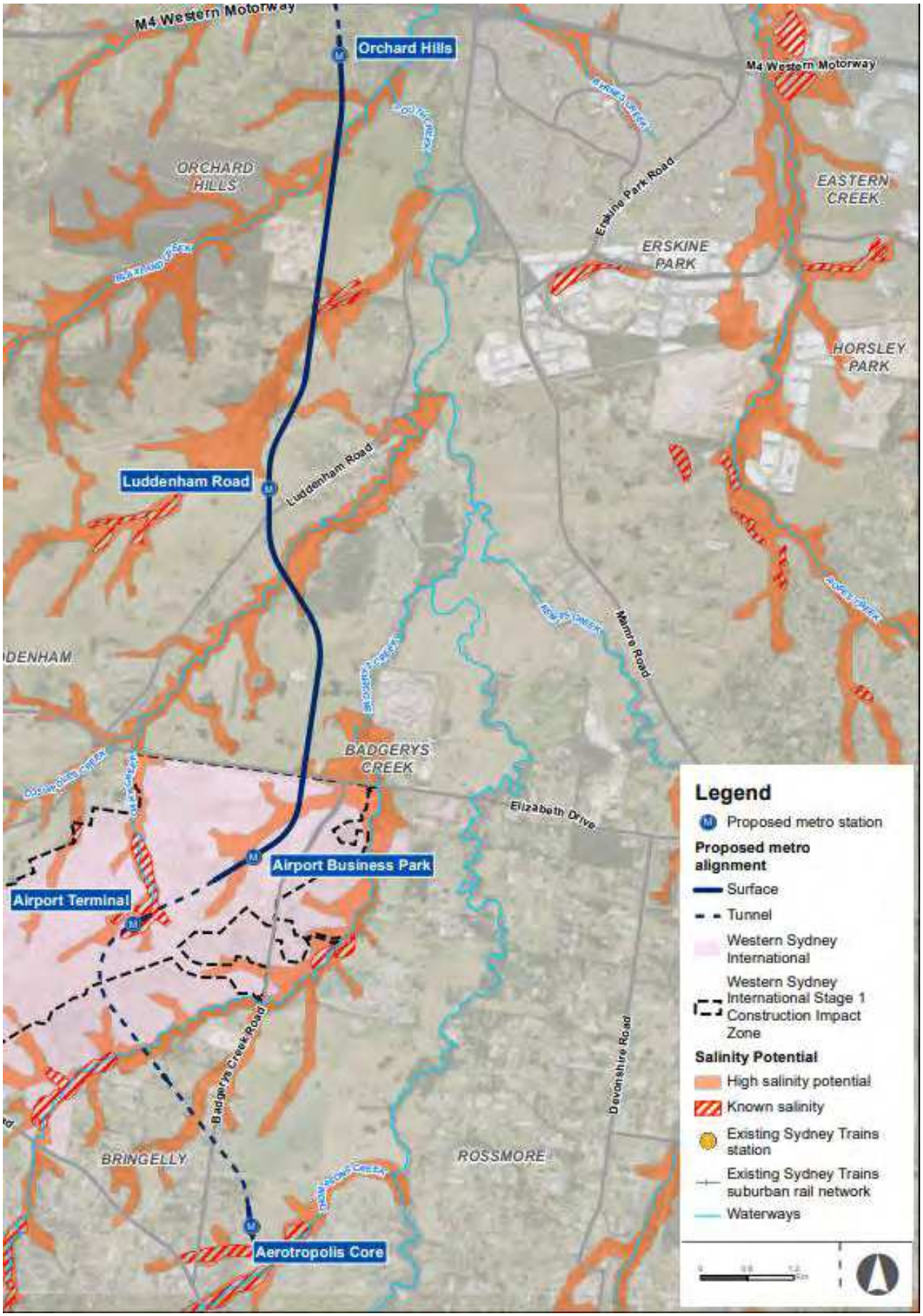

Figure 2 – Salinity Potential in Western Sydney (Source: Extract from Figure 16-1 SMWSA EIS Ch16)

5.6. 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 (e.g. masonry, concrete and bitumen). In Western Sydney, salinity issues are most commonly associated with dryland salinity. Figure 16-1 in the EIS (Figure 2) illustrates the Salinity Potential in Western Sydney and shows areas of known salinity, and high and moderate salinity potential within the SCAW project area. There is also high salinity potential for the areas around all watercourses. The remainder of the study area is mapped as having moderate salinity potential

5.7. Contamination

Table 8 details the areas of environmental concern (AECs) identified in the EIS including the potential contamination sources that could be encountered during excavation and other ground disturbing activities.

Table 8 – Potential contaminated sites with the SCAW project footprint

AEC	Address	Potential Contamination Sources	EIS Risk Rating
29	[redacted]	▪ Workshop ▪ Waste storage/onsite disposal ▪ Use or storage of hazardous building materials	Medium
30	[redacted]	▪ Workshop ▪ Waste storage/onsite disposal ▪ Use or storage of hazardous building materials	Medium
31a	[redacted]	▪ Widespread dumping and storage of wastes ▪ Dumping of waste within construction footprint	High
31b	[redacted]	▪ Workshop ▪ Use of hazardous building materials	Medium
32 & 33	[redacted]	▪ Filled areas ▪ Hazardous building material use	Medium
34	[redacted]	▪ Filled areas ▪ Hazardous building material use	Medium
35	[redacted]	▪ Buried farm waste	High
36	[redacted]	▪ Unexploded Ordnance (UXO) ▪ Buried waste ▪ Hazardous building materials ▪ Aqueous fire-fighting foams (PFAS)	High
37	[redacted]	▪ Lead paint ▪ Asbestos	Medium
38	[redacted]	▪ Fuel storage and use ▪ Aqueous fire-fighting foams (PFAS)	High
39	[redacted]	▪ Asbestos (pipelines/buildings ▪ Zinc (from previous investigations)	Medium
40	[redacted]	▪ Unlicensed stockpiling of waste and soil	High
41	[redacted]	▪ Illegal stockpiling of waste ▪ Imported soil	Medium

AEC	Address	Potential Contamination Sources	EIS Risk Rating
		▪ Imported fill with potential asbestos containing material	
42 and 43	[redacted]	▪ Workshop (fuel/oil/chemical storage and use) ▪ Spray race/Cattle dip (pesticides)	High
44	[redacted]	▪ Imported Fill	Medium

Contaminants that could be encountered during excavation and other ground disturbing activities include contamination associated with:

- unlicensed waste operations including areas of waste dumping and burial on rural properties in Luddenham and Badgerys Creek
- areas of oil, fuel and chemical storage, and potential use or storage of PFAS containing aqueous fire-fighting foam on rural properties within the construction footprint and the former Overseas Telecommunications Commission site in the Aerotropolis Core construction footprint, including bulk storage of diesel in underground storage tanks
- potential storage and use of fuel, oil and solvents, and potential use or storage of PFAS containing aqueous fire-fighting foam at Kennett's Airfield in the vicinity of the Warragamba to Prospect Water Supply Pipelines
- past military activities and potential use or storage of PFAS containing aqueous fire-fighting foam within the Defence Establishment Orchard Hills
- widespread historical use of herbicides and pesticides on rural properties within and surrounding the project
- evidence of hazardous building materials such as asbestos containing materials, lead paint and polychlorinated biphenyls in former and existing buildings, structures and underground conduits

Any contamination not identified during the DSIs would be treated as an unexpected find and managed under an unexpected finds procedure in **Appendix C5 – Unexpected Contaminated Land and Asbestos Finds Procedure**.

5.8. Surface Water Catchments/Waterways

The majority of the project alignment lies in the Hawkesbury-Nepean catchment. Within that catchment, it is located within the Upper South Creek sub-catchment. The South Creek sub-catchment encompasses the majority of the Cumberland Plain of Western Sydney. Watercourses and low-lying floodplain areas are primarily associated with South Creek and its tributaries. Tributaries of South Creek within the project area include Blaxland Creek, Unnamed Tributary of South Creek (South of Patons Lane), Cosgroves Creek and Badgerys Creek. South Creek is the receiving waterway for all creeks within the project area. The EIS identifies that South Creek is one of the most degraded catchments in the wider Hawkesbury-Nepean catchment largely associated with increased urbanisation occurring within the catchment resulting in vegetation clearance and the alteration of hydrological and sediment regimes. The waterways however, form important corridors for remnants of endangered riparian vegetation.

The project lies largely within the lower Hawkesbury-Nepean Catchment within the regions classified as 'mixed-use rural' and 'predominantly urban'. The nominated environmental values applying to waterways within the project area are:

- Protection of aquatic ecosystems
- Visual amenity
- Primary contact recreation
- Secondary contact recreation
- Water for irrigation and general use

- Livestock drinking

5.8.1. Surface Water Quality

Information provided in the EIS and technical reports indicate the existing water quality in the project corridor is considered poor and degraded. Due to the increasing urbanisation and vegetation clearance that has occurred within and near the project corridor, surface water quality is largely influenced by point source water pollution (e.g. from stormwater drains, effluent) and diffuse water pollution (e.g. market gardens, cattle and sheep grazing, intensive agriculture such as poultry farming) and subsequent algal and aquatic weed growth. The results of water quality sampling undertaken as part of the adjacent M12 Motorway project (summarised in Table 8) did not generally meet the recommended ANZECC values for the parameters analysed and is considered poor and degraded due to low dissolved oxygen and high nutrient (Total Nitrogen) concentrations.

Table 9 – Water Quality Monitoring from the M12 Motorway Project compared to ANZECC Guidelines

	Dissolved Oxygen (%)	Electrical Conductivity (µS/cm)	pH	Turbidity (NTU)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)
ANZECC Guidelines	**85-110**	**125-2200**	**6.5-8**	**6-50**	**0.5**	**0.05**
M12_2 Cosgroves Creek	62.7	3510	8.03	16	2.3	<0.05
M12_6 South Creek	80.1	2640	8.47	14.3	1.4	<0.05

The project environmental values, based on AZNG 2018 guideline trigger values for the protection of 95% of species in slightly disturbed to moderately disturbed freshwater systems are shown in Table 10

Table 10 – AZNG 2018 guideline water quality trigger values for physical and chemical stressors for slightly disturbed ecosystems in lowland rivers in south-east NSW

Parameter	Trigger Value or criteria
Chlorophyll-a	0.005 mg/L
Total Phosphorus (TP)	0.05 mg/L
Filterable Reactive Phosphorus (FRP)	0.02 mg/L
Total Nitrogen (TN)	0.5 mg/L
Oxides of Nitrogen (NO_x)	0.04 mg/L
Ammonia	0.02 mg/L
Dissolved Oxygen	85% - 110%
Turbidity	6 – 50 NTU
pH	6–5 - 8
Salinity	125 – 2200 µS/cm
Oils, petroleum and hydrocarbons	Oils and petrochemicals should not be noticeable as a visible film on the water, nor should they be detectable by odour.

5.8.2. Flooding

Existing flood modelling undertaken as part of the project EIS studies and technical papers has indicated that portions of the project is located on flood prone land which is inundated during the Probable Maximum Flood (PMF) event. These affected areas largely correspond to the South Creek, unnamed tributary of South Creek (South of Patons Lane), Blaxland Creek and Cosgroves Creek floodplains and sections of the alignment where bridges or viaducts are proposed. Figure 3 to Figure 6 illustrate the existing flood depths for the 1% AEP.

Figure 3 – 1% AEP Blaxland Creek

Figure 4 – 1% AEP Unnamed tributary of South Creek

Figure 5 – 1% AEP Unnamed tributary of South Creek

Figure 6 – 1% AEP Badgerys Creek

5.8.3. Wetlands

There are no Ramsar or nationally important wetlands within the project area.

5.8.4. Groundwater

Groundwater within the alluvial deposits is likely to be in connection with the surface water within the creeks when flowing. The alluvial groundwater is likely to provide some baseflows into the local creeks, particularly during periods of low rainfall and surface runoff.

Groundwater levels from monitoring bores within the project area indicate that the groundwater is generally between 2 to 5m bgl.

There are no high priority aquatic or karst groundwater dependent ecosystems within the project area.

The SCAW works will be undertaken in areas where there is low likelihood of groundwater interception as identified in Chapter 15 of the EIS.

As the SCAW works have a low likelihood of intercepting groundwater, a groundwater construction monitoring program is not required for these works.

5.8.5. Groundwater quality

The results of groundwater quality testing undertaken as part of the EIS indicated that groundwater had elevated salinity and contained elevated concentrations of heavy metals and nutrients. The EIS observed the pH of groundwater to be generally neutral to acidic largely in the pH range 5 – 7.5. The groundwater is dominated by sodium and chloride, with lesser amounts of magnesium and calcium cations. Electrical conductivity ranged from 1,500 – 36,000 µS/cm. Contamination testing undertaken as part of the EIS indicated that exceedances above the 95% threshold for ammonia, nitrate, phosphorus an several heavy metals (eg. cobalt, nickel, zinc).

5.9. Climate

There are three weather stations within 15 kilometres of the SCAW project area. The two nearest stations are those at Badgerys Creek and Orchard Hills Treatment Works. The Badgerys Creek AWS is located at the Western Sydney Airport, to the south of the project extent while Orchard Hills AWS is located to the east of SCAW. Table 11 and Table 12 illustrate the climate averages for both stations which has been obtained from BOM records.

Table 11 – Monthly climate averages for Orchard Hills Treatment Works (Station Number 067084, 1970-2021)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Max Temperature (°C)	28.3	27.8	26.5	23.8	20.4	17.3	17.2	18.9	21.8	23.9	25.8	28.5	23.4
Mean Min Temperature (°C)	16.9	17.4	16.0	13.0	9.6	7.0	5.3	5.9	8.7	11.1	13.2	15.5	11.6
Mean Rainfall (mm)	98.4	112.5	100.1	62.5	55.3	56.0	36.3	40.1	36.8	55.3	77.8	73.8	819.9
Mean rain days (>1mm)	8.5	8.6	8.3	6.1	5.4	5.3	4.3	3.8	5.0	6.7	7.7	7.4	77.1
Mean 9am wind speed (km/hr)	5.3	4.7	5.1	5.4	4.4	6.7	5.2	5.4	6.9	6.3	6.6	5.8	5.6

Table 12 – Monthly climate averages for Badgerys Creek AWS (Station Number 067108, 1995-2021)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Max Temperature (°C)	30.3	28.8	26.8	24.1	20.8	17.8	17.5	19.2	22.6	25.0	26.7	28.6	24.0
Mean Min Temperature (°C)	17.3	17.1	15.3	11.4	7.7	5.6	4.1	4.7	7.7	10.6	13.6	15.5	10.9
Mean Rainfall (mm)	74.8	108.4	95.1	45.1	38.0	59.2	24.8	36.2	34.9	52.9	66.9	55.0	658.1
Mean rain days (>1mm)	7.0	7.4	7.8	5.4	3.7	5.7	3.8	3.3	4.8	5.6	6.7	6.3	67.5
Mean 9am wind speed (km/hr)	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

The annual average rainfall at the weather stations ranges between 658.1mm (Badgerys Creek) and 819.9mm (Orchard Hills). In Western Sydney, there is a slight tendency for higher rainfall to occur in the summer months than in the winter. January to March are the wettest months on average with the corresponding highest number of rain days exceeding 1mm, while the driest months are July to September. Similar patterns of rainfall are observed across both stations as shown in Figure 7.

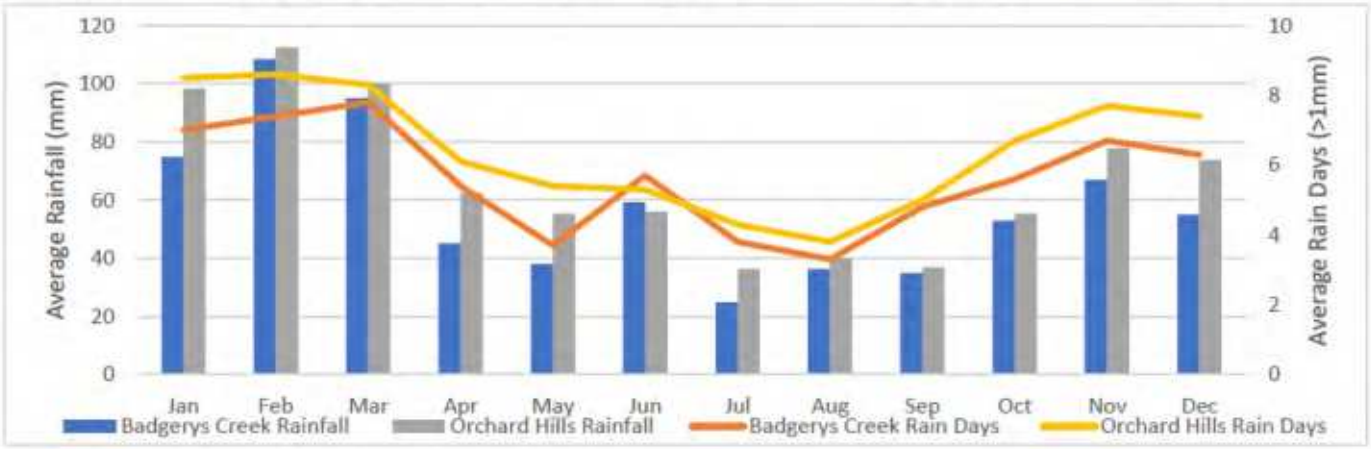

Figure 7 – Historic Rainfall Data for Badgerys Creek and Orchard Hills.

Although the above tables and figure show a slight dominance to rainfall totals, local experience by CPBUI JV dictates that significant rainfall can occur at any time of the year. As such, the risk of high rainfall is considered to be a significant consideration for construction-phase ESC on this project.

5.9.1. Design rainfall

The design rainfall event (85th Percentile) of 35.0mm is based on the design rainfall depth for Penrith. The R factor (2500) is based on the *Rainfall Erosivity of the Sydney 1:250,000* topographic sheet presented in the Blue Book. 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 RUSLE is used to determine the soil loss in tonnes per hectare over one year and is used in calculations when sizing construction sediment basins required for SCAW.

A quantitative erosion risk assessment for each disturbed catchment along the alignment will be conducted using the RUSLE. The RUSLE aims to predict the potential long term average soil loss rate from a given site based on the following parameters: **A = R x K x LS x C x P**

Where:

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

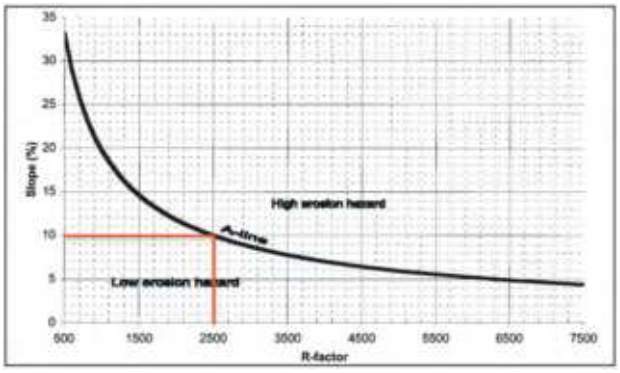

Figure 8 – Assessment of potential erosion hazard.

Based on the respective R factor, any slope greater than 10% represents a high erosion hazard as outline in Figure 8 (adopted from Figure 4.6 of the Blue Book).

Details of the specific design parameters for the project erosion and sediment controls, including the RUSLE and basin sizing calculations will be contained within the site specific ESCPs.

6. Environmental Aspects and Impacts

The key aspects and potential impacts in relation to the overall management of Soil and Water during SCAW are listed in Table 13 below.

Table 13 – Summary of overall aspects and potential impacts on soil and water

Aspect	Potential Impact
Storage and use of chemicals near stormwater systems and waterways	▪ Soil contamination as a result of a spill ▪ Pollutants to wash into the stormwater system, then into/directly into receiving waters
Clearing and Grubbing	▪ Increased sediment load in run off impacting aquatic fauna and flora ▪ Spills of fuel/hydraulic fluids impacting soil and water quality
Bulk earthworks and works within a waterway	▪ Sediment laden/contaminated runoff entering stormwater systems and/or directly into receiving waters, causing pollution. ▪ Ecological impacts on receiving water environment
Material stockpiles	
Wheel wash facilities	
Dewatering of excavations	▪ Turbid or saline water to enter stormwater systems and subsequently causing degradation of freshwater habitat and water quality
Modifications to natural hydrology or water quality from earthworks activities	▪ Localised Pollution of stormwater systems and/or directly into receiving waters ▪ Potential increases to peak flood levels during operation ▪ Potential afflux issues on surrounding properties and residences ▪ Increased risk of erosion and sedimentation due to clearing, loss of riparian vegetation, removal of farm dams, levee banks and flood control works
Working within riparian corridor	▪ Ecological impacts on receiving water environment ▪ Increased risk of erosion and sedimentation due to clearing, loss of riparian vegetation ▪ Localised pollution directly into receiving waters
Sediment tracking onto public roads from vehicles leaving construction worksites	▪ Sediment and gravel on roads ▪ Sediment entering into stormwater systems and/or directly into receiving waters, causing pollution
Dust blowing from the worksites or from vehicles during spoil removal	▪ Pollution of waterways
Floodwaters impacting on worksites	▪ Contamination of floodwaters by sewerage, fuels and/or chemicals ▪ Potential for floodwaters to drain into works excavations
Encountering contaminated material/water during SCAW	▪ Delaying the works or requiring additional controls to be implemented ▪ Potential impacts on receiving water environments if not managed correctly (eg. salinity)
Incorrect reuse, disposal or management of contaminated soil	▪ Spreading of contaminated material to land causing pollution
Concreting and grouting	▪ Water quality impacts on surface and ground water from runoff ▪ Spills of excess or waste concrete ▪ Waste concrete slurry to be discharged into stormwater systems
Construction or modification to stormwater systems	▪ Accidental discharge of sediment-laden runoff into stormwater systems

7. Management Strategy

7.1. Erosion and Sediment Control

7.1.1. Erosion and Sediment Control Plans

Before undertaking any work and during construction activities, site-specific Erosion and Sediment Control Plans (ESCPs) will be progressively developed for each SCAW work area. The Indicative Erosion and Sediment Control Strategy (detailed in Section 7.1.2 below and **Appendix C3 – Erosion and Sediment Control Management Procedure**) will be used as a guide by the SCAW project team in developing and implementing ESCPs and be based on the hierarchy of controls outlined in Figure 9. All ESCPs require sign-off by the Environment Manager (or delegate) prior to implementation. The Soil Conservationist will also conduct regular reviews, as required, of ESCPs to ensure they meet best practice (i.e. the NSW Blue Book). Any ESCPs developed and associated further revisions will be provided to the Sydney Metro and the ER for information.

Any areas disturbed during construction will be stabilised in accordance with the Blue Book or the final design, as soon as feasible.

ESCPs will be updated as works progress to ensure they are always relevant to on-ground activities. For minor changes, these can be notated onto the ESCP. Major changes to the type or nature of sediment controls or to stormwater runoff will warrant preparation of an updated ESCP.

Copies of the current ESCPs will be kept by SCAW project team in Work Packs for all active construction sites. A preliminary ESCP for the SCAW site is contained in **Appendix C9 – Preliminary ESCP**

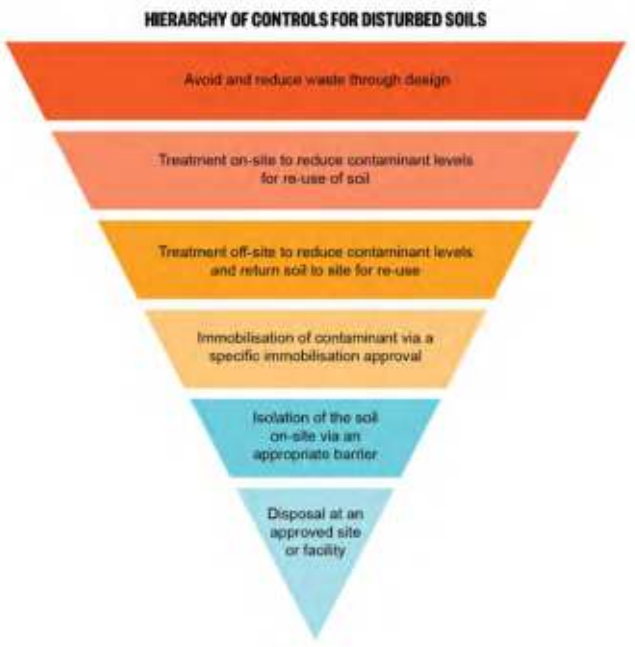

Figure 9 – Hierarchy of controls for disturbed soils

7.1.2. Erosion and Sediment Control Strategy

The Indicative Erosion and Sediment Control Strategy for SCAW includes the following measures and techniques:

- Clean water approaching the site from external catchments beyond the construction worksites will be managed via clean water drains and diversion berms to minimise run-on into the site. Impacts on adjacent land users will be considered to ensure that localized flooding or excessive run-on does not occur.
- Where sediment basins or sediment sumps cannot reasonably be constructed to the Blue Book requirements, undersized structures or alternatives (e.g. sediment fence) will be used, but with an enhanced focus on erosion control.
- Where possible, vegetation removed as part of the works will be mulched and reused on site for erosion and/or sediment control purposes.
- Stormwater flow velocities through work areas will be controlled using temporary berms or other suitable devices and water will be directed to appropriate locations.
- The spatial extent of exposed soils will be minimised, with no-go (exclusion) areas clearly marked on ESCPs, delineated and signposted.
- Temporary ground cover (e.g. geo-fabric, soil binder/stabiliser, hydro-mulch, other suitable products etc.) will be used to lock down high risk areas whenever significant rain is imminent.
- Rainfall forecasts will be actively monitored and used to trigger inspection and, where required, implementation of additional measures such as the application of soil binder.

- All channels along the Premises boundaries carrying clean water away from site are to drain either onto surrounding lands, into culverts or into existing drainage i.e. natural creeks or existing road drainage in accordance with the natural, pre-development drainage patterns.
- All exposed stockpiles will have sediment controls around their perimeter and be provided with adequate temporary cover if they will remain for more than 10 days. Stockpiles will be located outside the 10% AEP flood extent (short term) or 5% AEP flood extent if longer than 10 days) and significant rainfall is not forecast.
- At vehicle egress points from SCAW project work areas, washdown bays, rumble grids and/or stabilised laybacks or other solutions will be used to minimise the risk of sediment tracking onto public roads. Any tracked material will be cleaned from site egress points as soon as possible.
- All erosion and sediment controls will be inspected at least weekly, before a site closure of two days or more, prior to forecast heavy rain (greater than 20 mm predicted) and after rainfall exceeding 20 mm in 24 hours (if safe to do so).
- Maintenance will be carried out as soon as practical and prior to the next forecast rainfall event.
- Concrete washout will be confined to designated washout bays.
- Sediment collected from sediment basins or other traps will be transported to nominated stockpile sites or removed offsite as required.
- Dust generation will be minimised using water carts, soil stabilisers, reduced traffic speeds and application of temporary ground covers as required.
- EPL discharge points will include appropriate scour protection/dissipation.
- Any relevant guidance in the Blue Book must be considered when implementing erosion and sediment controls.

7.1.3. Sediment Basins

Temporary sediment basins will be implemented where required, based on the calculations and details established in each site ESCP. The sediment basins will capture water runoff from SCAW work areas and be designed in accordance with the Blue Book. Any modifications required will be undertaken in consultation with a Soil Conservationist and in accordance with the design calculations.

Where possible, any runoff contained in temporary basins would be used for dust suppression to maintain sufficient capacity in the basin. Where immediate emptying of the basin is required in anticipation of a rainfall event, water treatment will be undertaken to treat water to required standards for discharge to stormwater systems or waterways. Treatment will involve removal of oil and grease (if visible), accumulated rubbish, coarse sediment, chemical flocculation and pH correction. Maintenance of these sediment basins may be required in accordance with Blue Book requirements to ensure they are operating effectively.

7.2. Discharge Criteria and Targets

7.2.1. Sediment Basin and/or Excavation Discharge

Surface water and any groundwater discharge will be consistent with the EPL 21695, the relevant CoA (E129, E130) and applicable ANZECC Guidelines. Water quality criteria for discharging water off premises as detailed in EPL 21695 are:

- Oil and grease (not visible)
- pH 6.5 – 8.5
- Turbidity – 50 NTU

A permit to discharge (**Appendix C8 – Discharge and Dewatering Protocol)** will be prepared for each applicable discharge event and will be used to ensure discharge criteria are met which will assist in meeting the NSW Water Quality Objectives (NSW WQO).

A Water Pollution Impact Assessment (Discharge Impact Assessment) has been prepared to meet the requirements of CoA E130 and has been provided to EPA to inform the issuing of EPL 21695 and considers the NSW WQO required by CoA E126. A copy of the Discharge Impact Assessment and EPA consultation is contained in **Appendix C10 – Discharge Impact Assessment**.

7.2.2. Water usage and reuse

CPBUI has established project targets to optimise water usage throughout SCAW, including:

- Achieve a reduction in water use of 15% across construction and operation compared to a business as usual base case.
- Demonstrate that at least 33% of water used during construction and operation is from non-potable sources.

Water balance modelling will be undertaken for both construction and operational phases of the project. Further details on water usage and reuse strategies are provided in the Sustainability Management Plan. A water reuse strategy has been prepared as a stand-alone document as required by E102 and is publicly available on the CPB Contractors website.

7.3. Works in waterways and temporary waterway crossings

Work in and around waterways (within 40m) will be conducted in accordance with the *Guidelines for controlled activities on waterfront land riparian corridors* (Department of Industry 2018). Works will be scheduled in waterways during periods of predicted low flow to minimise impacts and will be avoided during rainfall events. 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 with permanent stabilisation measures implemented as soon as practicable.

Temporary waterway crossings will be designed, constructed and maintained, consistent with the Blue Book and in consultation with DPI Fisheries to minimise impacts on natural flow regimes and to not present any barriers.

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

The design of the project has been developed so viaducts avoid the main creek channels of Blaxland Creek, unnamed watercourse South of Patons Lane and Cosgroves Creek and works will be limited within these. The progressive ESCPs will document that works within the main creek channels will be avoided during and immediately following rainfall events, unless necessary in an emergency to avoid property damage or prevent the loss of life.

7.4. Surface Water and Flooding Management

Surface water control and/or diversion is to be designed in such a manner as to manage any potential flooding impacts on the project. There are sections of the project that are particularly susceptible to flooding. Site risk assessments will be conducted and mitigation measures for any identified flood risk will be incorporated in ESCPs as required. Detailed ESCPs plans will:

- review the site layout and staging of construction works to avoid or minimize obstruction of overland flow paths
- consider flood risks, obstruction of overland flow paths and limit the extent of flow diversion required.
- identify controls to be implemented and reviewed to minimize surface water flows impacting adjoining private properties during construction.

7.4.1. Flooding

Potential flooding during the construction phase will be considered by the design team in the temporary works design, with appropriate safeguards implemented during construction. The construction of the SCAW project should have a negligible impact on flooding within the catchment, with minimal loss of flood storage and minimal changes or restrictions to existing flood regimes. The majority of the SCAW project construction sites are at a low risk of flooding as the sites are generally located away from overland and mainstream flood areas.

The ESCPs will provide detail on flood-proofing to excavations at risk of flooding during construction, which may include increasing the size and capacity of temporary sediment basins and pumping or

dewatering techniques to be employed to reduce water storage prior to and following rain events where considered feasible.

Following detailed design, Stormwater and Flooding Management Plans would be prepared for construction sites that have a residual risk of flooding after mitigation. These plans would:

- Identify the appropriate design standard for flood mitigation based on the duration of construction, proposed activities and flood risks
- Develop procedures so that threats to human safety and damage to infrastructure are not exacerbated during the construction period. If a stormwater and flooding management plan is required to be developed, consultation with the State Emergency Service (SES), and relevant Councils will be carried out in accordance with CoA E17, during the development of the management plans

7.4.2. Emergency Response Plan

Any events or incidents resulting from flooding will be managed in accordance with the CPBUI JV Emergency Response Plan (SMWSASCA-CPU-1NL-NL000-ER-PLN-000007). This identifies floods/heavy rain events as a hazard, with risk of flooding of areas within the Project footprint. Key prevention measures include:

- Monitoring of weather, alerts and water levels in key watercourses
- Inform staff working in flood plain areas of flood risk
- Set up compounds on higher ground – away from natural water courses and flood prone land.

Copies of the Emergency Response Plan have been provided to a range of stakeholders, including the Penrith City Council, Liverpool City Council and the SES.

Within three months of construction commencing (currently scheduled for December 2022), the CPBUI Workplace Health and Safety Manager will instigate a workshop with representatives from all organisations provided with the Emergency Response Plan to ensure full understanding of the emergency response processes and promote cooperation amongst all parties. Outcomes from this workshop will encompass:

- Gaining a clear understanding of stakeholder requirements and communication protocols
- Agreement on emergency response processes to be followed, including flood response
- Ongoing meeting arrangements covering frequency, location, attendees, topics
- Ongoing site familiarization and access for emergency response
- Emergency response debriefing.

7.5. Chemicals, Refuelling and Spill Management

Spills will be managed in accordance with the **Appendix C7 – Emergency Spill Response Procedure**. The management of environmental incidents where material harm to the environment is caused or threatened will be managed in accordance with the Pollution Incident Response Management Plan required by Section 153A of the POEO Act for EPL holders. Any spills will be reported to Sydney Metro using the Sydney Metro Incident Notification Form.

Chemicals, hazardous substances and dangerous goods will be stored and used onsite in accordance with the following protocols:

- Hazardous substances will be stored onsite in lockable containers, in their original receptacles.
- All chemicals and fuels will be clearly labelled and will have Safety Data Sheets available nearby.
- All chemical storage facilities will be designed and constructed in accordance with:
  - All relevant Australian Standards
  - For liquids, a minimum bund volume requirement of 110% of the volume of the largest single stored volume within the bund
  - Storing and Handling Liquids: Environmental Protection – Participants Manual
  - Environmental Compliance Report: Liquid Chemical Storage, Handling and Spill Management – Part B Review of Best Practice and Regulation

  - Storage locations for non-liquids must be identified, away from stormwater drains
  - Easily accessible for maintenance and spill clean-up in the event of a rupture
  - Bunding maintenance must be undertaken to ensure capacity is maintained.
- Mobile bunds to be inspected after rain and where required dewatered in accordance with the Water Management Procedure.
- Storage and handling of flammable or combustible liquids will be in accordance with EPA guidelines for Bunding and Spill Management, as well as AS1940-1993 – The Storage and Handling of Flammable and Combustible Liquids.
- An up-to-date register of hazardous substances will be kept onsite at all times.
- Hazardous substances will only be used onsite as required, in accordance with the manufacturer/supplier instructions.
- Any substances with the potential to impact water quality will be assessed, to determine what environmental safeguards or procedures are required for that substance to minimize the risk of environmental harm.
- The use of any hazardous substance that could result in a spill will be undertaken away from drainage or stormwater lines and, wherever possible, within defined bunds.
- Any refueling on site shall be undertaken in designated areas only. Where this is not practicable i.e. large immobile plant, small equipment items such as pumps, small generators etc. refueling will be undertaken away from stormwater drains and waterways. A fully stocked spill kit will be on site during refueling.
- Spill kits will be available on site, in particular near batch plants, storage areas and main work areas.
- All spills or leakages will be immediately contained and cleaned up.
- Spills to be managed in accordance with the **Appendix C7 – Emergency Spill Response Procedure**. The management of environmental incidents where material harm to the environment is caused or threatened will be managed in accordance with the projects Emergency Response Plan (SMWSASCA-CPU-1NL-NL000-ER-PLN-000007).
- Where possible, equipment working over water will have sheathed hydraulic hoses and use biodegradable oil.

7.6. Contamination Management

A number of medium and high risk contaminated sites (identified as AECs in the EIS) will be disturbed as part of SCAW. Detailed Site Investigations (DSI) will be undertaken within the medium and high risk AECs prior to disturbance in accordance with CoA E92 (and REMM SC1 and SC2) and NSW EPA Contaminated Land Guidelines. The location of the AECs in relation to the SCAW footprint are shown in Figure 10 and Figure 11.

The Sampling, Analysis and Quality Plan (SAQP) and DSIs will be prepared, or reviewed and approved, by consultants certified under either the Environment Institute of Australia and New Zealand's Certified Environmental Practitioner (Site Contamination) scheme (CenvP(SC)) or the Soil Science Australia Certified Professional Soil Scientist Contaminated Site Assessment and Management (CPSS CSAM) scheme.

Where contamination is identified in the DSI's, remedial action plans (RAPs) will be prepared to address contamination in accordance with CoA E93 (and REMM SC3). No works will occur in the areas until the RAPs are approved by the NSW EPA-accredited Site Auditor.

The RAPs will be prepared by consultants certified under either the CenvP(SC) or the CPSS CSAM scheme

Where RAPs are prepared, a NSW EPA-accredited Site Auditor will be engaged to undertake the statutory audit functions required by CoA E94, E95 and E96 and REMM SC4.

E94 (and REMM SC4) requires that before commencing remediation, a Section B Site Audit Statement must be prepared by an NSW EPA-accredited Site Auditor that certifies that the RAPs is/are appropriate and that the site can be made suitable for the proposed use. All remediation will be performed in accordance with Australian standards and other relevant government guidelines (as listed in Section 3.4)

as an integrated component of construction and to a standard commensurate with the proposed end use of the land

Validation Reports will then be prepared in accordance with Consultants Reporting on Contaminated Land: Contaminated Land Guidelines (EPA, 2020) and relevant guidelines made or approved under section 105 of the CLM Act per CoA E95 (and to meet the objectives of REMM SC4).

E96 (and REMM SC4) requires that a Section A 1 or Section A2 Site Audit Statement (accompanied by an Environmental Management Plan) and its accompanying Site Audit Report, which state that the contaminated land disturbed by the work has been made suitable for the intended land use will be submitted to the Planning Secretary and the Relevant Council(s) after remediation and before the commencement of operation of the CSSI. Copies of the DSI, RAPs, Validation Reports, Site Audit Reports and Site Audit Statements will be submitted to the Planning Secretary and the Relevant Council(s) for information in accordance with CoA E97.

Low Risk AECs

For Areas of low contamination risk (ie not identified as an AEC in Figure 10 or Figure 11), worker health and safety will be managed by the Appendix C5 – Unexpected Contaminated Land and Asbestos Finds Procedure to meet the requirements for REMM SC1. Following completion of DSI's in the medium and high risk AEC's, if no contamination is identified that requires remediation, the AEC's would be re-classified as low contamination risk (per REMM SC2).

Medium Risk AECs

Following the SAQP and DSI prepared for the medium and high risk AEC, if the area remains or is change to medium risk, visual inspections and monitoring would be performed during earthworks. If suspected contamination is encountered, the materials would be subject to the **Appendix C5 – Unexpected Contaminated Land and Asbestos Finds Procedure** and sampling and analysis will be undertaken to assess management requirements in accordance with the relevant statutory guidelines made or endorsed by the NSW EPA.

High Risk AECs

Following the SAQP and DSI prepared for the medium and high risk AEC for areas of environmental concern that remain or change to high risk, the results from the site investigations would be assessed against criteria contained within the NEPM and remediation will be undertaken in accordance with a RAP prepared and the NSW EPA-accredited Site Auditor engaged to undertake the statutory audit functions required by CoA E94, E95 and E96 and REMM SC4.

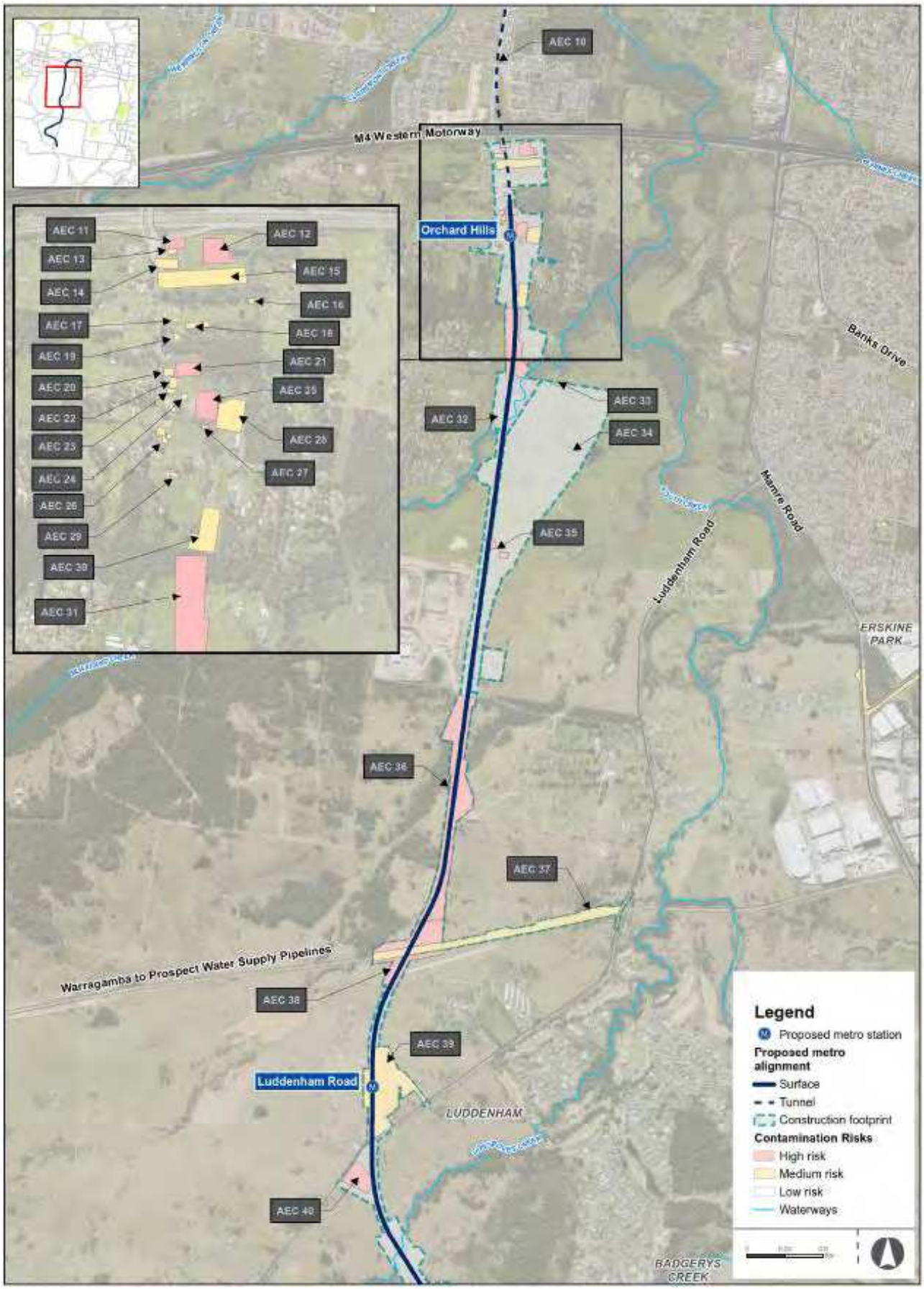

Figure 10 – Areas of Environmental Concern – Northern portion (Source: Extract from Figure 16-2b SMWSA EIS Ch16)

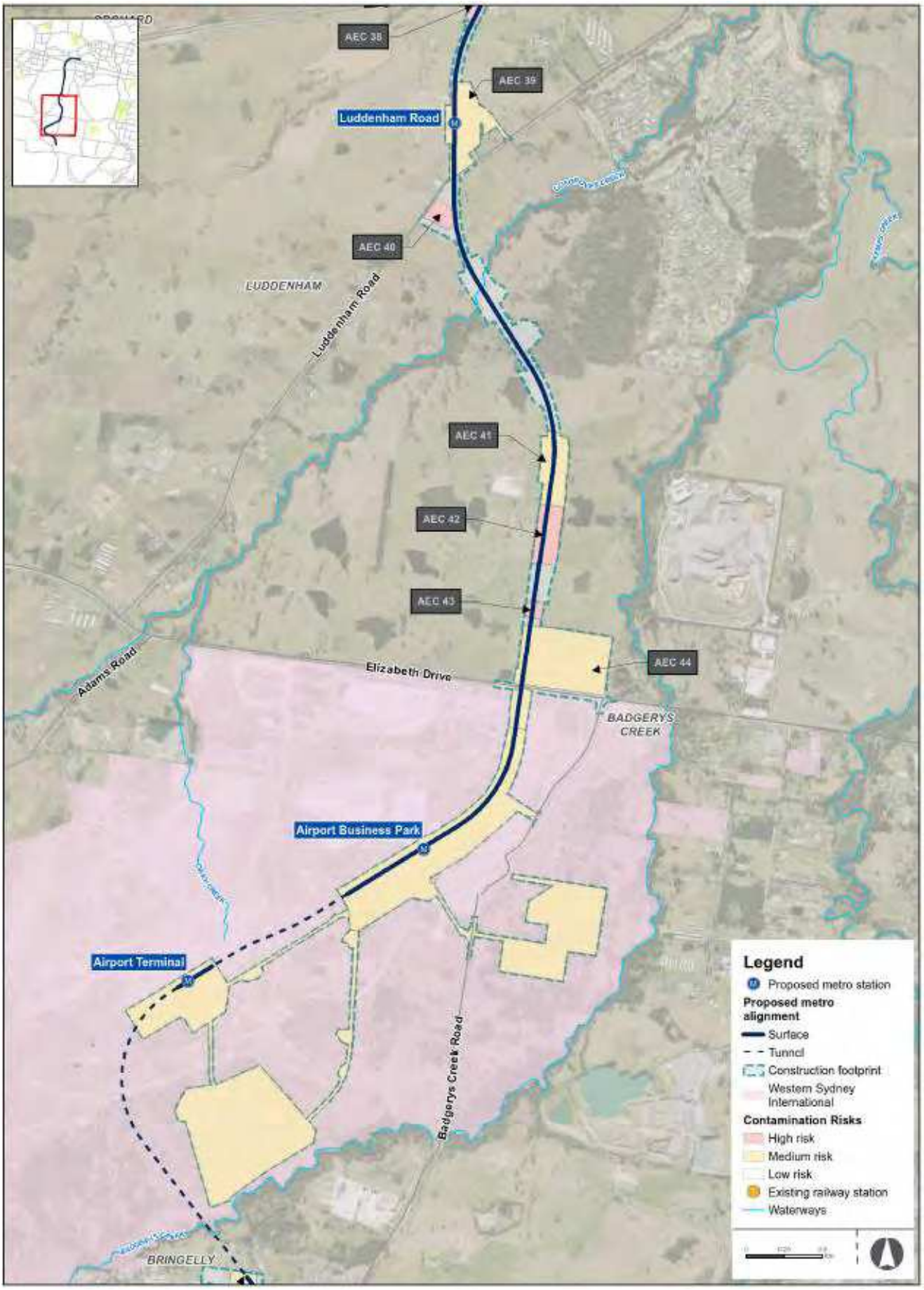

Figure 11 – Areas of Environmental Concern – Southern portion (Source: Extract from Figure 16-2c SMWSA EIS Ch16)

7.6.1. Unexpected Finds

Any unexpected contaminated soils encountered during SCAW will be managed as per the **Appendix C5 – Unexpected Contaminated Land and Asbestos Finds Procedure**.

In case any contaminated soil requires to be stockpiled on site, this will be done in a way that minimises the risk of contaminants reaching the water table or surface waters.

7.6.2. Acid Sulfate Soils

The ASS risk is considered low and potential inland acid sulfate areas have been identified in areas corresponding largely to those surrounding the main watercourse crossings on the project where ground disturbance is required. Figure 2 above illustrates these potential areas.

In the event that ASS is encountered, this will be managed in accordance with the following documents:

- Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee, 1998)
- Waste Classification Guidelines – Part 4: Acid Sulfate Soils (EPA, 2014).
- The **Appendix D – Unexpected Acid Sulfate Soil Finds Procedure**.

Potential acid sulfate soils locations are identified in the areas surrounding the major waterway crossings (e.g. Blaxland Creek, Cosgroves Creek) as shown in Figure 2 and indicated by areas of high salinity potential. Further testing will be undertaken by CPBUI to confirm the existence of ASS in the area and details of required management strategy to meet the requirements of REMM SC7 prior to disturbance.

7.6.3. Saline Soils and groundwater

To meet the requirements of REMM SC8, sampling will be undertaken in in areas of high salinity probability to determine the presence of saline soils prior to disturbance. If saline soils are encountered, expert advice will be obtained from the project soil conservationist, and salinity will be managed in accordance with the following documents:

- Site Investigations for Urban Salinity (DLWC, 2002)
- Western Sydney Salinity Code of Practice (WSROC 2004)
- Book 4 Dryland Salinity: Productive Use of Saline Land and Water (DECC 2008)
- Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004)
- The **Appendix C4 – Acid Sulfate Soil Management Procedure**

Wherever possible, avoid disturbance or exposure of saline soils. Consideration must be given to lowering the water table through the following:

- Reducing infiltration rates (e.g. lining of waterways with impervious materials)
- Improving drainage (e.g. installation of subsoil drains).

Groundwater sampling was undertaken by Sydney Metro (as outlined in Section 5.8.5) and a Groundwater Interpretation Report prepared by CPBUI to consider if saline groundwater (>1000 µS/cm) is present. Due to the limited interaction with the groundwater, the SCAW project is not predicted to cause rising groundwater, however, further investigations will be completed as part of DSIs and additional measures for salinity, if practical would be implemented as required by REMM SC9.

7.6.4. Hazardous Material

Prior to the stripping and demolition of structures and buildings which are suspected of containing hazardous materials (particularly asbestos) a hazardous materials audit will be carried out as required by REMM HR3.

The proposed locations where hazardous materials are known are in AEC43 and associated with the three buildings to be removed from the McGarvie Smith Farm:

- Cottage No. 2 (E06E) – Asbestos, Synthetic Mineral Fibers (SMF), polychlorinated biphenyls and lead paint in building to be demolished
- Cottage No. 3 (E06J) – Asbestos and lead paint in building to be demolished
- Cottage No. 4 (E06G) – Asbestos and SMF in building to be demolished

Hazardous materials and special waste (such as asbestos) will be classified in accordance with the Waste Classification Guidelines and removed and disposed of in accordance with the relevant legislation, codes of practice and Australian Standards (including the Work Health and Safety and Regulation 2011 (NSW)). Further detail is contained in the Demolition Management Plan (SMWSASCA-CPU-1NL-NL000-DM-PLN-000001)

7.6.5. Contamination controls

Controls that are adequate to minimize contamination impacts, to ensure compliance, and to reduce risk are implemented before any relevant works commence. Elimination of the hazard is the first preference of control, followed by engineering, then administrative controls. Typical controls used on this project are included in Table 14 and will be further defined in RAPs to be prepared to address contamination in accordance with CoA E93.

Table 14 – Contamination controls

Control	Accountability
Contaminated land & general contamination risks shall be considered when developing Construction Area Plans and Work Packs	Project Engineers Environment Manager
When contaminated materials are discovered or suspected, works will cease, and the Site Supervisor and Environment Manager notified immediately and **Appendix C5 – Unexpected Contaminated Land and Asbestos Finds Procedure** implemented	All staff Site Supervisor Environment Manager
Ensure contaminated land is handled, stockpiled, reused and/or disposed of as per the RAP prepared	Site Supervisor
Contaminated water runoff from suspected or actual contaminated land and stockpiles will be contained, treated and managed	Site Supervisor
All vehicles, plant and other machinery operating in contact with contaminated soil will be decontaminated prior to leaving site	Site Supervisor

7.7. Ongoing Environmental Risk Identification and Management

The ongoing identification and management of environmental risks and opportunities is a key consideration during all project risk assessment activities and is described in the CEMP.

A Project Preliminary Environmental Risk Assessment has been conducted to identify key risks and control measures; to inform the preparation of the CEMP, sub-plans and procedures; and to provide input into the project Risk Register. The project Risk Register is a dynamic document that will be reviewed and updated as the project progress.

Environmental risk assessments are completed at each stage of project planning and delivery, and each level of risk assessment is periodically reviewed. The key documents and activities underpinning ongoing environmental risk assessment are:

- Construction Area Plan (CAP) Risk Assessments
- Work Pack Risk Assessments
- Environmental Work Method Statements (EWMS)
- Pre-start Meetings.

7.8. Controls Used to Manage Water Quality

Controls that are adequate to minimise water use and potential water quality impacts, to ensure compliance, and to reduce risk are implemented before any relevant works commence. Elimination of the hazard is the first preference of control, followed by engineering, then administrative controls. Typical controls used on this project are included in Table 15

Table 15 – Water quality controls

Control	Accountability
Erosion and sediment controls will be designed, developed and implemented in consultation with the construction team and Project Environmental Representative	Site Supervisor Environment Manager
Prior to the commencement of works, a Water Pollution Impact Assessment shall be prepared to assess the impacts of proposed construction-phase project discharge limits against the NSW Water Quality Objectives (WQOs) in accordance with CoA condition E130.	Environment Manager
Wherever possible, clean water will be diverted around disturbed site areas, stockpiles and contaminated areas. These diversions would be installed prior to the commencement of works wherever possible.	Site Supervisor Project Engineer
Erosion and sediment controls will be installed downstream of works, stockpiles and other disturbed areas prior to or immediately upon any disturbance to vegetation or soil. These controls will remain in place until revegetation, stabilisation or hard scaping has occurred. If these controls require maintenance notify your supervisor.	Site Supervisor Project Engineer
Cleared areas will be kept to a minimum and be progressively rehabilitated/revegetated as they become available.	Site Supervisor
All materials will be stockpiled away from water flow paths.	Site Supervisor
Sediment laden water (dirty water) captured onsite will be preferentially reused e.g. dust control.	Site Supervisor Engineer
Water transfers/movement around site and discharged from site is in strict accordance with the site's dewatering procedure and Permit to Dewater or Discharge, which is approved by the Environment Manager (or delegate).	Environment Manager Site Supervisor
An adequate number of concrete washout facilities will always be maintained. The washout facilities will be isolated from surface water flows using bunds to prevent contamination of clean surface waters and will be lined to prevent contamination of soil and ground water	Site Supervisor Project Engineer
Dangerous good and hazardous materials storage will be within bunded areas with a capacity of 110% of the maximum single stored volume.	Site Supervisor
All hazardous substances (liquids and solids) are stored and managed according with AS1940.	Site Supervisor
Chemicals will be stored and handled in accordance with relevant Australian standards	Site Supervisor
Spill kits are to be available on site where activities are being undertaken with risks of spillages (e.g. batch plants, storage areas and main work sites)	Site Supervisor
All refuelling points, including refuelling trucks, will carry hydrocarbon spill kits.	Site Supervisor
All spills on site will be managed in accordance with the Emergency Spill Response Procedure	Site Supervisor
The quantity of water consumed on the project from each of the following sources are reported monthly: Potable water Water obtained under an extraction licence or other regulatory authority Recycled water sourced from outside the project.	Project Engineer Sustainability Manager
A water budget appropriate to the type and scale of the project will be maintained.	Sustainability Manager

Control	Accountability
Opportunities to minimise the use of potable/fresh water will be continually sought and adopted as appropriate.	Sustainability Manager
Temporary waterway crossings will be designed and constructed to minimise impacts on natural flow regimes and to not present any barriers. Temporary waterway crossings will be designed by a suitably qualified and experienced person and will incorporate suitable hard, durable material that will avoid erosion of fine particles into waterways or siltation of waterways. Erosion and sediment controls will be implemented at the entry and exits points of temporary waterway crossings as per Blue Book requirements	Senior Design Manager Project Engineers

7.9. Monitoring

Inspection of work activities with the potential for soil and water impacts will occur for the duration of construction. Weekly and other routine inspections by the Sydney Metro Environment Manager (or delegate) and project ER will occur throughout construction. The project requirements for monitoring are detailed in the MIRRA schedule (Element 3 (Section 7.4) and Element 4 (Section 7.13) of the CEMP) and contained in Table 16. Monitoring will be undertaken to assist the management of cumulative impacts.

Table 16 –Monitoring and inspections relevant soil and water management

Monitoring/inspection	Frequency	Responsibility
Site inspections	Weekly and prior to heavy rainfall (greater than 20 mm predicted)	Environment Manager
Post rainfall inspections	Following >20mm rain in 24 hours	Environment Manager
Surface water monitoring program	Monthly	Environment Manager
Visual surveillance of ESCPs, stockpiles, mud tracking	Daily	Site Supervisors

7.9.1. Surface Water Quality Monitoring Program

Appendix A contains the Surface Water Quality Monitoring Program (SWQMP) that has been prepared in accordance with CoA C13 and in consultation with DPE Water, DPI Fisheries, and Penrith and Liverpool Councils. To meet REMM WQ1, a copy of this program was provided to NSW EPA as part of the application for the EPL. As the SCAW project footprint is not upstream of the Western Sydney Airport, they have not been formally consulted with (as relevant), but will be provided a copy of the program for information. The Secretary's approval and ER endorsement of this WQMP will be sought as part of seeking approval and endorsement of this Sub-Plan.

Results of the SWQMP, in the form of a 6-Monthly Construction Monitoring Report, will be submitted to the Planning Secretary and relevant regulatory agencies (nominally only Penrith City Council and the EPA as part of EPL E2 conditions) on a six-monthly basis from the commencement of construction in accordance with CoA C22.

Water quality will be monitored to ensure discharge from the construction impact area is in accordance with regulatory guidelines, ANZECC/NSW Water Quality Objectives (required by CoA E126), conclusions from the Water Pollution Discharge Impact Assessment (prepared to CoA E130) and to identify potential non-compliances before they occur.

7.9.2. Meteorological Monitoring

Meteorological data will be checked to assist with managing impacts and identify potential non-compliances. Weather data including daily weather conditions and forecasts will be obtained from weather station to be installed at the main compound and cross checked with the Bureau of Meteorology monitoring stations at The Orchard Hills Treatment Works AWS (Station Number 067084) and Badgerys Creek AWS (Station Number 067108).

In addition, the Site Supervisor, Site Engineers and Environment Coordinator will monitor rainfall events on site.

The criteria for monitoring rain events and the associated response is provided in Table 17 below.

Table 17 – Meteorological monitoring details

Event	Criteria	Response
Rain Event	>20mm in 24 hours	▪ Inspect rumble grid and wheel-wash facilities ▪ Inspect adjacent roads for signs of mud tracking ▪ Inspect site erosion and sediment controls for effectiveness/maintenance

7.9.3. Post Construction Monitoring

Post construction, an inspection of construction, stockpiling and laydown sites and soil validation of redundant sedimentation/water quality basins would be undertaken to assess if further investigation and remediation is required in accordance with REMM SC6 and SC10.

All inspections, investigations and remediation would be undertaken by a qualified contaminated lands consultant with reports prepared or reviewed by a Certified Contaminated Land Consultant.

The inspections reports will include as a minimum:

- Details of any contamination / remediation / validation undertaken in the area (if applicable)
- Visual confirmation that all wastes and construction materials have been removed
- Details of any soil sampling undertaken and comparison of the results against the HHERA

7.10. Cumulative impact management

CPBUI will manage the potential for cumulative impacts via coordination and engagement with key stakeholders and other SSI projects in accordance with the Sydney Metro Construction Cumulative Impacts Management Plan (developed in accordance with REMM CL1) and the SCAW Community Communications Strategy.

Cumulative impacts from soil and water quality will be managed through the monitoring requirements detailed in Section 7.9 which will be used to monitor the cumulative impacts from the SCAW project and other surrounding projects or waste facilities and identify if further management measures are required.

8. Elements and Expectations

Part B of this Sub-plan explains how potential soil and water impacts during the SCAW Works will be minimised and managed. Compliance with all elements is required at all times to minimise the likelihood of causing unauthorised environmental harm and maximise the uptake of opportunities to reduce environmental impact.

Part B contains the following:

- **Environmental Elements and Expectations:** These describe what is required of CPBUI JV to implement the objectives of the Environment and Sustainability Policy Statement and system requirements:
- **Element** – Key aspects for managing this function in delivering the SCAW Works
- **Expectation** – The outcomes achieved as part of each Element.
- **Requirements:** These are the specific actions required to demonstrate compliance with the Elements and Expectations.
- **Responsibility and Key Contributor:** Designation of responsibility for achieving compliance with the stated Expectation. Key contributors assist/contribute to achieving compliance.
- **Deliverables:** Tangible outcomes produced to demonstrate compliance with the environmental Elements and Expectations.

Element 1: Training

CPBUI will ensure that SCAW project personnel can competently perform their duties and meet environmental obligations

Expectations		How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Deliverables
1.1	All personnel have completed an induction containing relevant environmental information before they are authorised to work on the project	Induction presentation will include: ▪ Legislative requirements (POEO Act, EPL etc.) including Section 120. ▪ Erosion and sedimentation control planning and hold points ▪ Duty to notify of environmental harm (or the potential for it) including chain of reporting. ▪ Spill containment and management procedure. ▪ Storage and use of hazardous substances. ▪ Water reuse and discharge procedure. ▪ Unexpected finds Soil Contamination and Asbestos procedure ▪ Maintenance of environmental controls (e.g. erosion and sediment controls).	**Senior HR Advisor** Environment Manager Environment Coordinators	Induction presentation Induction records
1.2	Toolbox talks are used to reinforce key management requirements and lessons learnt	Toolbox talks will be held regularly during site establishment and throughout construction. They will reinforce and reiterate information from inductions. Toolbox talks will be undertaken with key site people on the following procedures: ▪ Water Management ▪ Spill Management ▪ Unexpected Finds Soil Contamination and ASS ▪ Erosion and Sediment Control Management	**Environment Manager** Site Supervisors Environment Coordinators	Toolbox presentations Toolbox records

Expectations		How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Deliverables
1.3	Erosion and sediment control training for personnel responsible for the installation and maintenance of erosion and sediment controls	Detailed training will be provided to key personnel regarding erosion and sediment control. This training will include: ▪ Legislation as it applies to erosion and sediment control. ▪ Basics of soil management, handling and stockpiling to minimise erosion. ▪ Sediment basin management and discharge. ▪ Appropriate use, installation and maintenance of relevant erosion and sediment controls, such as silt fences. ▪ Effective site rehabilitation and stabilisation. ▪ Use of erosion control techniques such as geotextiles, organic fibre mats, mulches and soil polymer stabilisers. ▪ Monitoring of controls following rain events and maintenance as necessary, including removal of accumulated silt to maintain functionality of silt fences. ▪ Preparing, reading and interpreting Erosion and Sediment Control Plans.	**Soil Conservationist** Environment Manager **Environment Coordinators**	Training packages and presentations Training records

Element 2: Monitoring and Reporting

All staff, employees and subcontractors will actively drive compliant environmental performance of SCAW.

Expectations		How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Deliverables
2.1	Worksites are regularly inspected to ensure the adequacy of controls and compliance with the requirements of this Sub-plan	CPBUI will regularly review the SCAW Project Works to ensure compliance with this plan. A regular inspection program for soil and water will be conducted as follows: ▪ Details of daily inspections undertaken by the Site Supervisor will be logged in their respective site diaries. ▪ Weekly site inspections are to be conducted to monitor the condition, adequacy and effectiveness of ESC and other control measures ▪ Site Inspections to be conducted following significant rainfall events (> 20 mm / 24 hrs) ▪ Inspection reports will be documented in CPB's electronic systems and made available to the ER upon request. The ER will monitor the implementation of this Sub-plan and related documents such as ESCPs to ensure compliance with what is stated in the documents and the terms of the planning approvals. The ER will achieve this through: ▪ Regular inspections of active worksites ▪ Review of CPB's records such as water quality monitoring records.	Environment Manager **Site Supervisors** **Environment Coordinators** ER	Environment and Sustainability Inspection Checklists Site Diary entries ER Reports
2.2	Water Quality Monitoring	Water quality monitoring will be undertaken for controlled discharges offsite to watercourses and stormwater drainage. Surface water quality monitoring will be undertaken in line with the Surface Water Quality Monitoring Program (Appendix 1).	Environment Manager **Environment Coordinators** **Site Engineers and supervisors**	Soil and Water Monitoring Program Monitoring Forms and Reports Permit to Discharge

Expectations		How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Deliverables
2.3	Water Usage Reporting	Data of water usage and reuse on site will be collected to allow monthly reporting.	Environment Manager **Environment Coordinators**	Monthly Sustainability Reports Monthly EMS reporting
2.4	Records of testing of any water prior to discharge	Records of the release of the hold point to discharge water from the construction site to the receiving environment will be held on file	Environment Manager **Environment Coordinators**	Permit to Discharge
2.5	Salinity and ASS/PASS Monitoring and Testing	Field testing to be undertaken as part of DSI and Geotech investigations to confirm presence of salinity and ASS/PASS per REMM SC7 and SC8. If ASS/PASS is identified, following the Appendix C4 – Acid Sulfate Soil Management Procedure	Environment Manager **Environment Coordinators**	Monitoring Forms and Reports Environment and Sustainability Inspection Checklists Acid Sulfate Soils Tracking Sheet

Element 3: Auditing, Review and Improvement

CPBUI will continually improve its environmental systems and performance by monitoring and reviewing their effectiveness

Expectations		How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Deliverables
3.1	Audits are undertaken to ensure compliance with the requirements of this Sub-plan	Procedures for corrective actions are addressed in the CEMP. Audits will be performed in accordance with the CEMP and this Sub-plan. Associated documents or procedures will be updated if required. The ER may participate in or conduct audits to ensure the implementation of this Sub-plan and related documents is compliant with what is stated in the documents and the terms of the planning approvals.	**Environment Manager** Environment Coordinators Sustainability Manager ER	Audit Reports Corrective Action Reports
3.2	All non-compliances are reported and actioned	A soil and water non-compliance can generally be defined as a failure to comply with the Project Planning Approval and/or the EPL. Where a non-compliance is raised as part of an audit or an incident or complaint investigation the audit, incident or complaint report may be used to close out the non-compliance and it is not necessary to raise a separate non-compliance reporting process. Corrective and Preventative Actions may also be raised in accordance with the CEMP.	**Environment Manager** Sustainability Manager Environment Coordinators Quality Manager	Audit Reports Corrective Action Reports

Element 4: Project Specific Requirements

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CoA C1	Construction Environmental Management Plans (CEMPs) and CEMP Sub-plans must be prepared in accordance with the Construction Environmental Management Framework (CEMF) included in the documents listed in Condition A1 to detail how the performance outcomes, commitments and mitigation measures specified in the documents listed in Condition A1 will be implemented and achieved during construction.	This Sub-plan	**Environment Manager**	Pre-construction
CoA C2	With the exception of any CEMPs expressly nominated by the Planning Secretary to be endorsed by the ER, all CEMPs must be submitted to the Planning Secretary for approval. Note: The Planning Secretary will consider the assessment of the predicted level of environmental risk and potential level of community concern required under Condition €(e) when deciding whether any CEMP's may be endorsed by the ER.	Section 2.1.3	**Environment Manager**	Pre-construction
CoA C4	Any CEMP to be approved by the Planning Secretary must be endorsed by the ER and then submitted to the Planning Secretary for approval no later than one (1) month before the commencement of construction or where construction is staged no later than one (1) month before the commencement of that stage.	Section 2.1.3	**Environment Manager**	Pre-construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CoA C5	Of the CEMP Sub-plans required under Condition C1, the following CEMP Sub-plans must be prepared in consultation with the relevant government agencies identified for each CEMP Sub-plan. Details of issues raised by a government agency during consultation (as required by Condition A6) must be provided as part of the relevant CEMP Sub Plan when submitted to the Planning Secretary / ER (whichever is applicable). Where a government agency(ies) request(s) is not included, the Proponent must provide the Planning Secretary / ER (whichever is applicable) justification as to why. **Soil and Water - DPI Fisheries, and Relevant Councils**	Section 2.1.3	**Environment Manager**	Pre-construction
CoA C6	The CEMP Sub-plans must state how: (a) the environmental performance outcomes identified in the documents listed in Condition A1 will be achieved,	Section 2.1.1	**Environment Manager**	Construction
	(b) the mitigation measures identified in the documents listed in Condition A1 will be implemented,	Section 7	**Environment Manager**	Construction
	(c) the relevant terms of this approval will be complied with; and	Element 4: Project Specific Requirements	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
	(d) issues requiring management during construction (including cumulative impacts), as identified through ongoing environmental risk analysis, will be managed through SMART principles.	Element 3: Auditing, Review and Improvement Section 7 Element 2: Monitoring and Reporting The performance during construction will be monitored against the objectives and targets (Section 2.1.2) and performance monitoring will be documented in the compliance reporting addressed in Element 2: Monitoring and Reporting and at least on an annual basis as part of auditing requirements (Element 12 of the CEMP)	**Environment Manager**	Construction
CoA C12	In addition to the relevant requirements of the CEMF, the Soil and Water CEMP Sub-Plan must include but not be limited to: (a) details how the requirements of Conditions E127, E128 and E129 will be met;	Section 3.3 Section 7.1 Section 7.2 Section 7.3	**Environment Manager**	Pre-Construction
	(b) the unexpected contaminated finds protocol required by Condition E98	Section 7.6.1 Appendix C5 – Unexpected Contaminated Land and Asbestos Finds Procedure	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CoA C13	The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies (as required by Condition A6) identified for each to compare actual performance of construction of the CSSI against the performance predicted in the documents listed in Condition A1 or in the CEMP. Where a government agency(ies) request(s) is not included, the Proponent must provide the Planning Secretary / ER (whichever is applicable) justification as to why. Required Construction Monitoring Programs Relevant government agencies to be consulted for each Construction Monitoring Program (b) Surface water–quality - DPIE Water *(now DPE Water)*, DPI Fisheries, and Relevant Councils	Section 7.9 Appendix C1 – Surface Water Quality Monitoring Program	**Environment Manager**	Pre-Construction
CoA C14	Each Construction Monitoring Program must provide: (a) details of baseline data available including the period of baseline monitoring;	Section 7.9 Appendix C1 – Surface Water Quality Monitoring Program	**Environment Manager**	Pre-Construction
	(b) details of baseline data to be obtained and when;			
	(c) details of all monitoring of the project to be undertaken;			
	(d) the parameters of the project to be monitor€			
	(e) the frequency of monitoring to be undertaken;			
	(f) the location of monitoring;			
	(g) the reporting of monitoring results and analysis results against relevant criteria;			
	(h) details of the methods that will be used to analyse the monitoring data;			
	(i) procedures to identify and implement additional mitigation measures where the results of the monitoring indicated unacceptable project impacts;			
	(j) a consideration of SMART principles;			

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
	(k) any consultation to be undertaken in relation to the monitoring programs; and			
	(l) any specific requirements as required by Conditions C15 to C16			
CoA C17	With the exception of any Construction Monitoring Programs expressly nominated by the Planning Secretary to be endorsed by the ER, all Construction Monitoring Programs must be submitted to the Planning Secretary for approval.	Section 2.1.3	**Environment Manager**	Pre-construction
CoA C19	Any of the Construction Monitoring Programs which require Planning Secretary approval must be endorsed by the ER and then submitted to the Planning Secretary for approval at least one (1) month before the commencement of construction or where construction is staged no later than one (1) month before the commencement of that stage.	Section 1.1	**Environment Manager**	Pre-construction
CoA C20	Unless otherwise agreed with the Planning Secretary, construction must not commence until the Planning Secretary has approved, or the ER has endorsed (whichever is applicable), all of the required Construction Monitoring Programs and all relevant baseline data for the specific construction activity has been collected.	Section 1.1	**Environment Manager**	Pre-construction
CoA C21	The Construction Monitoring Programs, as approved by the Planning Secretary or the ER has endorsed (whichever is applicable), 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 Planning Secretary or the ER (whichever is applicable), whichever is the greater.	Section 1.1	**Environment Manager**	Pre-construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CoA C22	The results of the Construction Monitoring Programs must be submitted to the Planning Secretary, ER and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program. Note: Where a relevant CEMP Sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-plan.	Section 7.9 Appendix C1 – Surface Water Quality Monitoring Program	**Environment Manager**	Construction

<table>
<tr><th>No</th><th>Requirement</th><th>How we will meet the Expectations (minimum requirements)</th><th>Responsibility Key Contributor</th><th>Timing</th></tr>
<tr><td>CoA E15</td><td>The CSSI must be designed and constructed with the objective of not exceeding the flood impacts presented in the documents listed in Condition A1 or the flood impact criteria in Table 5, whichever is greater, within and in the vicinity of the CSSI for all flood events up to and including the one (1) per cent Annual Exceedance Probability (AEP) flood event.

Table 5: Flood Impact Criteria
<table>
<tr><th>Parameter</th><th>Location</th><th>Criteria</th></tr>
<tr><td rowspan="4">Afflux</td><td rowspan="3">Land zoned as residential, industrial or commercial, and critical infrastructure</td><td>Maximum 10 mm to buildings that are flood prone in existng conditions</td></tr>
<tr><td>No new above floor flooding</td></tr>
<tr><td>Maximum 50 mm where flooding is below floor level</td></tr>
<tr><td>Roads</td><td>Maximum 50 mm</td></tr>
<tr><td>Velocity</td><td>Land zoned as rural, primary production, environment or public recreation</td><td>Maximum 100 mm</td></tr>
<tr><td>Flood hazard</td><td>All areas</td><td>Velocities are to remain below 1 metre per second. Where existing velocities exceed 1 metre per second, increase by less than 10 per cent</td></tr>
<tr><td rowspan="2">Flood duration</td><td>Residential and commercial land</td><td>No increase in the flood hazard or risk to life</td></tr>
<tr><td>Roads</td><td>No increase in the flood hazard or risk to life</td></tr>
<tr><td rowspan="2">Residential and commercial buildings</td><td>No increase to duration of above floor flooding</td></tr>
<tr><td>Roads</td><td>No more than one hour increase</td></tr>
<tr><td>Crown land, open space, farming, grazing and cropping land</td><td>No more than one hour increase</td></tr>
</table>
Measures identified in the documents listed in Condition A1 to limit flooding impacts or measures that achieve the same outcome must be incorporated into the detailed design of the CSSI.</td><td>Design Reports</td><td>Design Manager</td><td>Construction</td></tr>
</table>

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CoA E16	Updated modelling that incorporates these measures and is calibrated and validated with consideration of the results of the Wianamatta-South Creek Catchment Flood Assessment prepared by Infrastructure NSW as part of Stage 2 of the South Creek Sector Review must be prepared by a suitably qualified flood consultant. The modelling must identify changes in post-development flood behaviour including cumulative flood impacts associated with Western Sydney International Airport and the M12, where this information is available, prior to detailed design being finalised.	Design Reports	**Design Manager**	Construction
CoA E17	Where flooding characteristics exceed the levels identified in Condition E15 above the Proponent must undertake the following: (a) consult with affected landowners for properties adversely flood affected as a result of the CSSI regarding appropriate mitigations; and (b) consult with the NSW State Emergency Service (SES) and Relevant Council(s) regarding the management of any continuous and residual flood risk from rarer flood events larger than the 1 per cent AEP and up to the probable maximum flood. In the event that the Proponent and the affected landowner cannot agree on the measures to mitigate the impact as described in Condition E15, the Proponent must engage a suitably qualified and experienced independent person to advise and assist in determining the impact and relevant mitigation measures.	Design Reports	**Design Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CoA E18	Flood information including flood reports, models and geographic information system outputs must be provided to the DPIE PDPS, Relevant Council(s), DPIE EES and the SES in order to assist in preparing relevant documents and to reflect changes in flood behaviour as a result of Stage 1 of the CSSI. The DPIE PDPS, Relevant Council(s), DPIE EES and the SES must be notified in writing that the information is available no later than one (1) month following the completion of construction. Information requested by the DPIE PDPS, Relevant Council(s), DPIE EES or the SES must be provided no later than six (6) months following the completion of construction or within another timeframe agreed with the DPIE PDPS, Relevant Council(s), DPIE EES and the SES. The project flood models and data must be uploaded to the NSW Flood Data Portal and access must be provided to the DPIE PDPS, Relevant Council(s), DPIE EES and SES no later than one (1) month following the completion of construction.	Design Reports	**Design Manager**	Post-Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CoA E92	Before commencement of any construction that would result in the disturbance of moderate to high risk contaminated sites as identified in the documents identified in Condition A1, Detailed Site Investigations (for contamination) must be conducted to determine the full nature and extent of the contamination. The Detailed Site Investigation Report(s) and the subsequent report(s), must be prepared, or reviewed and approved, by consultants certified under either the Environment Institute of Australia and New Zealand's Certified Environmental Practitioner (Site Contamination) scheme (CEnvP(SC)) or the Soil Science Australia Certified Professional Soil Scientist Contaminated Site Assessment and Management (CPSS CSAM) scheme. The Detailed Site Investigations must be undertaken in accordance with guidelines made or approved under section 105 of *Contaminated Land Management Act 1997* (NSW). Note: Nothing in this condition prevents the Proponent from preparing individual Detailed Site Investigation Reports (for contamination) for separate sites.	Section 7.6	**Contaminated Land Specialist**	Pre-construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CoA E93	Should remediation be required to make land suitable for the final intended land use, a Remedial Action Plan must be prepared, or reviewed and approved, by consultants certified under either the Environment Institute of Australia and New Zealand's Certified Environmental Practitioner (Site Contamination) scheme (CEnvP(SC)) or the Soil Science Australia Certified Professional Soil Scientist Contaminated Site Assessment and Management (CPSS CSAM) scheme. The Remedial Action Plan must be prepared in accordance with relevant guidelines made or approved by the EPA under section 105 of the *Contaminated Land Management Act 1997* (NSW) and must include measures to remediate the contamination at the site to ensure the site will be suitable for the proposed use when the Remedial Action Plan is implemented. Note: Nothing in this condition prevents the Proponent from preparing individual Remedial Action Plans for separate sites.	Section 7.6	**Contaminated Land Specialist**	Pre-construction
CoA E94	Before commencing remediation, a Section B Site Audit Statement(s) must be prepared by an NSW EPA-accredited Site Auditor that certifies that the Remedial Action Plan(s) is/are appropriate and that the site can be made suitable for the proposed use. The Remedial Action Plan(s) must be implemented and any changes to the Remedial Action Plan(s) must be approved in writing by the NSW EPA-accredited Site Auditor. Note: Nothing in this condition prevents the Proponent from engaging an NSW EPA-accredited Site Auditor to prepare individual Site Audit Statements for Remedial Action Plans for separate sites.	Section 7.6	**NSW Site Auditor** Contaminated Land Specialist	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CoA E95	Validation Report(s) must be prepared in accordance with Consultants Reporting on Contaminated Land: Contaminated Land Guidelines (EPA, 2020) and relevant guidelines made or approved under section 105 of the *Contaminated Land Management Act 1997* (NSW). Note: Nothing in this condition prevents the Proponent from preparing individual Validation Reports for separate sites.	Section 7.6	**Environment Manager** Contaminated Land Specialist	Construction
CoA E96	A Section A1 or Section A2 Site Audit Statement (accompanied by an Environmental Management Plan) and its accompanying Site Audit Report, which state that the contaminated land disturbed by the work has been made suitable for the intended land use, must be submitted to the Planning Secretary and the Relevant Council(s) after remediation and before the commencement of operation of the CSSI. Note: Nothing in this condition prevents the Proponent from obtaining Section A Site Audit Statements for individual parcels of remediated land.	Section 7.6	**NSW Site Auditor** Contaminated Land Specialist	Construction
CoA E97	A copy of Detailed Site Investigation Report(s), Remedial Action Plan(s), Validation Report(s), Site Audit Report(s) and Site Audit Statement(s) must be submitted to the Planning Secretary and the Relevant Council(s) for information	Section 7.6	**Environment Manager**	Construction
CoA E98	An Unexpected Contaminated Land and Asbestos Finds Procedure must be prepared before the commencement of construction and must be followed should unexpected contaminated land or asbestos (or suspected contaminated land or asbestos) be excavated or otherwise discovered during construction.	Section 7.6.1 Appendix C5 – Unexpected Contaminated Land and Asbestos Finds Procedure	**Environment Manager**	Pre-construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CoA E99	The Unexpected Contaminated Land and Asbestos Finds Procedure must be implemented throughout construction.	Section 7.6.1 Appendix C5 – Unexpected Contaminated Land and Asbestos Finds Procedure	**Environment Manager**	Construction
CoA E102	**A Water Reuse Strategy must be prepared, which sets out options for the reuse of collected stormwater and groundwater during construction and operation. The Water Reuse Strategy must include, but not be limited to:**	Section 7.2.2 **Sustainability Management Plan**	**Environment Manager** **Sustainability Manager**	Pre-construction
	(a) evaluation of reuse options;			
	(b) details of the preferred reuse option(s), including volumes of water to be reused, proposed reuse locations and/or activities, proposed treatment (if required), and any additional licences or approvals that may be required;			
	(c) measures to avoid misuse of recycled water as potable water;			
	(d) consideration of the public health risks from water recycling; and			
	(e) time frame for the implementation of the preferred reuse option(s).			
	The Water Reuse Strategy must be prepared based on best practice and advice sought from relevant agencies, as required. The Strategy must be applied during construction. Justification must be provided to the Planning Secretary if it is concluded that no reuse options prevail. A copy of the Water Reuse Strategy must be made publicly available. Note: Nothing in this condition prevents the Proponent from preparing separate Water Reuse Strategies for the construction and operational stages of the CSSI.			

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CoA E126	The CSSI must be designed and constructed so as to maintain the NSW Water Quality Objectives (NSW WQO) where they are being achieved as at the date of this approval, and contribute towards achievement of the NSW WQO over time where they are not being achieved as at the date of this approval, unless an EPL in force in respect of the CSSI contains different requirements in relation to the NSW WQO, in which case those requirements must be complied with.	Section 7.9 Appendix C8 – Discharge and Dewatering Protocol Progressive ESCPs	**Environment Manager**	Construction
CoA E127	The Proponent must consider the Guidelines for controlled activities on waterfront land riparian corridors (Department of Industry 2018) when carrying out work within 40 metres of a watercourse, including its bed.	Section 7.3 Progressive ESCPs	**Environment Manager**	Construction
CoA E128	Before undertaking any works and during maintenance or construction activities, erosion and sediment controls must be implemented and maintained to prevent water pollution consistent with Managing Urban Stormwater: Soils and Construction Vol 1 4th ed. by Landcom, 2004 (The Blue Book).	Section 7.1	**Environment Manager**	Construction
CoA E130	If construction stage stormwater discharges are proposed, a Water Pollution Impact Assessment will be required to inform licensing consistent with section 45 of the POEO Act. Any such assessment must be prepared in consultation with the EPA and be consistent with the National Water Quality Guidelines, with a level of detail commensurate with the potential water pollution risk. Note: If an EPL is required the Water Pollution Impact Assessment will be required to inform licensing consistent with section 45 of the POEO Act.	Section 7.9.1	**Environment Manager**	Construction
CoA E131	Drainage feature crossings (permanent and temporary watercourse crossings and stream diversions) and drainage swales and depressions must be carried out in accordance with relevant guidelines and designed by a suitably qualified and experienced person.	Design Reports	**Design Manager**	Pre-construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
REMM HYD1	Construction planning would consider flood related mitigation, including: ▪ staging construction works to reduce the duration of works within the floodplain ▪ daily and continuous monitoring of weather forecasts and storm events, rainfall levels and water levels in key watercourses to identify potential flooding events and related flood emergency response ▪ consultation with NSW State Emergency Services and relevant local councils to ensure consistent approaches to the management of flood events (off-airport only) ▪ provide flood-proofing to excavations at risk of flooding during construction, where reasonable and feasible, such as raised entry into shafts and/or pump-out facilities to minimise ingress of floodwaters into shafts and the dive structure ▪ review of site layout and staging of construction works to avoid or minimise obstruction of overland flow paths and limit the extent of flow diversion required	Section 7.4 Emergency Response Plan Progressive ESCPs	**Environment Manager**	Pre-construction
REMM HYD2	Minimise works in the main creek channels (at Blaxland Creek, unnamed watercourse south of Patons Lane and Cosgroves Creek) where possible and avoid works in the channel during rainfall events	Section 7.3 Progressive ESCPs	**Environment Manager**	Construction
REMM HYD3	Surface water flows during construction would be managed to ensure that there is no increase in flows into or through the Warragamba to Prospect Water Supply Pipelines corridor.	Progressive ESCPs Design Reports	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
REMM WQ1	A surface water quality monitoring program would be implemented to monitor water quality during construction. The program would be developed in consultation with (as relevant) Western Sydney Airport, NSW Environment Protection Authority, relevant sections of Department of Planning, Industry and Environment and relevant local councils. The program would consider monitoring being undertaken as part of other infrastructure projects such as the M12 Motorway and Western Sydney International On-airport, the water quality monitoring program would ensure that works meet the requirements under Schedule 2 of the *Airports (Environment Protection) Regulations 1997*. The program would monitor all construction discharge locations.	Section 7.9.1 Appendix C1 – Surface Water Quality Monitoring Program	**Environment Manager**	Construction
REMM WQ3	The design and construction of the project would take into account the former NSW Office of Water's Guidelines for controlled activities on waterfront land.	As per CoA E127	**Environment Manager**	Construction
REMM OHYD1	The flood model for the project would be updated with regard to flood modelling undertaken for the South Creek Sector Review (anticipated to be released in 2021). The updated flood modelling would be used to inform design development including but not limited to, addressing potential residual flood impacts identified at the following locations: ▪ the viaduct and earthworks in the vicinity of Blaxland Creek so as to minimise the extent of the project within the floodplain ▪ the earthworks arrangement at the stabling and maintenance facility in the area affected by the Probable Maximum Flood The flood model for the project would be prepared in consultation with relevant stakeholders	Design Reports	**Design Manager**	Pre-construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
REMM OHYD4	The design of the viaduct crossing over the Warragamba to Prospect Water Supply Pipelines would not result in an increase of overland flows into or through the pipelines corridor for each storm event up to and including the 1% AEP event	Design Reports	**Design Manager**	Pre-construction
REMM OWQ1	Design batter slope gradients and surface treatments to minimise erosion risk	Progressive ESCPs Design Reports	**Senior Design Manager** Environment Manager	Pre-construction and Construction
REMM OWQ2	Drainage and water treatment design to be undertaken in accordance with Water Sensitive Urban Design requirements specified in local council, Transport for NSW and on-airport standards	Design Reports	**Senior Design Manager** Environment Manager	Pre-construction and Construction
REMM OWQ3	Suitably designed scour and erosion controls should be included at drainage and sedimentation basin outlet discharge points	Progressive ESCPs	**Environment Manager**	Construction
REMM OWQ4	Detailed design of viaducts across waterways would aim to minimise infrastructure within the bed and banks of existing waterways and minimise changes to flood behaviour across the floodplain	Design Reports	**Senior Design Manager**	Pre-construction
REMM OWQ5	Where feasible, on-site detention of stormwater would be introduced where stormwater runoff rates are increased. Where there is insufficient space for the provision of on-site detention, the upgrade of downstream infrastructure would be implemented where feasible and reasonable	Design Reports	**Senior Design Manager**	Pre-construction
REMM OWQ6	At all locations where stormwater is discharged, water quality measures such as gross pollutant traps, bio-retention swales and Water Sensitive Urban Design features would be investigated and implemented where feasible and reasonable	Design Reports Progressive ESCPs	**Senior Design Manager** Environment Manager	Pre-construction and Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
REMM SC1	The Soil and Water Management Plan would incorporate the following measures: ▪ for low risk areas of environmental concern, worker health and safety measures, waste management and tracking for contamination would be outlined. ▪ for medium and high risk areas of environmental concern, detailed site investigations and review of further available information would be undertaken prior to the start of construction	Section 7.6	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
REMM SC2	Based on outcomes of SC1: ▪ if a medium or high risk area of environmental concern is reassessed as low risk, the site would be managed in accordance with the Soil and Water Management Plan. This would typically occur where there is minor, isolated contamination that can be readily remediated through standard construction practices such as excavation and off-site disposal ▪ for areas of environmental concern that remain or change to medium risk, visual inspections and monitoring would be performed during earthworks. If suspected contamination is encountered, the materials would be subject to sampling and analysis to assess management requirements in accordance with statutory guidelines made or endorsed by the NSW Environment Protection Authority statutory guidelines ▪ for areas of environmental concern that remain or change to high risk, a Sampling, Analysis and Quality Plan would be prepared for Detailed Site Investigations or data gap investigations. The results from the site investigations would be assessed against criteria contained within the National Environment Protection (Assessment of Site Contamination) Measure (2013) and other applicable NSW statutory guidelines to assess whether remediation is required. Remediation works would be performed in accordance with the hierarchy of preferred strategies in the Guidelines for the NSW Site Auditor Scheme (NSW Environment Protection Authority, 2017) and other guidelines made or endorsed by the NSW Environment Protection Authority. Where practical, remediation works would be integrated with excavation and development works performed during construction	Section 7.6	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
REMM SC3	Where information gathered from investigations for medium and high risk areas of environmental concern (as per mitigation measure SC1) is insufficient to determine the risk of contamination, a detailed site investigation would be carried out in accordance with the National Environment Protection Measure (2013) and other guidelines made or endorsed by the NSW Environment Protection Authority Where data from the additional data review (mitigation measure SC1) or the detailed site investigation (mitigation measure SC2) confirms that contamination would require remediation, a Remediation Action Plan would be developed for the area of the construction footprint. If a Remediation Action Plan is required, it would be developed in accordance with NSW Environment Protection Authority statutory guidelines and a Site Auditor would be engaged. Remediation methodologies would be undertaken in accordance with Australian Standards and other relevant government guidelines and codes of practice Remediation would be performed as an integrated component of construction and to a standard commensurate with the proposed end use of the land	Section 7.6	**Environment Manager**	Construction
REMM SC4	If a duty to report to the NSW Environment Protection Authority under Section 60 of the Contaminated Lands Management Act 1997 is triggered, or where a medium to high risk of contamination is identified, an accredited Site Auditor would review and approve the Remediation Action Plan (including issue of interim audit advice) and would develop a Site Audit Statement and Site Audit Report upon completion of remediation	Section 7.6	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
REMM SC5	An unexpected finds procedure would be developed and implemented as part of the project Soil and Water Management Plan, outlining a set of potential contamination issues which could be encountered, and detailing the management actions to be implemented. The unexpected finds procedure would include a process for chemical and asbestos contamination and would generally include: ▪ cessation of works within the affected area until inspection of the suspected contamination by a qualified contaminated lands consultant (verification by a certified contaminated land practitioner) ▪ collection of soil samples for chemical or asbestos analysis, where required, based on observations ▪ assessment of results against applicable land use or waste classification criteria in accordance with statutory guidelines made or endorsed by the NSW Environment Protection Authority statutory guidelines ▪ management of the contamination in accordance with statutory guidelines made or endorsed by the NSW Environment Protection Authority statutory guidelines ▪ the unexpected finds procedure for on-airport construction would be consistent with the Western Sydney Airport unexpected finds procedure detailed in the Soil and Water Construction Environmental Management Plan (Western Sydney Airport, 2019)	As per CoA E98	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
REMM SC6	Post construction, an inspection of construction, stockpiling and laydown sites and soil validation of redundant sedimentation/water quality basins would be undertaken to assess if further investigation and remediation is required. Investigation and remediation (if required) would be undertaken in accordance with the Soil and Water Management Plan (off-airport) and a project specific Remediation Action Plan that would be prepared in a manner consistent with the Western Sydney Airport Remediation Action Plan (2019) (on-airport). All inspections, investigations and remediation would be undertaken by a qualified contaminated lands consultant with reports prepared or reviewed by a Certified Contaminated Land Consultant	Section 7.9.3	**Environment Manager**	Construction
REMM SC7	Prior to ground disturbance in areas of potential acid sulfate soil occurrence, testing would be carried out to determine the actual presence of acid sulfate soils. If acid sulfate soils are encountered, they would be managed in accordance with the Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee, 1998)	Section 7.6.2	**Environment Manager**	Construction
REMM SC8	Prior to ground disturbance in high probability salinity areas testing would be carried out to determine the presence of saline soils. If salinity is encountered, excavated soils would not be reused or would be managed in accordance with Book 4 Dryland Salinity: Productive Use of Saline Land and Water (NSW DECC 2008). Erosion controls would be implemented in accordance with the Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004)	Section 7.6.3	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
REMM SC9	Targeted groundwater investigations would be undertaken prior to construction to identify high salinity areas at risk from rising groundwater. Where high saline areas (>1000 µS/cm) are identified, measures such as planting, regenerating and maintaining native vegetation and good ground cover in recharge, transmission and discharge zones would be implemented where possible	Section 7.6.3	**Environment Manager**	Construction
REMM SC10	Where the construction footprint is not used as part of the operational footprint (residual land), an assessment of the suitability of the site for the proposed land use would be undertaken in accordance with statutory guidelines made or endorsed by the NSW Environment Protection Authority	Section 7.9.3	**Environment Manager**	Construction
REMM HR1	All hazardous substances that may be required for construction would be stored and managed in accordance with the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005), the Hazardous and Offensive Development Application Guidelines: Applying SEPP 33 (Department of Planning, Industry and Environment, 2011), the Work Health and Safety Act 2011 (Commonwealth and NSW) and the requirements of the Environmentally Hazardous Chemicals Act 1985 (NSW)	Section 7.5	**Environment Manager**	Construction
REMM HR3	A hazardous materials analysis would be carried out prior to stripping and demolition of structures and buildings which are suspected of containing hazardous materials (particularly asbestos). Hazardous materials and special waste (such as asbestos) would be removed and disposed of in accordance with the relevant legislation, codes of practice and Australian Standards (including the *Work Health and Safety and Regulation 2011* (NSW))	Section 7.6.4	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CEMF 3.11 a	Principal Contractors are responsible for determining the training needs of their personnel. As a minimum this will include site induction, regular toolbox talks and topic specific environmental training as follows: i. The site induction will be provided to all site personnel and will include, as a minimum: ▪ Training purpose, objectives and key issues; ▪ Contractor's environmental and sustainability policy(s) and key performance indicators; ▪ Due diligence, duty of care and responsibilities; ▪ Relevant conditions of any environmental licence and/or the relevant conditions of approval; ▪ Site specific issues and controls including those described in the environmental procedures; ▪ Reporting procedure(s) for environmental hazards and incidents; and ▪ Communication protocols for interactions with community and stakeholders ii. Toolbox talks will be held on a regular basis in order to provide a project or site wide update, including any key or recurring environmental issues; and iii. Topic specific environmental training should be based upon, but is not limited to, issue specific sub-plans required under Section 3.5 (a).	CEMP – Element 7 (Section 7.8)	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CEMF 3.11 b	Principal Contractors will conduct a Training Needs Analysis which: i. Identifies that all staff are to receive an environmental training; ii. Identifies the competency requirements of staff that hold environmental roles and responsibilities documented within the Construction Environmental Management Plan and sub-plans; iii. Identifies appropriate training courses/events and the frequency of training to achieve and/or maintain these competency requirements; and iv. Implements and documents as part of the CEMP a training schedule that plans attendance at environmental training events, provides mechanisms to notify staff of their training requirements, and identifies staff who do not attend scheduled training events or who have overdue training requirements.	CEMP – Element 7 (Section 7.8)	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CEMF 3.12 a	Principal Contractors undertaking off-airport work in accordance with an EPL must develop and implement a Pollution Incident Response Management Plan, in accordance with the requirements of the POEO Act. Contractor's emergency and incident response procedures will also be consistent with any relevant Sydney Metro procedures and, for on-airport works, consistent with the environmental incident and emergency management requirements identified in the Western Sydney Airport Site Environmental Management Framework, and will include: i. Categories for environmental emergencies and incidents; ii. Notification protocols for each category of environmental emergency or incident, including notification to Sydney Metro, WSA (where required for on-airport works) and notification to owners / occupiers in the vicinity of the incident. This is to include relevant contact details; iii. Identification of personnel who have the authority to take immediate action to shut down any activity, or to affect any environmental control measure (including as directed by an authorised officer of any regulator or government department); iv. A process for undertaking appropriate levels of investigation for all incidents and the identification, implementation and assessment of corrective and preventative actions; and v. Notification protocols of incidents to relevant regulators and stakeholders including (but not limited to) the EPA, DPIE, the AEO, WSA and DITRDC for incidents that are made by the Contractor or Sydney Metro.	CEMP – Element 9 (Section 7.10) Pollution Incident Response Management Plan Emergency Response Plan	**Environment Manager**	Construction
CEMF 3.12 b	The Contractor will make all personnel aware of the plan and their responsibilities.	CEMP – Element 9 (Section 7.8.1) Pollution Incident Response Management Plan Emergency Response Plan	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CEMF 3.18 a	Principal Contractors will maintain appropriate records of the following: i. Site inspections, audits, monitoring, reviews or remedial actions; ii. Documentation as required by performance conditions, approvals, licences and legislation; iii. Modifications to site environmental documentation (e.g. CEMP, sub-plans and procedures); and iv. Other records as required by this Construction Environmental Management Framework.	CEMP – Element 11 (Section 7.12.1)	**Environment Manager**	Construction
CEMF 3.18 b	Records must be accessible onsite for the duration of works.	CEMP – Element 11 (Section 7.12.1)	**Environment Manager**	Construction
CEMF 3.18 c	Records will be retained by the Principal Contractor for a period of no less than 7 years. Records will be made available in a timely manner to Sydney Metro (or their representative) upon request.	CEMP – Element 11 (Section 7.12.1)	**Quality Manager**	Construction Post Construction
CEMF 3.18 d	Compliance reports detailing the outcome of any environmental surveillance activity including internal and external audits (refer to Section 3.14) will be produced by the Principal Contractors Environment Manager or delegate. These reports will be submitted to Sydney Metro at an agreed frequency.	CEMP – Element 12 (Section 7.13.2)	**Environment Manager**	Construction
CEMF 12.1 a	The following soil and water management objectives will apply to construction:		**Environment Manager**	Construction
	i. Minimise pollution of surface water through appropriate erosion and sediment control;	PESCP		
	ii. Minimise leaks and spills from construction activities	Section 7.5		
	iii. Maintain existing water quality of surrounding surface water;	PESCP		
	iv. Source construction water from non-potable sources, where feasible and reasonable; and	Section 7.2.2		

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
	v. For on-airport works, the Sydney Metro Western Sydney Airport Soil and Water CEMP soil and water management objectives and will be consistent with the WSA Soil and Water CEMP, including all appendices to the CEMP	On-airport Soil and Water CEMP	**Environment Manager**	Pre-Construction
CEMF 12.2 a	**On-airport management of soil and water will be achieved through the implementation of the SMWSA Soil and Water CEMP and Principal Contractors will develop and implement a Soil and Water Management Plan for all off-airport works. Both plans will include as a minimum:**		**Environment Manager**	Construction
	i. The soil and water mitigation measures as detailed in the planning approvals and sustainability requirements;	Section 7.8		
	ii. Details of construction activities and their locations, which have the potential to impact on water courses, storage facilities, stormwater flows, and groundwater;	Section 6 PESCPs		
	iii. Surface water and ground water impact assessment criteria consistent with the principles of the Australian and New Zealand Environment Conservation Council (ANZECC) guidelines for off-airport works and the *Airports (Environment Protection) Regulations 1997* for on-airport works (with due consideration of the ANZECC guidelines);	Section 7.9.1		
	iv. Management measures to be used to minimise surface and groundwater impacts, including identification of water treatment measures and discharge points, details of how spoil and fill material required by the project will be sourced, handled, stockpiled, reused and managed; erosion and sediment control measures; salinity control measures and the consideration of flood events;	Section 7.8		

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
	v. A contingency plan, consistent with the NSW Acid Sulphate Soils Manual (EPA 1998), to deal with the unexpected discovery of actual or potential acid sulphate soils both on and off-airport lands. The plan must including procedures for the investigation, handling, treatment and management of such soils and water seepage;	**Appendix C4 – Acid Sulfate Soil Management Procedure**		
	vi. Management measures for contaminated material (soils, water and building materials) and a contingency plan to be implemented in the case of unanticipated discovery of contaminated material, including asbestos, during construction;	Section 7.6 Appendix C5 – Unexpected Contaminated Land and Asbestos Finds Procedure		
CEMF 12.2 a	vii. A description of how the effectiveness of these actions and measures would be monitored during the proposed works, clearly indicating how often this monitoring would be undertaken, the locations where monitoring would take place, how the results of the monitoring would be recorded and reported, and, if any exceedance of the criteria is detected how any non-compliance can be rectified;	MIRRA schedule Section 7.9 (CEMP) Element 3: Auditing, Review and Improvement Appendix C1 – Surface Water Quality Monitoring Program	**Environment Manager**	Construction
	viii. The requirements of any applicable licence conditions;	Element 4: Project Specific Requirements		
	ix. The responsibilities of key project personnel with respect to the implementation of the plan;	Section 4		
	x. Procedures for the development and implementation of Progressive Erosion and Sediment Control Plans;	Section 7.1		
	xi. Identification of locations where site specific Stormwater and Flooding Management Plans are required; and	Section 7.4 Emergency Response Plan		
	xii. Compliance record generation and management.	CEMP		
CEMF	x. Procedures for the development and implementation of Progressive Erosion and Sediment Control Plans;	Section 7.1	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
12.2 a	xi. Identification of locations where site specific Stormwater and Flooding Management Plans are required; and	Section 7.4 Emergency Response Plan		
	xii. Compliance record generation and management.	CEMP		
CEMF 12.2 b	Principal Contractors will develop and implement Progressive Erosion and Sediment Control Plans (ESCPs)for all active worksites in accordance with Managing Urban Stormwater: Soils & Construction Volume 1(Landcom, 2004) (known as the "Blue Book"). The ESCPs will be approved by the Contractor's Environment Manager (or delegate) prior to any works commencing (including vegetation clearing) on a particular site. Copies of the approved ESCP will be held by the relevant Contractor personnel including the Engineer and the Site Foreman.	Section 7.1.1	**Environment Manager**	Construction
CEMF 12.2 c	ESCPs will detail all required erosion and sediment control measures for the particular site at the particular point in time and be progressively updated to reflect the current site conditions. Any amendments to the ESCP will be approved by the Contractor's Environment Manager (or delegate).	Section 7.1.1	**Environment Manager**	Construction
CEMF 12.2 d	Principal Contractors will develop and implement Stormwater and Flooding Management Plans for the relevant construction sites. These plans will identify the appropriate design standard for flood mitigation based on the duration of construction, proposed activities and flood risks. The plan will develop procedures to ensure that threats to human safety and damage to infrastructure are not exacerbated during the construction period.	Section 7.4 Emergency Response Plan	**Environment Manager**	Construction
CEMF 12.2 e	Principal Contractors will undertake the following soil and water monitoring as a minimum:			
	i. Weekly inspections of the erosion and sediment control measures. Issues identified would be rectified as soon as practicable;	Weekly Inspection Checklist Element 2: Monitoring and Reporting	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CEMF 12.2 e	ii. Additional inspections will be undertaken following significant rainfall events (greater than 20 mm in 24 hours); and	Post Rainfall Inspection Checklist Element 2: Monitoring and Reporting	**Environment Manager**	Construction
	iii. All water will be tested (and treated if required) prior to discharge from the site in order to determine compliance with the appropriate approvals and licencing. No water will be discharged from the site without written approval of the Contractor's Environment Manager (or delegate). This is to form a HOLD POINT.	Appendix C8 – Discharge and Dewatering Protocol	**Environment Manager**	Construction
CEMF 12.2 f	**The following compliance records will be kept by the Principal Contractors:**		**Environment Manager** Environment Coordinators **Soil Conservationist**	Construction
	i. Copies of current ESCPs for all active construction sites;	Section 7.1.2 Element 2: Monitoring and Reporting		
	ii. Records of soil and water inspections undertaken;	Section 7.1.2		
	iii. Records of testing of any water prior to discharge; and	Section 7.2		
	iv. Records of the release of the hold point to discharge water from the construction site to the receiving environment.	Appendix C8 – Discharge and Dewatering Protocol		
CEMF 12.2 g	The following water resources management objectives will apply to the construction of the project:			
	i. Minimise demand for, and use of potable water;	Section 7.2.2	**Environment Manager**	Construction
	ii. Maximise opportunities for water re-use from captured stormwater, wastewater and groundwater;	Section 7.2.2		

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
	iii. Examples of measures to minimise potable water consumption include: Water efficient controls, fixtures and fittings in temporary facilities; Collecting, treating and reusing water generated in tunnelling operations, concrete batching and casting facility processes; Using recycled water or treated water from onsite sources in the formulation of concrete; Harvesting and reusing rainwater from roofs of temporary facilities; Using water from recycled water networks; Collecting, treating and reusing groundwater and stormwater; Using water efficient construction methods and equipment; and Providing designated sealed areas for equipment wash down.	Section 7.2.2	Sustainability Manager	
CEMF 12.3 a	**The on-airport Soil and Water CEMP and the off-airport Soil and Water Management Plan will include:**			
	i. Clean water will be diverted around disturbed site areas, stockpiles and contaminated areas;	Section 7.1	**Environment Manager** Environment Coordinators **Soil Conservationist** **Superintendent**	Construction
	ii. Control measures will be installed downstream of works, stockpiles and other disturbed areas;	Section 7.1		
	iii. Exposed surfaces will be minimised, and stabilised / revegetated as soon feasible and reasonable upon completion of construction;	Section 7.1		
	iv. Dangerous good and hazardous materials storage will be within bunded areas with a capacity of 110 per cent of the maximum single stored volume;	Section 7.8		

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
CEMF 12.3 a	v. Chemicals will be stored and handled in accordance with relevant Australian standards such as: AS 1940-2004 The storage and handling of flammable and combustible liquids AS/NZS 4452:1997 The storage and handling of toxic substances AS/NZS 5026:2012 The storage and handling of Class 4 dangerous goods AS/NZS 1547:2012 On-site domestic wastewater management	Section 7.8	**Environment Manager** Environment Coordinators Soil Conservationist Superintendent	Construction
	vi. Spill kits will be provided at the batch plants, storage areas and main work sites;	Section 7.8		
	vii. A protocol will be developed and implemented to respond to and remedy leaks or spills.	Appendix C7 – Emergency Spill Response Procedure		
	viii. A remedial action plan and unexpected finds protocol would be established to facilitate the quarantining, isolation and remediation of contamination identified throughout the construction programme. Any asbestos identified on site would be managed in accordance with applicable regulatory requirements.	Appendix C5 – Unexpected Contaminated Land and Asbestos Finds Procedure		
EPL 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*.	PESCP Appendix C8 – Discharge and Dewatering Protocol	**Environment Manager**	Construction
EPL L2	Concentration limits to be added to EPL at later date	Not applicable at this stage	**Environment Manager**	Construction
EPL O1.1	Licensed activities must be carried out in a competent manner. This includes: a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.	Section 7.9 Waste Management Sub-plan	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
EPL O2	All plant and equipment installed at the premises or used in connection with the licensed activity: a) must be maintained in a proper and efficient condition; and b) must be operated in a proper and efficient manner.	Environment and Sustainability Inspection Checklists Site Diary entries ER Reports	**Environment Manager**	Construction
EPL O4.1	The licensee must implement all feasible and reasonable erosion and sediment controls as may be necessary throughout the life of works and activities to minimise sediment leaving the premises	PESCP Environment and Sustainability Inspection Checklists	**Environment Manager**	Construction
EPL O4.2	The licensee must ensure erosion and sediment controls are designed, constructed, operated and maintained consistent with the principle and practices of industry best practice, including: a) Managing Urban Stormwater – Soils and Construction, Volume 2D, Main Road Construction (DECC, 2008), to be read and used in conjunction with Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition (Landcom, 2004); b) Best Practice Erosion and Sediment Control (IECA 2008); and c) other industry best practice documents if it can demonstrate the guidance will provide improved or equivalent outcomes for the environment and meet the requirements of condition L1.1 of this licence.	PESCP Environment and Sustainability Inspection Checklists	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
EPL O4.3	a) all vehicular access points to the premises are designed, constructed, maintained and stabilised to minimise vehicles tracking materials onto public roads and roads outside the premises as much as is reasonable and feasible; b) vehicle, motorised plant and equipment movements onto or off the premises minimise the deposition of any material onto the surface of roads outside of the premises; c) mud, splatter, dust and other material likely to fall from or be cast off the wheels, underside or body of any vehicle, trailer, motorised plant and equipment leaving the premises, is removed to the greatest extent practicable before it leaves the premises; and d) road surfaces subject to any tracking of material by vehicles leaving the premises must be cleaned as required to ensure compliance with a) and b) of this condition and condition L1.1 of this licence.	PESCP Environment and Sustainability Inspection Checklists	**Environment Manager**	Construction

Part C Appendices

Appendix C1 – Surface Water Quality Monitoring Program

Appendix C1 – Surface Water Quality Monitoring Program

Western Sydney Airport – Surface and Civil Alignment Works

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Abbreviations and definitions

Refer to Definitions, Abbreviations and Acronyms, Sydney Metro – Western Sydney Airport Surface Civil and Alignment Works Package.

Table 1 – Abbreviations and definitions

Abbreviation	Description
ANZECC	Australian and New Zealand Environment Conservation Council
CEMF	Sydney Metro Construction Environment Management Framework
CEMP	Construction Environmental Management Plan
CMS	CPB Management System
CoA	Conditions of Approval SSI-10051
CoC	Chain of Custody
CPB	CPB Contractors Pty Ltd
CPBUI JV	CPB Contractors and United Infrastructure Joint Venture
CSSI	Critical State Significant Infrastructure
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
EPA	Environmental Protection Authority
EPL	Environmental Protection Licence
ER	Environmental Representative
Hold point	A verification point that prevents work from commencing prior to approval from the appointed authority.
NATA	National Association of Testing Authorities
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 CEMP or supporting documentation
NTU	Nephelometric Turbidity Units
REMM	Revised Environmental Mitigation Measures
SCAW	Metro Western Sydney Airport Surface Civil and Alignment Works Project
SWMP	Soil and Water Management Sub-plan
TSS	Total Suspended Solids

1. Introduction

1.1. Background and Project Description

The Sydney Metro – Western Sydney Airport project involves the construction and operation of a new metro railway line around 23 kilometres in length between the T1 Western Line at St Marys in the north and the Aerotropolis in the south. This would include a section of the alignment which passes through and provides access to Western Sydney International (Nancy-Bird Walton) Airport.

The Sydney Metro – Western Sydney Airport project is characterised into two (2) main components to align with their different planning approval pathways required under State and Commonwealth legislation:

- Outside Western Sydney International (off-airport)
- Within Western Sydney International (on-airport).

Construction of the Sydney Metro – Western Sydney Airport project is planned to be undertaken in three stages:

- SCAW
- Station Box and Tunnels Project
- Stations, Systems, Trains, Operations, and Maintenance.

SCAW includes approximately 10.6 kilometres of rail alignment up to the underside of track formation from Orchard Hills to the Western Sydney International (Nancy-Bird Walton) Airport. This includes approximately:

- 3.6 kilometres of viaduct, in three sections
- 209 metres of bridges
- 6.9 kilometres of at-grade alignment
- Bulk earth works for the stabling and maintenance facility
- Temporary and permanent access roads.

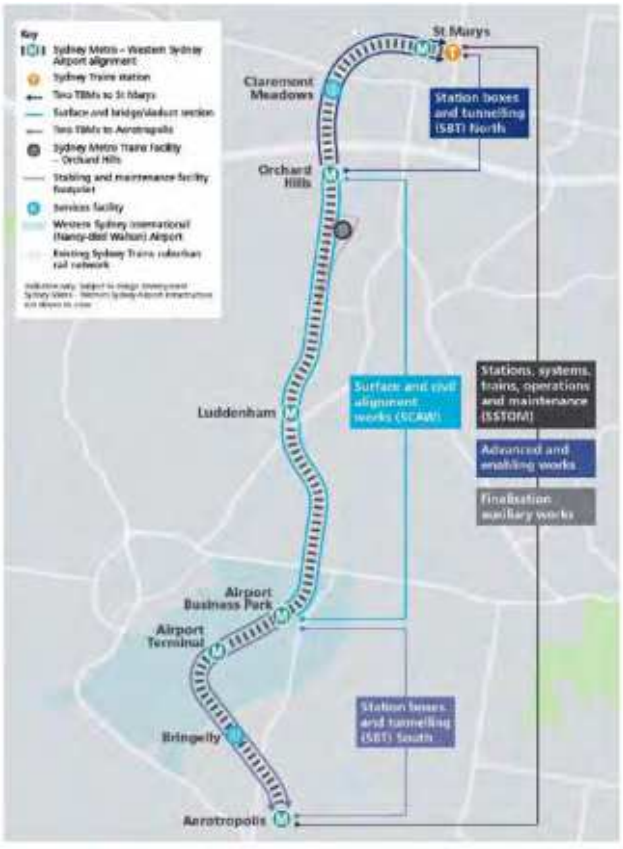

Figure 1 – Sydney Metro - WSA Project Overview

1.2. Scope of this Monitoring Program

This Surface Water Quality Monitoring Program (the Program) forms Appendix C1 of the Soil and Water Management Sub-plan (SWMP).

This Program has been prepared to address the requirements of the Ministers Conditions of Approval (CoA), Project Approvals and all applicable guidance and legislation.

The scope of this Program is to describe how CPB Contractors United Infrastructure Joint Venture (CPBUI) proposes to monitor potential impacts to surface water during construction of the Project. Operational monitoring and operation measures do not fall within the scope of the construction phase and therefore are not included within the processes contained within this Program.

2. Purpose and objectives

2.1. Purpose

The purpose of the Program is to describe how CPBUI will monitor surface water quality during construction of the Project.

The Program will be implemented to monitor the effectiveness of mitigation measures applied during the construction phase of the Project. Monitoring of surface water will be undertaken to identify potential impacts and ensure an appropriate management regime can be implemented to address those impacts and manage local surface water quality.

This Program provides details of the surface water monitoring network, frequency of monitoring, and test parameters. This Program supplements the SWMP, which itself is an appendix of the Construction Environmental Management Plan (CEMP).

This Program is based on baseline studies developed for the project EIS (NSW Government, 2020).

2.2. Objectives

The key objectives of this Program are to ensure all relevant Minister's Conditions of Approval (CoAs), Revised Environmental Management Measures (REMMs), and licence/permit requirements relating to surface water quality monitoring are described, scheduled, and assigned responsibility as outlined in:

- The EIS prepared for the Project,
- The Sydney Metro – Western Sydney Airport Submissions Report,
- CoA granted to the project on 23 July 2021,
- The Sydney Metro Construction Environment Management Framework
- The Project's Environment Protection Licence (EPL) #21596, and
- All relevant legislation and other requirements described in Section 2 of the SWMP.

The Program has been designed to consider the SMART Principals through:

- Specific targets (Section 3.2.6)
- Measurable outcomes (Section 5.3)
- Achievable outcomes (Section 5.4)
- Relevant outcomes (Section 5.4)
- Time-bound requirements (Section 5.5)

2.3. Consultation

This program was provided to the Department of Planning and Environment (DPE) Water, Department of Primary Industries (DPI) Fisheries, Penrith City Council and Liverpool City Council in accordance with CoA C13(b). Details of the consultation and the issues raised are contained in Appendix C2 of the SWMP.

To meet REMM WQ1, a copy of this program was provided to NSW EPA as part of the application for the EPL. As the SCAW project footprint is not upstream of the Western Sydney Airport, they have not been formally consulted with (as relevant) but will be provided a copy of the program for information.

In accordance with CoAC17 and the SM-WSA Staging Report (Revision 6), the ER will endorse the Monitoring Program prior to it being submitted to the Planning Secretary for approval at least one month prior to the commencement of construction in accordance with CoA C19. Unless otherwise agreed with the Planning Secretary, construction must not commence until the Planning Secretary has approved the required Monitoring Program in accordance with CoA C20.

Community feedback and complaints relating to surface water quality will be managed in accordance with the Communication Strategy and Complaints Management System.

2.4. Compliance

The CoAs and REMMs relevant to this Program are detailed in Table 2.

Table 2 –CoAs and REMMs for this Program.

<table>
<tr><th>ID</th><th>Type</th><th>Detail</th><th>How addressed</th></tr>
<tr><td>WQ1</td><td>REMM</td><td>A surface water quality monitoring program would be implemented to monitor water quality during construction. The program would be developed in consultation with (as relevant) Western Sydney Airport, NSW Environment Protection Authority, relevant sections of Department of Planning, Industry and Environment and relevant local councils. The program would consider monitoring being undertaken as part of other infrastructure projects such as the M12 Motorway and Western Sydney International.
On-airport, the water quality monitoring program would ensure that works meet the requirements under Schedule 2 of the Airports (Environment Protection) Regulations 1997
The program would monitor all construction discharge locations.</td><td>This document.
Refer to Section 2.3 for consultation details.
Refer to Section 3.2 for monitoring locations.</td></tr>
<tr><td>C13(b)</td><td>CoA</td><td>The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies (as required by Condition A6) identified for each to compare actual performance of construction of the CSSI against the performance predicted in the documents listed in Condition A1 or in the CEMP. Where a government agency(ies) request(s) is not included, the Proponent must provide the Planning Secretary / ER (whichever is applicable) justification as to why.
<table>
<tr><th>No</th><th>Required Construction Monitoring Programs</th><th>Relevant government agencies to be consulted for each Construction Monitoring Program</th></tr>
<tr><td>(b)</td><td>Surface water quality</td><td>DPIE Water, DPI Fisheries, and Relevant Councils</td></tr>
</table></td><td>Refer to Section 2.3 for consultation details.</td></tr>
<tr><td>C14</td><td>CoA</td><td>Each Construction Monitoring Program must provide:</td><td></td></tr>
<tr><td></td><td></td><td>(a) details of baseline data available including the period of baseline monitoring;</td><td>Table 3</td></tr>
<tr><td></td><td></td><td>(b) details of baseline data to be obtained and when;</td><td>Table 4</td></tr>
<tr><td></td><td></td><td>(c) details of all monitoring of the project to be undertaken;</td><td>Appendix C1 –Baseline surface water monitoring results</td></tr>
<tr><td></td><td></td><td>(d) the parameters of the project to be monitored;</td><td>Table 9</td></tr>
<tr><td></td><td></td><td>(e) the frequency of monitoring to be undertaken;</td><td>Table 8</td></tr>
<tr><td></td><td></td><td>(f) the location of monitoring;</td><td>Section 3.2.3, Figure 6 and Figure 7</td></tr>
<tr><td></td><td></td><td>(g) the reporting of monitoring results and analysis results against relevant criteria;</td><td>Table 10</td></tr>
<tr><td></td><td></td><td>(h) details of the methods that will be used to analyse the monitoring data;</td><td>Section 5.3</td></tr>
</table>

ID	Type	Detail	How addressed
		(i) procedures to identify and implement additional mitigation measures where the results of the monitoring indicated unacceptable project impacts;	Section 6
		(j) a consideration of SMART principles;	Section 2.2
		(k) any consultation to be undertaken in relation to the monitoring programs; and	Section 2.3
		(l) any specific requirements as required by Conditions C15 to C16.	Not applicable
C17	CoA	With the exception of any Construction Monitoring Programs expressly nominated by the Planning Secretary to be endorsed by the ER, all Construction Monitoring Programs must be submitted to the Planning Secretary for approval.	Refer to Section 2.3 for consultation details.
C18	CoA	The Construction Monitoring Programs not requiring the Planning Secretary's approval must obtain the endorsement of the ER as being in accordance with the conditions of approval and all undertakings made in the documents listed in Condition A1. Any of these Construction Monitoring Programs must be submitted to the ER for endorsement at least one (1) month before the commencement of construction or where construction is staged no later than one (1) month before the commencement of that stage.	Refer to Section 2.3 for consultation details.
C19	CoA	Any of the Construction Monitoring Programs which require Planning Secretary approval must be endorsed by the ER and then submitted to the Planning Secretary for approval at least one (1) month before the commencement of construction or where construction is staged no later than one (1) month before the commencement of that stage.	Refer to Section 2.3 for consultation details.
C20	CoA	Unless otherwise agreed with the Planning Secretary, construction must not commence until the Planning Secretary has approved, or the ER has endorsed (whichever is applicable), all of the required Construction Monitoring Programs and all relevant baseline data for the specific construction activity has been collected.	Refer to Section 2.3 for consultation details.
C21	CoA	The Construction Monitoring Programs, as approved by the Planning Secretary or the ER has endorsed (whichever is applicable), 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 Planning Secretary or the ER (whichever is applicable), whichever is the greater.	Section 5
C22	CoA	The results of the Construction Monitoring Programs must be submitted to the Planning Secretary, ER 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 5.5

3. Surface water monitoring

3.1. Baseline monitoring

3.1.1. Overview

Baseline surface water monitoring in waterways surrounding the project has been undertaken over the past 20 years, as reported in the project EIS (NSW Government, 2020). This includes results from the following:

- Western Sydney Airport – Surface Water Quality Assessment (GHD, 2016).
- Environmental Field Survey of Commonwealth Land at Badgerys Creek (SMEC, 2014).
- Geology, Soils and Water Technical Paper – Proposal for a Second Sydney Airport at Badgerys Creek or Holsworthy Military Area (PPK, 1997).

In addition to the above data sets, water quality monitoring was also conducted for the M12 Motorway project (GHD, 2020) at a series of sites in Cosgroves, Badgerys, South, Kemps and Ropes Creeks.

Monitoring of water quality within the watercourses surrounding the WSIA has been undertaken by Cardno (2021) as required by the WSIA Soil and Water Construction Environmental Management Plan (SWCEMP) and builds on the previous water quality monitoring initiated in 2015 by GHD (GHD, 2016).

3.1.2. Monitoring network

3.1.2.1. Available data

Baseline water quality monitoring locations were located in various local waterways both upstream and downstream of the Project alignment and ancillary facilities as shown in *Figure 2* to *Figure 5* and listed in Table 3.

Note that numerous monitoring locations shown on *Figure 2* to *Figure 5* are associated with other projects and are not relevant to the monitoring program for this Project. Those sites are omitted from Table 3. No data has historically been collected from downstream of the Blaxland Creek and the northern portion of the SCAW project work area.

Table 3 – Baseline surface water monitoring locations relevant to this Project.

Position	Sample ID	Sample Location	Source	Refer to Figure
Upstream of Project alignment	BCDS	Badgerys Creek	GHD, 2016	*Figure 3*
	B3	Badgerys Creek	PPK, 1997 and SMEC, 2014	*Figure 3*
	COSUS	Thompsons Creek	GHD, 2016	*Figure 3*
	L9	Badgerys Creek	GHD, 2016	*Figure 3*
	D/S Badgerys	Badgerys Creek	Cardno, 2021	*Figure 5*
	U/S Airport 2	Badgerys Creek	Cardno, 2021	*Figure 5*
Downstream of Project alignment (South: WSIA to Aerotropolis Station)		Cosgroves Creek	GHD, 2020	*Figure 6*
	BADDS	Badgerys Creek	GHD, 2020	*Figure 4*
	SREC	South Creek	GHD, 2016	*Figure 2*
	S1	South Creek	PPK, 1997	*Figure 3*
	S2	South Creek	PPK, 1997	*Figure 3*

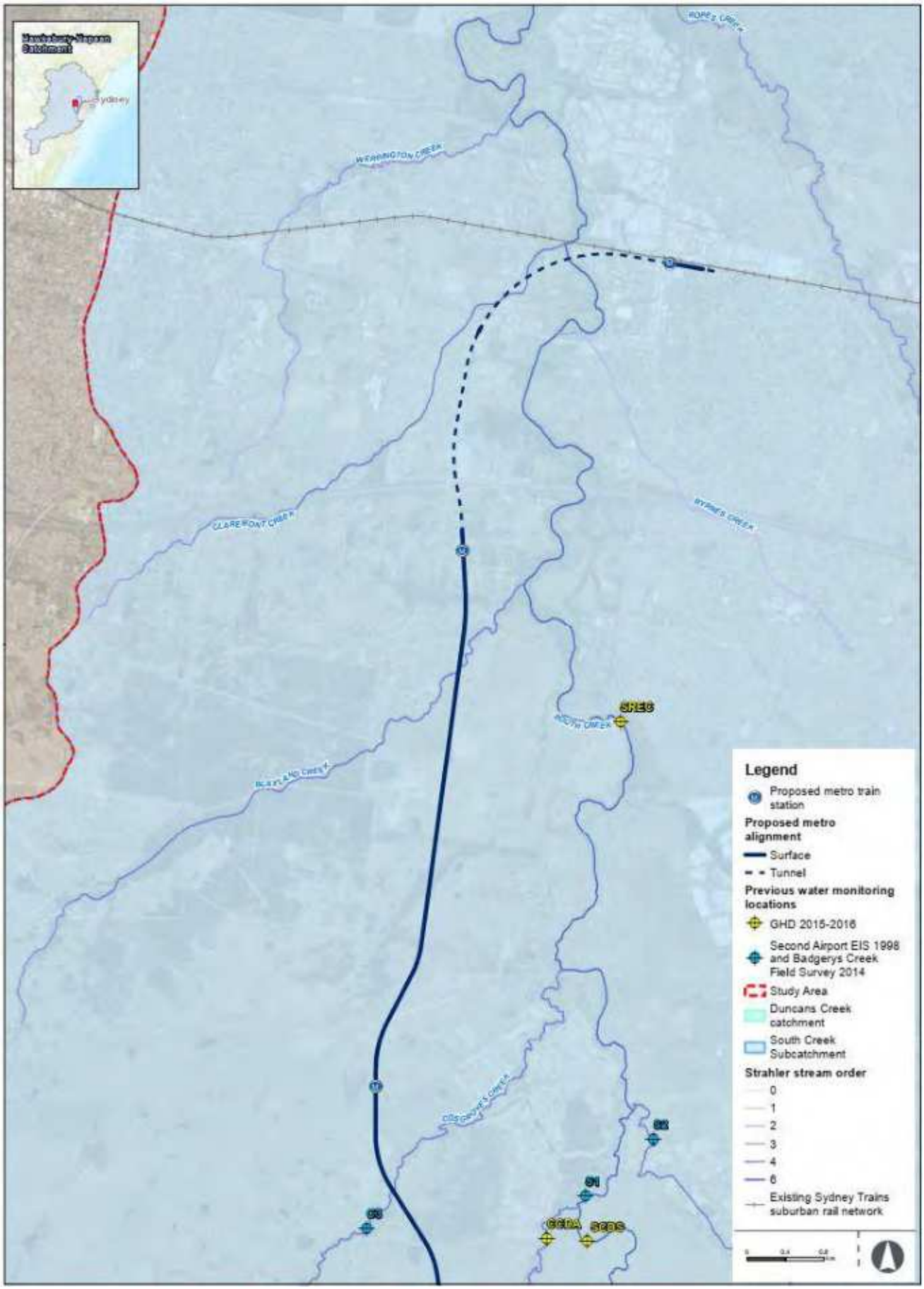

Figure 2 – Project alignment (north) showing baseline monitoring locations from previous studies and reports

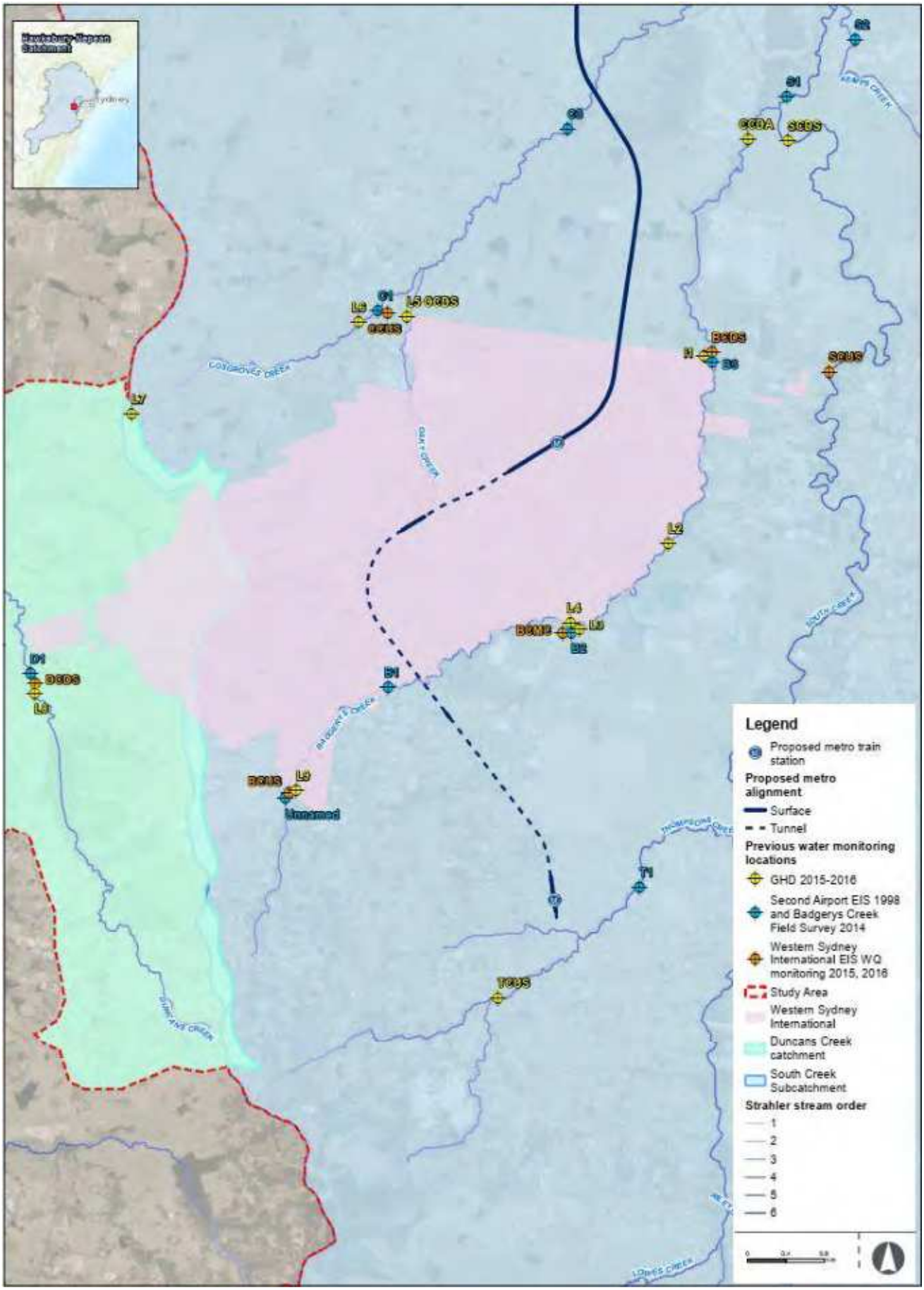

Figure 3 – Project alignment (south) showing baseline monitoring locations from previous studies and reports

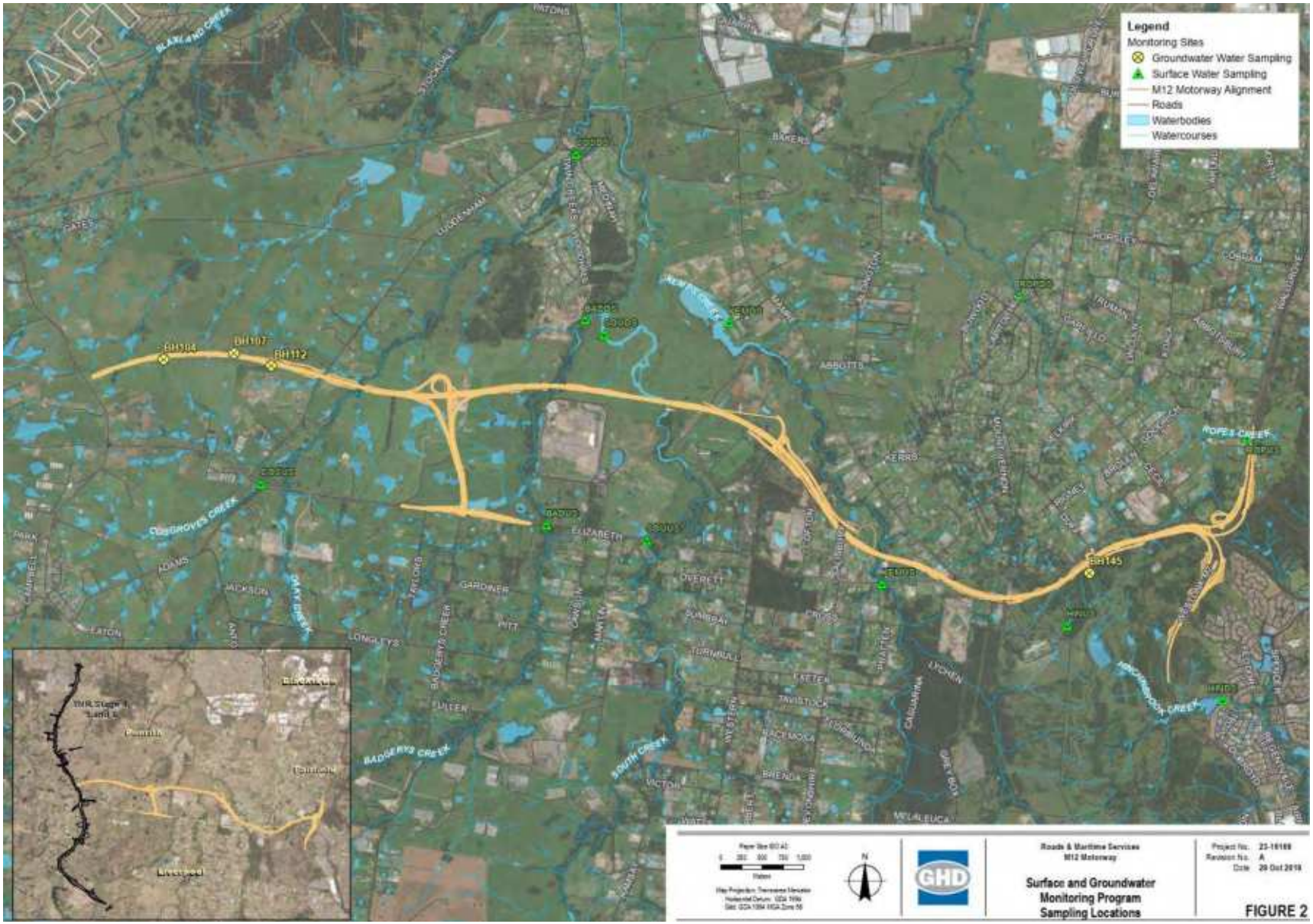

Figure 4 – M12 Motorway water monitoring locations (GHD, 2020)

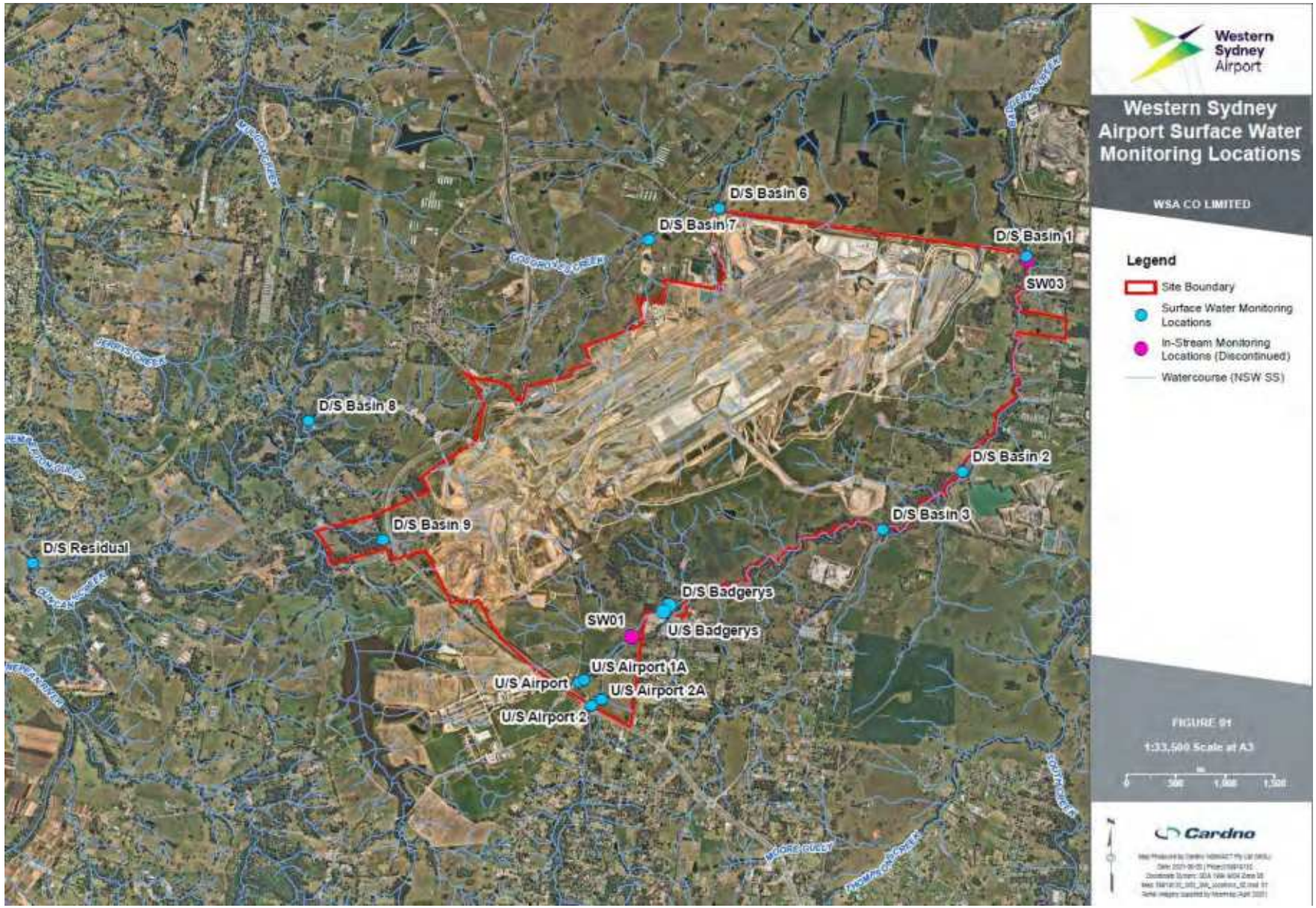

Figure 5 – WSIA surface water monitoring sites (Cardno, 2021))

3.1.2.2. Selected sites

As noted in Section 3.3.1, there are numerous locations that have been subject to water quality monitoring over the past few decades. Project-specific monitoring locations have been determined based on the SCAW Works and correlated to existing monitoring locations as much as possible within South Creek, Badgerys Creek and Cosgroves Creeks.

Section 3.1.1 details the historic sites selected to inform the baseline water quality data in South Creek, Badgerys Creek and Thompsons Creek. These have been selected based on the proximity of the sites to the Project, and data quality/quantity.

Refer to Section 3.2.3 for details of the SCAW Works monitoring locations

Table 4 – Selected upstream and downstream surface water monitoring locations for baseline analysis.

Position	Sample ID	Sample Location	Source	Refer to Figure
Upstream of Project alignment	S1	South Creek	PPK, 1997 and SMEC, 2014	Figure 6
Upstream of Project alignment	S2	South Creek	PPK, 1997 and SMEC, 2014	Figure 6
Upstream of Project alignment	D/S Badgerys	Badgerys Creek	Cardno, 2021	Figure 7
Downstream of Project alignment	D/S Basin 3	Badgerys Creek	Cardno, 2021	Figure 7

3.1.3. Surface water quality

South Creek Catchment in Western Sydney is one of the most heavily degraded catchments in Australia (Hawkesbury-Nepean CMA, 2007). The catchment has suffered from high pollution loads, increased impervious surfaces from urbanisation and long-term clearing of vegetation resulting in a rise of saline groundwater into streams and increased sediment and pollutant runoff (Boon, 2017).

Monitoring of water quality within the watercourses surrounding the WSIA has been undertaken by Cardno (2021) as required by the WSIA Soil and Water Construction Environmental Management Plan (SWCEMP) and builds on the previous water quality monitoring initiated in 2015 by GHD (GHD, 2016). Water quality parameters that have been tested include:

- Total recoverable hydrocarbons (TRH).
- Polycyclic aromatic hydrocarbons (PAHs) and trace phenols.
- Volatile organic compounds (VOCs).
- Benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN).
- Metals (As, Cd, Cr, Cu, Pb, Hg, Ni and Zn).
- Trace organochlorine and organophosphorus pesticides.
- Nutrients (nitrate, nitrite, ammonia, total Kjeldahl nitrogen, total phosphorous, reactive phosphorous, total nitrogen).
- Total suspended solids (TSS).
- Turbidity.
- Thermotolerant coliforms and Chloropyhll-(a).

As noted above, the baseline surface water quality dataset is derived from a range of sampling programs. As such, there is some variance in the analytes that were sampled and tested.

Table 5 provides a summary of the baseline water quality data for the four historic monitoring sites, with detailed tables included in Annexure A where such data is available. Interpretation of the baseline surface water monitoring data is summarised in Table 6.

Table 5 – Selected upstream and downstream surface water monitoring locations for baseline analysis.

Parameter	ANZG (2018) and ANZECC (2000)*	Historic monitoring location			
		S1	S2	D/S Badgerys	D/S Basin 3
DO % sat	85-110	83 to 105	39 to 79	53.99	60.44
Conductivity (µs/cm)	125-2,200	nt	<500 to 3,200	1075.92	7857.92
pH	6.5-8.0	7 to 7.2	6.9 to 7.4	7.74	7.5
Turbidity (NTU)	6-50	15 to 65	12 to 40	41.08	49.16
TSS (mg/L)	3-25 (see note 2)	9 to 56	4 to 14	44.7	42.12
TN (mg/L)	0.5	0.49 to 1.6	0.8 to 1.52	3.46	3.6
TP (mg/L)	0.05	0.01 to 0.14	0.05 to 0.5	0.52	0.6
Arsenic	0.013	nt	nt	0.0017	0.0027
Cadmium	0.0002	nt	nt	<0.0002	0.0002
Chromium (VI)	0.0033 (III) and 0.001 (VI)	1.7	nt	0.0025	0.004
Copper	0.0014	3.6	nt	0.0076	0.0083
Lead	0.0034	1.61	nt	0.0024	0.0032
Mercury	0.0006	nt	nt	<0.0001	<0.0001
Nickel	0.011	nt	nt	0.0026	0.0035
Zinc	0.008	9.1	nt	0.0125	0.0147

* 95th percentile species protection.

Table 6 – Summary of interpretation of baseline water quality conditions in the Project area.

Waterway	Baseline data obtained	Description of water quality
South Creek	Samples collected at S1 and S3 (PPK, 1997).	Generally elevated concentrations of nutrients (nitrogen and phosphorous) and depleted dissolved oxygen. Heavy metals exceed guideline values (Chromium VI, copper and zinc). Turbidity exceeds guideline levels following heavy rainfall. Electrical conductivity (salinity) is above guideline levels during dry weather when the dilution effect of additional inflows is absent.
Badgerys Creek	Samples collected at D/S Badgerys and D/S Basin 3 by GHD (2016) and Cardno (2021).	Heavy metals all lower than guideline levels. Generally elevated concentrations of nutrients (nitrogen and phosphorous) and depleted dissolved oxygen. Turbidity exceeds guideline levels following heavy rainfall. Electrical conductivity (salinity) is above guideline levels, especially during dry weather when the dilution effect of additional inflows is absent.

Transport for New South Wales (TfNSW) have also been undertaking monthly baseline sampling since April 2019 in Cosgroves, Badgerys and South Creeks as part of the M12 Motorway project. Several Reports have been compiled by GHD who have undertaken the sampling and analysis on behalf of TfNSW including:

- M12 Motorway Surface Water Monitoring Second Report – April 2019 to March 2020 (GHD, 2020)
- M12 Motorway Surface Water Monitoring Report for monitoring period of April 2020 to September 2020 (GHD, 2020)
- M12 Motorway Surface Water Monitoring Biannual Report 4 – October 2020 to March 2021 (GHD, 2021)

General observations on the baseline water quality in the vicinity of the M12 project are summarised below in Table 7.

Table 7 – M12 Motorway Baseline Surface Water Quality

Monitoring Report	General Observations
M12 Motorway Surface Water Monitoring Second Report – April 2019 to March 2020 (GHD, 2020)	▪ The data obtained indicates that various urban pollutants affect the water quality of the selected sites, most of which are poor in water quality. ▪ Two outstanding characteristics of all of the sites are elevated electrical conductivity (EC), and nutrient enrichment, which are both closely related to landuse ▪ Nutrient enrichment of both standing pools and flowing waterways is common, indicated particularly by highly elevated concentrations of total phosphorus (TP), total nitrogen (TN), nitrate and nitrite (NOx) and ammonia. ▪ Some metals were detected frequently at most sites, however only copper and zinc were frequently recorded at concentrations greater than ANZECC ecosystem protection guidelines ▪ Oil and grease were infrequently detected between October 2019 and February 2020, with six positive samples from five sites, ▪ Chlorophyll-a measurements indicated that most sites have highly productive water bodies, dominated by algal growth, which is a direct outcome of nutrient enrichment. ▪ Broad-spectrum systemic insecticide were detected at concentrations above the ANZECC 95% ecosystem protection guidelines at several sites, and most frequently at the South Creek and Kemps Creek sites
M12 Motorway Surface Water Monitoring Report for monitoring period of April 2020 to September 2020 (GHD, 2020)	▪ Surface water pH was largely within the ANZECC guideline range during the current monitoring period (April to September 2020) ▪ EC concentrations at the studied sites were generally in the 1000-2000 µS/cm range. 25 samples reported concentrations of EC in exceedance of the ANZECC criteria, 10 from ROPUS and 5 from HINUS alone ▪ The majority of samples reported concentrations of DO outside of the ANZECC guideline range. ▪ Almost half of all samples (95 out of 189) reported concentrations of turbidity above the outside of the ANZECC guideline range. ▪ Almost all samples reported concentrations of ammonia and total nitrogen oxides, total nitrogen and total phosphorus above the laboratory limit of reporting, many of which exceeded the ecological criteria, with some exceeding the human health criteria. ▪ All samples reported concentration of arsenic, cadmium, mercury below the adopted criteria. ▪ The concentration of chromium, copper, lead, zinc, iron and nickel was detected above the adopted ecological criteria in majority of samples.

Monitoring Report	General Observations
M12 Motorway Surface Water Monitoring Biannual Report 4 – October 2020 to March 2021 (GHD, 2021)	▪ Majority of samples reported total suspended solid (TDS) concentrations above ANZECC & ARMCANZ (2000) ecological criteria during monitoring events. ▪ Majority of samples reported total dissolved solid (TDS) concentrations above ADWG (NHMRC & NRMMC, 2011) recommendations. Hinchinbrook Creek locations reported sample concentrations remaining below these recommendations for TDS during all monitoring events. ▪ Majority of sampling locations reported nutrient concentrations (ammonia, oxidised nitrogen, total nitrogen, soluble reactive phosphorus, total phosphorus and chlorophyll-a) above adopted ANZECC & ARMCANZ (2000) ecological criteria. ▪ Exceedances of ANZG (2018) 95% freshwater criteria and/or ADWG (NHMRC & NRMMC, 2011) criteria were reported for arsenic, chromium, copper, iron, lead, manganese, nickel and zinc during sampling events. ▪ Hardness-modified trigger values (HMTV) were not exceeded for analysed heavy metals, indicating that the toxicity of metals within surface water is being reduced due to the presence of hard water.

3.2. Surface water quality construction monitoring

3.2.1. Overview

The discharge of sediments and pollutants during the SCAW scope of works is identified as a potential impact on surface water within the disturbed catchments and waterways of Blaxland, Unnamed tributary of South Creek (hereby referred to as Unnamed Creek), Cosgroves and Badgerys Creeks.

A soil conservation specialist will be engaged to provide design input on erosion and sediment control and Table 9 contains the parameters to be tested as part of this Program. Site specific trigger values (SSTVs) are identified in Table 10 and will be used to assess potential impacts on waterways.

Variation in physio-chemical parameters (Table 10) provides an indication of a change to overall water quality triggering the assigned performance criteria and further impact assessment.

The Project EPL may authorise discharge of water from specific locations or premises and establish criteria that differ from those given in this Program. In such circumstances the EPL, and any conditions and criteria of that EPL, take precedence over this Program.

3.2.2. Rainfall monitoring

For the purpose of determining when a post-rainfall monitoring event is triggered (see Section 3.2.4), rainfall will be monitored during the construction phase via rain gauges at CPBUI compounds or nearby BOM weather stations (Badgerys Creek and Orchard Hills) and will be checked on each workday or automated using an electronic weather station.

3.2.3. Monitoring locations

Surface water quality monitoring will be carried out during construction at four creeks / eight locations, listed in Table 8 and shown in Figure 6 and Figure 7. The monitoring program will commence prior to any ground disturbance. Background monitoring from previous studies (see Section 3.1) comprises the background monitoring of this program. Construction phase monitoring will commence following approval by Department of Planning and Environment (DPE) of this Program.

The monitoring allows for the assessment trends in water quality, including natural variations, and will allow sufficient data to enable assessment of any potential impacts measured during construction. The surface water quality monitoring locations were also monitored during the baseline monitoring period that informed the EIS (as discussed in Section 3.1).

Table 8 – Construction phase surface water monitoring program.

Sample ID	Equivalent historic monitoring location(s) (see note 1)	Sample location	Analysis suite (see note 2)	Sampling frequency
SCAW 1 US	N/A	Blaxland Creek Upstream	All	Monthly / Wet weather (see note 3)
SCAW 1 DS	N/A	Blaxland Creek Downstream	All	Monthly / Wet weather (see note 3)
SCAW 2 US	N/A	Unnamed Creek upstream	All	Monthly / Wet weather (see note 3)
SCAW 2 DS	N/A	Unnamed Creek downstream	All	Monthly / Wet weather (see note 3)
SCAW 3 US	C3	Cosgroves Creek upstream		Monthly / Wet weather (see note 3)
SCAW 3 DS	COSDS	Cosgroves Creek downstream		Monthly / Wet weather (see note 3)
SCAW 4 US	BCDS / BADUS	Badgerys Creek upstream, Badgerys Creek Road crossing, Bringelly		Monthly / Wet weather (see note 3)
SCAW 4 DS	CCDA/BADDS	Badgerys Creek downstream		Monthly / Wet weather (see note 3)

Note:

1. Sample location ID's from previous studies. Included to allow for cross-checking.
2. Analysis as detailed in Table 9.
3. Wet weather monitoring (following 25mm of continuous rainfall in a 24 hour period – see Sampling frequency in Section 3.2.4).
4. Exact monitoring locations may vary slightly based on access/safety constraints.

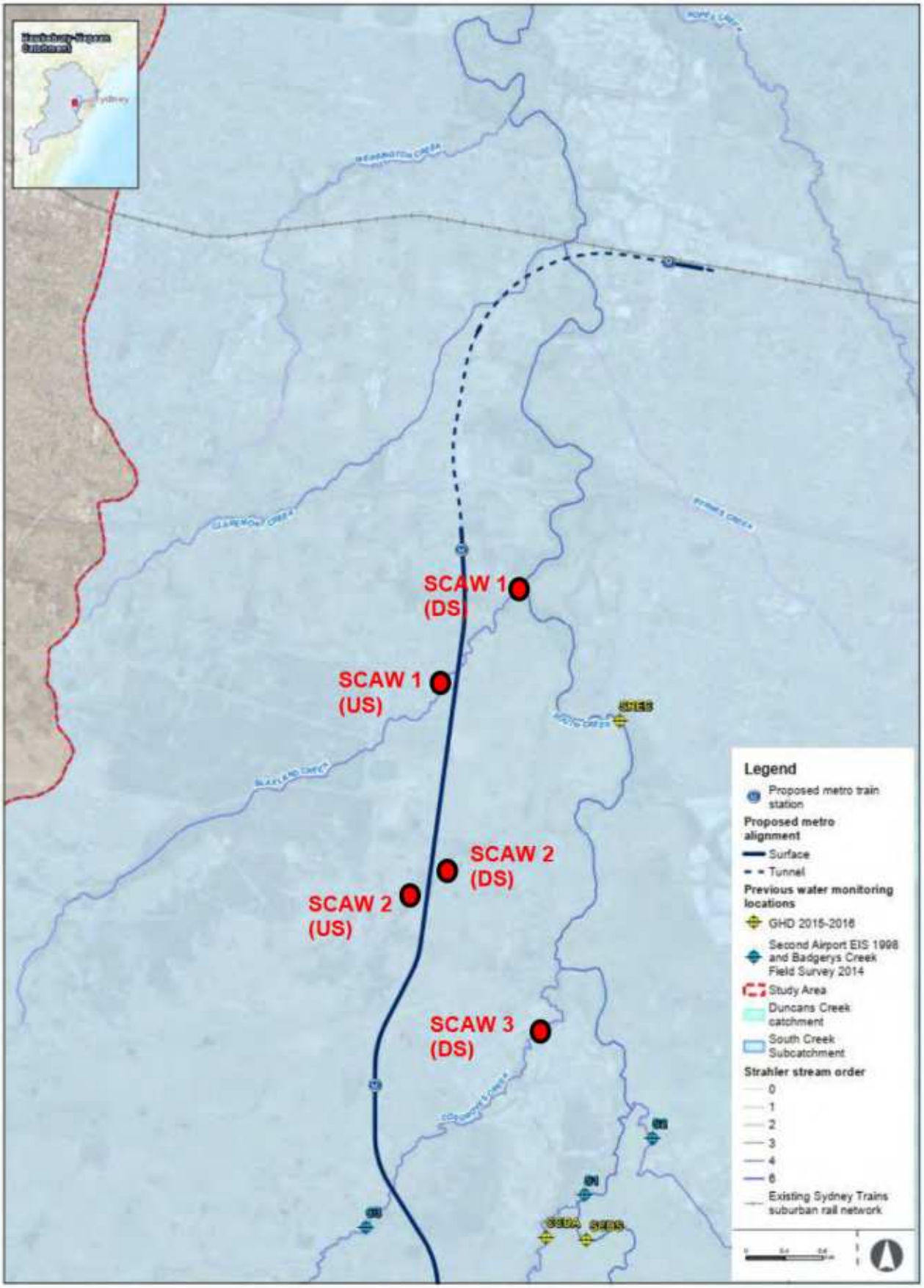

Figure 6 –Project alignment showing SCAW monitoring locations.

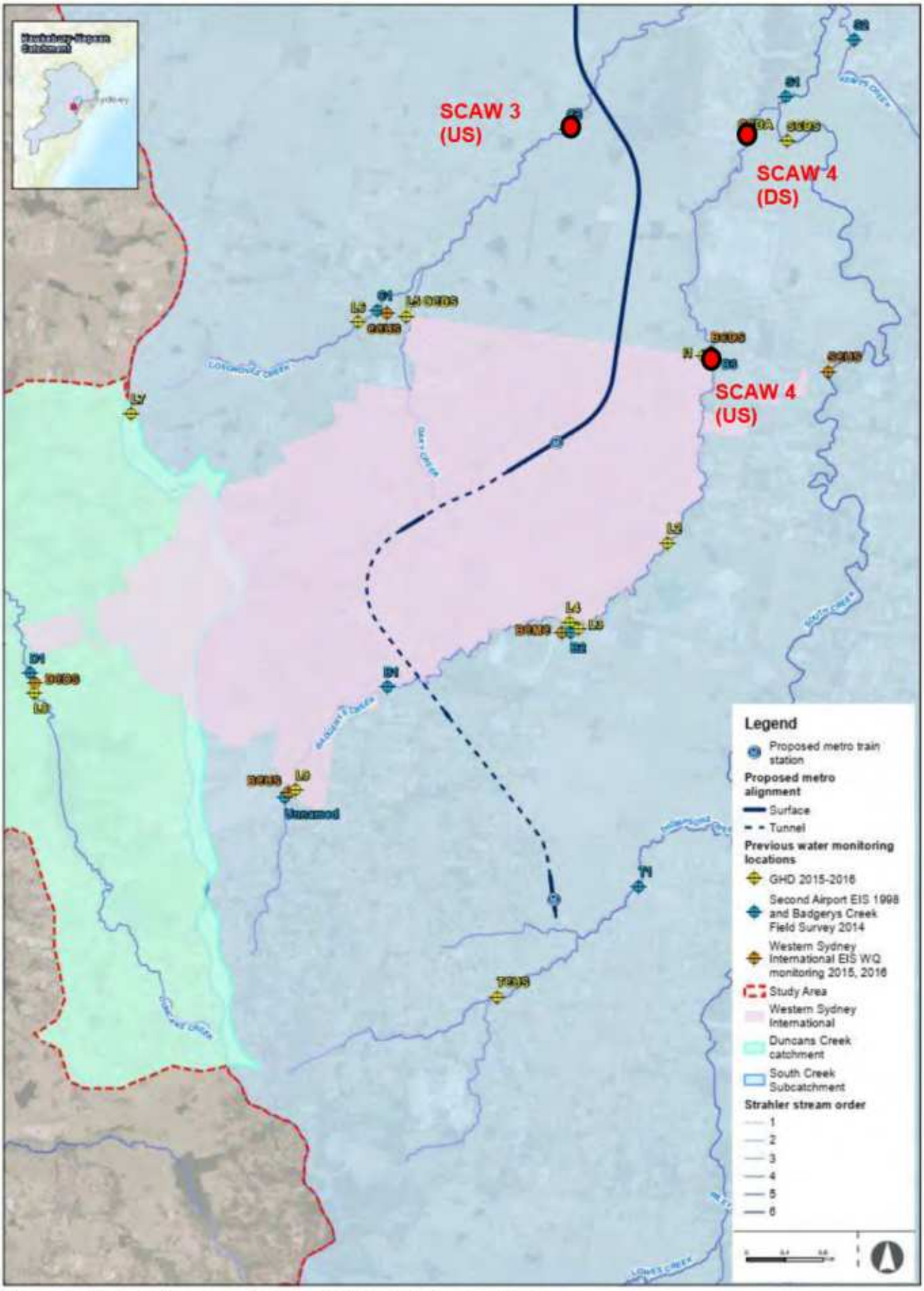

Figure 7 –Project alignment showing SCAW monitoring locations.

3.2.4. Sample frequency

During the construction phase water quality sampling will be undertaken monthly.

Wet weather monitoring will be carried out when a continuous rainfall event of >25mm is received in the local catchment during a 24-hour period (as recorded at the Project's rain gauge(s) or nearby weather station) and has generated runoff from site.

For safety reasons sampling will not be undertaken during peak storm-flows. Sampling will be completed when flows are reasonably constant and monitoring points can be safely accessed, monitoring locations will be selected where possible to enable a safe monitoring location during all weather conditions.

The monitoring program will continue for the duration of construction and until either the SCAW package worksites are handed over to a subsequent contractor, or for 6 months, whichever occurs first.

3.2.5. Surface water quality parameters

Table 9 details the **analytes that will be monitored during the construction phase surface water monitoring, at the locations listed Table 8** and shown in Figure 6 and Figure 7.

Surface water quality analysis results will be assessed and compared to baseline conditions, rainfall records, upstream monitoring results, and the performance criteria described below.

Table 9 – Surface water quality monitoring parameters

Category	Measured	Parameters
Physio-chemical parameters	In-field using a calibrated multi parameter probe.	▪ Temperature (°C) ▪ Dissolved Oxygen (% saturation) ▪ Electrical Conductivity (µS/cm) ▪ Reduction-Oxidation Potential (Redox)(mV) ▪ pH ▪ Total suspended solids (TSS) ▪ Turbidity (NTU) ▪ Visible oil and grease
Heavy Metals	Laboratory testing	▪ Aluminium ▪ Arsenic III ▪ Cadmium ▪ Cobalt ▪ Chromium (III and VI) ▪ Copper ▪ Lead ▪ Manganese ▪ Mercury ▪ Nickel ▪ Vanadium ▪ Zinc
Organochlorine pesticides	Laboratory testing	▪ Endosulphan ▪ Methoxychlor

3.2.6. Performance criteria

3.2.6.1. Site specific trigger values

Baseline monitoring shows that some surface water quality parameters exceed the default ANZECC (2000a) water quality trigger values for slightly to moderately disturbed ecosystems.

This is not unexpected given the highly disturbed catchment area and receiving waterways surrounding the project.

Location specific performance criteria (site-specific trigger values (SSTV)) have been developed for downstream (impact) surface water monitoring locations (see Table 10).

SSTV were originally developed for appropriate parameters using baseline monitoring data and ANZECC (2000a) guideline criteria for slightly to moderately disturbed ecosystems (generally protecting 95% of species) (Table 10). SSTV will continue to be updated using a combination of ANZECC (2000a) guidelines, baseline monitoring and a rolling average of SCAW results at upstream monitoring locations as per Section 3.2.6.3.

Table 10 – Indicative site specific trigger values

Parameter	Units	ANZECC guidelines	SCAW 1	SCAW 2	SCAW 3	SCAW 4
			Blaxland Creek	Unnamed Creek	Cosgroves Creek	Badgerys Creek
pH	pH	6.5-8.0	ANZECC	ANZECC	ANZECC	ANZECC
Electrical Conductivity	µS /cm	125-2,200	ANZECC	ANZECC	ANZECC	ANZECC
Turbidity	NTU	6-50	ANZECC	ANZECC	ANZECC	74.325
TSS	mg/L	3-25 (see note 2)	ANZECC	ANZECC	ANZECC	ANZECC
DO	% sat	85-110	ANZECC	ANZECC	ANZECC	ANZECC
Aluminium	mg/L	0.55 (for pH >6.5)	ANZECC	ANZECC	ANZECC	ANZECC
Arsenic (III)	mg/L	0.013	ANZECC	ANZECC	ANZECC	ANZECC
Cadmium	mg/L	0.0002	ANZECC	ANZECC	ANZECC	0.0002
Cobalt	mg/L	0.0014	0.0182	ANZECC	ANZECC	ANZECC
Chromium	mg/L	0.0033 (III) and 0.001 (VI)	ANZECC	ANZECC	ANZECC	ANZECC
Copper	mg/L	0.0014	ANZECC	ANZECC	ANZECC	ANZECC
Lead	mg/L	0.0034	ANZECC	ANZECC	ANZECC	ANZECC
Manganese	mg/L	1.900 1.900.005	ANZECC	ANZECC	ANZECC	ANZECC
Mercury	mg/L	0.0006	ANZECC	ANZECC	ANZECC	ANZECC
Nickel	mg/L	0.011	ANZECC	ANZECC	ANZECC	ANZECC
Vanadium		0.006	ANZECC	ANZECC	ANZECC	ANZECC
Zinc	mg/L	0.008	ANZECC	ANZECC	ANZECC	ANZECC
Endosulphan	mg/L	0.0002	ANZECC	ANZECC	ANZECC	ANZECC
Methoxychlor	mg/L	Insufficient Data	TBC	TBC	TBC	TBC

3.2.6.2. Notes on SSTVs:

1. SCAW 1 U/S and SCAW 4 U/S did not have an initial SSTV, but have been updated with a rolling average SSTV based on collected results.
2. TSS is conservatively assumed to be at a ratio of 1:2 with Turbidity.
3. Where a SSTV is unable to be established, the relevant ANZECC (2000a) guideline will be adopted as a trigger level.
4. Methoxychlor does not have an ANZECC (2000a) guideline value and insufficient data has been obtained from monitoring therefore no SSTV can be established.

The SSTV's provide an easily identifiable indication of a potential change in water quality. A management response would be initiated if any of the following occurs:

- A parameter downstream exceeds the corresponding parameter upstream for any single monitoring event by more than 20%,
- A parameter exceeds the SSTV for two consecutive monitoring events,
- A parameter exceeds the SSTV for half of the sampling events in a twelve-month period.

In the event that any of the above triggers are observed, a review will be initiated immediately to determine the significance of the exceedance(s) and possible causes. The review will assess the baseline data for the relevant waterway, recent rainfall records, other activities within the catchment and recent activities or recorded erosion/sediment control incidents occurring in the catchment.

If the exceedance is determined to be attributable to Project works, the event will be treated as an environmental incident and managed in accordance with the requirements of the CEMP. Corrective and preventative actions will be identified and implemented as part of that process.

3.2.6.3. Rolling mean SSTV

SSTV have been developed for water quality parameters based on a rolling mean of upstream monitoring results. As 10 months of samples have been collected and tested (including pre construction and during construction), the rolling average concentrations of water quality parameters at upstream locations will be established as the SSTV based on those data. As each round of sampling and testing occurs, the SSTV will be updated according to the average of the expanded dataset. Where insufficient data is unavailable or the rolling mean is below ANZECC values, the default ANZECC values would be adopted as the SSTVs (where available). Table 10 shows indicative SSTV based on the rolling mean up to August 2023 (based on background data (where applicable) and rolling mean from the first 10 rounds of monitoring). The SSTV will continue to be updated monthly based rolling monthly results of surface water quality monitoring (upstream locations).

In analysing these data, the SSTV responses would be initiated as per the instructions in Section 3.2.6.1.

4. Monitoring methodology / sampling protocol

4.1. Sample collection

Grab samples will be collected manually from the sampling locations identified in Table 5, Figure 6 and Figure 7. The volume of sample collected will be sufficient for the required physio-chemical (field) parameter analysis using a multi-probe water quality meter(s).

4.2. Field measures

Field physio-chemical parameters including EC, pH, DO, TDS, ORP, temperature, and turbidity will be measured at each sampling location using a fully calibrated multi-probe water quality meter(s) or provided for laboratory analysis. Other observations including odour and colour may also be recorded.

The multi-probe field water quality meter(s) will be calibrated against known standards, as supplied by the manufacturer, at the start and completion of each day of water quality sampling.

4.3. Recording of field results

Results for each monitoring location will be recorded on appropriate field sheets (hard copy or digital) using unique sampling identification nomenclature consisting of the sample date, location, and sampler details. Records will be held on the project file for up to 30 years.

4.4. Decontamination

Sampling equipment will be cleaned (decontaminated) between each sample. Where a sample site shows evidence of contamination (i.e. there is an algal bloom, or the site smells strongly of hydrocarbons, sewage or something else) equipment will need to be cleaned thoroughly. In addition, equipment will need to be cleaned periodically to prevent a build-up of dirt.

The following method will be followed:

- Rinse the equipment in tap water,
- Clean with De-Con 90 (a phosphate free detergent), or equivalent,
- Rinse again with tap water,
- Rinse three times with de-ionised water; and
- Allow to dry.

De-ionised and tap water will be available for washing equipment in the field, if required.

4.5. Quality Assurance and documentation

Any sample to be sent to a laboratory will be subject to quality assurance protocols.

Quality assurance and control protocols during sampling and recording of physio-chemical (field) parameters will be undertaken (each sampling event) in accordance with ANZECC/ARMCANZ (2000b) to ensure the integrity of the dataset.

As part of sampling the following will be undertaken:

- Rinsate blanks (one per sampling event only),
- Blind duplicates (at a rate not less than 20% of total samples), and
- Split duplicates (at a rate not less than 20% of total samples).

Samples are to be transported to a NATA-accredited laboratory under documented chain-of custody protocols.

Field results will be checked for accuracy before leaving the site and errors or discrepancies will be cross-checked, and further investigation initiated if required.

Monitoring and calibration records will be maintained in accordance with the appropriate standard.

5. Compliance management

5.1. Roles, responsibility, and training

The CPBUI Project Team's organisational structure and overall roles and responsibilities are outlined in the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Section 7.1 of the SWMP.

All employees, contractors and utility staff working on site will undergo site induction and targeted training relating to surface water management issues, detailed in the SWMP.

Further details regarding staff induction and training are outlined in the CEMP

5.2. Monitoring and inspection

This Program details the monitoring requirements for surface water. Additional soil and surface water inspection requirements (including weekly site inspections) are detailed in the SWMP Section 7.3.

The CPBUI Environmental Manager will be responsible for ensuring monitoring activities are undertaken.

Additional requirements and responsibilities in relation to inspections are documented in the CEMP

5.3. Data analysis and management response

Results from the construction monitoring program will be compared with the SSTVs and with previous results.

Monitoring results for surface water quality will be compared against SSTVs (Table 10), and reported in the construction compliance monitoring reports (Section 5.5). If a trigger is observed (see Section 3.2.6), a review will be initiated to determine the significance of the exceedance(s) and possible causes. The review will assess available surface water data, baseline data for the relevant waterway, recent rainfall records, and recent activities or recorded erosion/sediment control incidents occurring in the catchment. If the exceedance is determined to be attributable to Project works, the event will be treated as an environmental incident and managed in accordance with the requirements of the CEMP. Corrective and preventative actions will be identified and implemented as part of that process.

5.4. Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this Program, CoA, and other relevant approvals, licenses and guidelines.

Audit requirements are further detailed in the CEMP

5.5. Reporting

During construction, surface water quality data will be collected, tabulated and assessed against baseline conditions and performance criteria. Monitoring reports will be submitted to the Planning Secretary, the ER and relevant regulatory agencies (nominally only Penrith City Council and the EPA as part of EPL E2 conditions) on a six-monthly basis from the commencement of construction in accordance with CoA C22.

Reporting requirements associated with the Program for the construction phase of the Project are presented in Table 11.

Table 11 –Reporting requirements

Schedule (during construction)	Requirements	Recipient (relevant authority)	Timing
EPL Monitoring Reports and Annual Returns	EPL monitoring reports will be prepared in accordance with the requirements of the EPL. An EPL Annual Return will be prepared in	EPA	In accordance with EPL

Schedule (during construction)	Requirements	Recipient (relevant authority)	Timing
	respect of each EPL reporting period (typically 12 months).		
Monthly Progress Report	Monitoring program performance (monthly and post rainfall upstream and downstream surface water quality) will be documented in the Monthly Progress Report where applicable. Any incidents and key environmental issues will be documented.	Sydney Metro ER	Monthly
6 Monthly Construction Monitoring Report	Data summary reports presenting tabulated surface water monitoring data collected during the reporting period. Surface water quality results will be presented and performance criteria exceedances will be highlighted. Applicable management responses will be documented.	Sydney Metro ER DPE Penrith Council EPA	Within 60 days of the end of the 6 - monthly reporting period

6. Review and improvement

6.1. Continuous improvement

Monitoring data will be reviewed throughout the construction period to provide potential requirements to increase, or decrease, the number of sampling locations and/or the analytical suites. SSTV will be reviewed for appropriateness monthly. Alterations to SSTV, monitoring locations, analytical suites, or frequencies will be reported in the Water Monitoring Reports (Section 5.5).

Continuous improvement of this Program will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets (detailed in Section 2.2), and the Project performance outcomes of the EIS for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance,
- 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, and
- Make comparisons with objectives and targets.

6.2. SWQMP update and amendment

The processes described for review and amendment in the CEMP may result in the need to update or revise this Program.

Revisions of this Program will be in accordance with the process outlined in the CEMP.

A copy of the updated Program and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure.

7. References

Acid Sulfate Soil Management Advisory Committee (ASSMAC) (1998). Acid Sulfate Soil Manual

ANZECC/ARMCANZ (2000a). Australian and New Zealand Guidelines for Fresh and Marine Water Quality

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RTA, 1999. Guideline for Construction Water Quality Monitoring. NSW Road and Traffic Authority

SMEC (2014). Environmental Field Survey of Commonwealth Land at Badgerys Creek. SMEC, Sydney.

Part C Appendices

Appendix C1 –Baseline surface water monitoring results

Baseline Surface Water Monitoring SCAW4 (from D/S Badgerys, Cardno, 2021

Sampled Date	pH (Field)	Electrical conductivity (field)	DO (%S) (Field)	Temperature (Field)	Turbidity (Field)	Total Suspended Solids	Nitrogen (Total)	Phosphorus (Total)	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
2/11/2015	7.42	2764	37.2	20.42	66.6	12	0.5	0.04	0.002	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.002	<0.005
8/12/2015	7.83	1847	31.5	19.85	4.2	5	0.8	0.05	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.001	<0.005
5/01/2016	7.76	1720	49.9	19.78	62.4	26	3.2	0.44	0.001	<0.0001	<0.001	0.004	<0.001	<0.0001	0.004	0.012
4/02/2016	7.7	851	58.6	24.19	26.6	<5	1.2	0.11	0.001	<0.0001	<0.001	0.002	<0.001	<0.0001	0.002	<0.005
2/03/2016	7.64	19.73	19.1	21.9	9	6	0.5	0.04	0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.002	<0.005
7/04/2016	7.89	1516	47	18.66	3.67	7	0.4	0.03	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.001	<0.005
5/05/2016	7.72	1797	18.2	14.77	0.3	<5	0.2	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.001	<0.005
17/06/2016	7.45	1033	66.3	10.09	53	6	1.2	0.12	<0.001	<0.0001	<0.001	0.006	<0.001	<0.0001	0.002	0.008
20/06/2016	7.54	698	77.9	12.88	72	16	1.6	0.2	0.001	<0.0001	<0.001	0.003	<0.001	<0.0001	0.002	0.006
8/07/2016	7.48	1136	74.8	11.14	38.2	17	0.9	0.07	0.001	<0.0001	<0.001	0.003	<0.001	<0.0001	0.002	<0.005
5/08/2016	7.59	847	86.1	12.55	34.5	8	1.2	0.09	<0.001	<0.0001	<0.001	0.002	<0.001	<0.0001	0.002	0.005
12/09/2016	7.9	1463	89.9	15.86	14	21	2.9	0.51	0.002	<0.0001	<0.001	0.003	<0.001	<0.0001	0.004	0.006
7/10/2016	8.23	2222	63.1	17.54	22.8	13	1.3	0.07	0.001	<0.0001	<0.001	0.002	<0.001	<0.0001	0.002	<0.005
4/11/2016	8	2427	55	16	8	9	0.9	0.01	0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.004	<0.005
12/12/2016	7.4	1484	63.2	17.31	10.2	11	0.9	0.06	0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.001	<0.005
12/01/2017	7.23	1516	65.4	23.36	12.1	5	0.8	0.08	0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.001	<0.005
2/02/2017	7.7	1691	35.7	22.47	4.6	12	0.4	0.09	0.003	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.001	<0.005
8/02/2017	7.91	749.4	54.2	23.8	370.6	116	2	0.26	0.002	<0.0001	0.003	0.007	0.002	<0.0001	0.003	0.013
13/03/2017	8.31	766.3	30.9	19.13	35	13	0.9	0.04	<0.001	<0.0001	<0.001	0.001	<0.001	<0.0001	0.002	<0.005
10/04/2017	7.74	963	74.4	17.98	41.2	16	1.5	0.2	0.002	<0.0001	0.001	0.003	0.001	<0.0001	0.003	0.006
8/05/2017	7.77	1734	47.4	12.28	18.3	<5	0.9	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.002	<0.005
5/06/2017	7.82	2183	55	11.13	19	8	0.6	0.03	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.002	<0.005
13/07/2017	7.82	2284	73	7.34	10.4	5	0.7	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.005

Sampled Date	pH (Field)	Electrical conductivity (field)	DO (%S) (Field)	Temperature (Field)	Turbidity (Field)	Total Suspended Solids	Nitrogen (Total)	Phosphorus (Total)	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
8/08/2017	8.13	2520	77.7	9.04	18.6	<5	0.7	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.005
8/09/2017	8.2	1882	76.5	10.5	3.6	6	0.2	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.002	<0.005
5/10/2017	7.85	1783	109.1	15.5	2.6	<5	<0.1	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.005
6/04/2018	7.6	476	48.8	18.1	17.1	14	0.8	0.05	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.005
11/05/2018	7.86	423.8	88.7	9.9	167.2	627	4.2	0.46	0.003	<0.0001	0.004	0.009	0.005	<0.0001	0.006	0.03
28/06/2018	7.91	366.1	91	10	5.3	52	1.7	0.08	0.001	<0.0001	0.002	0.007	0.002	<0.0001	0.005	0.023
26/10/2018	7.49	129.3	72.5	18.5	7.6	27	1.1	0.03	<0.001	<0.0001	<0.001	0.002	<0.001	<0.0001	0.003	0.007
17/12/2018	6.61	480.4	3.4	20.8	26.9	33	1.9	0.33	<0.001	<0.0001	<0.001	0.005	<0.001	<0.0001	0.003	0.01
30/01/2019	8.67	134.1	31.5	24.1	55.6	20	1.3	0.14	0.002	<0.0001	<0.001	0.006	<0.001	<0.0001	0.002	0.006
2/04/2019	7.64	110.5	20.5	15.5	5.1	11	1.3	0.13	<0.001	<0.0001	<0.001	0.002	<0.001	<0.0001	0.001	<0.005
20/06/2019	7.99	101.8	69.8	9.96	8.9	9	0.93	0.02	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.0001	0.001	<0.005
16/07/2019	7.7	59.2	80.8	9.25	-	9.3	0.64	0.03	<0.001	<0.0002	<0.001	0.003	<0.001	<0.0001	<0.001	<0.005
17/09/2019	7.66	39.6	91.5	10.76	-	21	0.68	0.05	<0.001	<0.0002	<0.001	0.001	<0.001	<0.0001	<0.001	<0.005
16/10/2019	7.39	70.3	42.9	15.1	-	13	0.45	0.04	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.005
13/02/2020	7.1	470	32.1	24	-	25	2.7	0.03	0.001	<0.0002	<0.001	0.005	<0.001	<0.0001	0.002	<0.005
16/03/2020	7.9	417	13	19	-	8.1	0.91	0.09	0.001	<0.0002	<0.001	0.002	<0.001	<0.0001	<0.001	<0.005
15/04/2020	8	293	22	15.1	-	4.1	1.1	0.16	<0.001	<0.0002	<0.001	0.03	<0.001	<0.0001	0.004	0.012
13/05/2020	7.9	196	32	11	-	1.4	0.98	0.1	<0.001	<0.0002	<0.001	0.026	<0.001	<0.0001	0.003	0.008
18/06/2020	7.5	358	35	12	-	280	1.18	0.08	<0.001	<0.0002	<0.001	0.016	<0.001	<0.0001	0.003	0.011
15/07/2020	7.9	262	67	12	-	20	0.7	0.04	<0.001	<0.0002	<0.001	0.015	<0.001	<0.0001	0.003	0.009
13/08/2020	7.8	1031	40	12	-	470	51.1	3.3	0.002	<0.0002	<0.001	0.009	<0.001	<0.0001	0.004	0.011
17/09/2020	7.7	1223	42	14	-	30	12.2	1.1	0.003	<0.0002	<0.001	0.007	<0.001	<0.0001	0.004	<0.005
15/10/2020	8.1	1600	-	-	-	11	5.83	1.5	0.003	<0.0002	<0.001	0.004	<0.001	<0.0001	0.003	<0.005
12/11/2020	7.7	888	52	19	-	7.9	4.7	0.28	0.001	<0.0002	<0.001	0.006	<0.001	<0.0001	0.003	-

Sampled Date	pH (Field)	Electrical conductivity (field)	DO (%S) (Field)	Temperature (Field)	Turbidity (Field)	Total Suspended Solids	Nitrogen (Total)	Phosphorus (Total)	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
14/12/2020	8	800	98	-	-	8.5	1.47	0.31	0.002	<0.0002	<0.001	0.004	<0.001	<0.0001	0.001	0.011
21/01/2021	7.9	957	15	19	-	14	1.44	0.14	<0.001	<0.0002	<0.001	0.044	0.002	<0.0001	0.005	0.049
18/02/2021	7.8	860	100	-	-	15	0.6	0.11	0.001	<0.0002	<0.001	0.014	<0.001	<0.0001	0.003	0.013
29/03/2021	7.6	1493	21	20	-	56	23.1	8.6	0.004	<0.0002	<0.001	0.004	<0.001	<0.0001	0.003	0.007
21/04/2021	7.7	2271	9	14	-	22	26.4	6.4	<0.01	<0.001	<0.01	<0.01	<0.001	<0.0001	<0.01	<0.05
27/05/2021	7.2	1231	39		-	29	6.1	1.3	0.002	<0.0002	<0.001	0.005	<0.001	<0.0001	0.003	0.011
23/06/2021	7.8	1462	66	10	-	14	1.5	0.51	<0.001	<0.0002	<0.001	0.004	<0.001	<0.0001	0.002	<0.005

Appendix C2 – Consultation Records

Penrith City Council

Liverpool City Council

Location
Chair
Date
Attendees

Item

Item

Actions

CPB | UNITED INFRASTRUCTURE

Item	Meeting notes	Actions

CPB | UNITED INFRASTRUCTURE

Item	Meeting notes	Actions
CEMP Sub-plans and Monitoring Programs		Nil

CPB | UNITED INFRASTRUCTURE

Item	Meeting notes	Actions

CPB | UNITED INFRASTRUCTURE

Item	Meeting notes	Actions

DPI Fisheries

DPE Water

Appendix C3 – Erosion and Sediment Control Management Procedure

EROSION AND SEDIMENT CONTROL MANAGEMENT PROCEDURE

MANAGEMENT AND RESPONSIBILITY

Inform Environmental Coordinator of upcoming works. Have the works been included in a current Erosion Sediment Control Plan (ESCP)?

Project Engineer

N

ESCP to be compiled by site Environmental Coordinator in collaboration with the Site Engineer in accordance with "Landcom (2004) Soils and Construction Vol.1, 4th Edition, March 2004 Managing Urban Stormwater" (Blue Book). Environmental Coordinator and Site Engineer are to undertake a site inspection to obtain an understanding of any constraints and if any additional environmental controls are required.

Y

Works can proceed in accordance with the ESCP.

Environmental Coordinator
Site Engineer

HOLD POINT – Excavation works cannot commence / recommence until an ESCP is developed or reviewed and deemed appropriate by the Environmental Coordinator.

Does the ESCP take into consideration the following aspects?

- Clean/dirty water separation and water diversion; dirty water (onsite water) must be captured and treated or pass through appropriate controls
- Topography/slope/natural drainage lines; slope breaks are to be implemented on steep slopes to slow water movement and reduce erosion. Design batter slope gradients and surface treatments to minimise erosion risk
- Areas of unsealed ground; ground cover is to be implemented on unsealed ground/stockpiles using geofabric or polymer
- Discharge points and on-site detention of water; include suitably designed scour and erosion controls at drainage and sedimentation basin outlet discharge points
- Use of compostable or reusable temporary erosion and sediment control devices where practicable.

HOLD POINT – No runoff (sediment laden or otherwise) is permitted to leave site unless in accordance with the Water Reuse and Discharge Management Procedure

- Implement boundary controls at the site perimeters and surrounding storm water drains if works are being undertaken in close proximity
- Controls are to be inspected regularly including before and after rainfall and maintained as required.

Final version of the ESCP must be signed by the Site Engineer, Environmental Coordinator and Site Supervisor. Content to be included in Toolbox Talk and ESCP to be displayed on the site notice board.

Project Engineer
Site Engineer
Environmental Coordinator
Site Supervisor

Appendix C4 – Acid Sulfate Soil Management Procedure

Appendix C4 – Acid Sulfate Soil Management Procedure

Western Sydney Airport – Surface and Civil Alignment Works

Project Name	Sydney Metro – Western Sydney Airport, Surface and Civil Alignment Works
Project Number	N81150
Revision Date	18/10/2022
Revision	F
Document Number	SMWSASCA-CPU-1NL-NL000-WA-PLN-000001

Document Approval

Rev.	Date	Prepared by	Reviewed by	Approved by	Remarks
A	17/05/2022	[redacted]			First Draft
Signature					
B	26/07/2022				See Revision Table
Signature					
C	17/08/2022				See Revision Table
Signature					
D	27/08/2022				See Revision Table
Signature					
E	16/09/2022				See Revision Table
Signature					
F	18/10/2022				See Revision Table
Signature					

Distribution and Authorisation

Document Control

The CPBUI JV Project Director is responsible for ensuring this plan is reviewed and approved. The Project Director is responsible for updating this plan to reflect changes to the project, legal and other requirements, as required.

The controlled master version will be maintained on TeamBinder. All circulated hard copies are deemed to be uncontrolled.

Amendments

The implementation of this Plan is under the authority of the CPBUI Delegated Authority Matrix. All Contract personnel will perform their duties in accordance with this Plan, supporting plans, and related procedures.

Revision Details

Rev.	Details
A	First Draft
B	In response to Sydney Metro and ER comments
C	In response to Sydney Metro, Independent Certifier and ER comments
D	In response to final ER comments prior to endorsement
E	In response to minor ER comments prior to endorsement
F	Updated following DPE review

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Abbreviations and definitions

Refer to Definitions, Abbreviations and Acronyms, Sydney Metro – Western Sydney Airport Surface Civil and Alignment Works Package.

Table 1 – Abbreviations and definitions

Abbreviation	Description
ASS	Acid Sulfate Soil
ASSMP	Acid Sulfate Soil Management Procedure
CEMF	Sydney Metro Construction Environment Management Framework
CEMP	Construction Environmental Management Plan
CoA	Conditions of Approval SSI-10051
CoC	Chain of Custody
CPB	CPB Contractors Pty Ltd
CPBUI JV	CPB Contractors and United Infrastructure Joint Venture
CSSI	Critical State Significant Infrastructure
EPA	Environmental Protection Authority
ER	Environmental Representative
EWMS	Environmental Work Method Statement
Hold point	A verification point that prevents work from commencing prior to approval from the appointed authority.
NATA	National Association of Testing Authorities
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 CEMP or supporting documentation
PASS	Potential Acid Sulfate Soil
SPOCAS	Suspension Peroxide Oxidation Combined Acidity and Sulfate
QA	Quality Assurance
QASSIT	Queensland Acid Sulfate Soils Investigation Team
REMM	Revised Environmental Mitigation Measures
SCAW	Metro Western Sydney Airport Surface Civil and Alignment Works Project
SWMP	Soil and Water Management Sub-plan

1. Description

This Acid Sulfate Soil Management Procedure (ASSMP) has been developed in accordance with the Acid Sulfate Soils Manual, Acid Sulfate Soil Management Advisory Committee NSW (ASSMAC 1998) and the Queensland Acid Sulfate Soils Investigation Team (QASSIT) Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines (2002) where applicable, and describes the actions to be taken when unexpected Actual Acid Sulfate Soils (AASS) or Potential Acid Sulfate Soils (PASS) are encountered during excavation / construction activities.

1.1. Interface with other plans

This ASSMP is an appendix to the SWMP, which is a sub-plan of the CEMP: The SWMP sets out the requirements for soil and water management to minimise the risk of pollution.

1.2. Objectives

The key objective of the ASSMP is to ensure appropriate management measures are implemented to manage acid sulfate soils and water quality impacts during construction of the Project. To achieve this objective, CPB Contractors United Infrastructure Joint Venture (CPBUI) will undertake the following:

- Ensure appropriate controls and procedures are implemented during construction activities to avoid or minimise impacts to acid sulfate soils and potential adverse impacts along the Project corridor.
- Ensure appropriate measures are implemented to address the relevant legal requirements and the mitigation measures detailed in the EIS for the Project.

2. Legislative Requirements

Relevant NSW legislation to acid sulfate soil (ASS) management includes:

- Environmental Planning and Assessment Act 1979
- Protection of the Environment Operations Act 1997
- Contaminated Land Management Act 1997

The purpose of the Procedure is to describe how CPBUI will manage ASS in the event they are encountered during construction of the Project.

The risk of encountering ASS is considered low to very low based on information contained within the EIS and supplementary geotechnical investigations. The Procedure supplements the Soil and Water Management Sub-plan (SWMP), which itself is an appendix of the Construction Environmental Management Plan (CEMP).

2.1. Guidelines

Guidelines used in preparation of this procedure include:

- NSW Acid Sulfate Soil Management Advisory Committee (ASSMAC) (1998), Acid Sulfate Soil Manual
- NSW Environmental Protection Authority (1999) Assessment Classification and Management of Liquid and Non-Liquid Waste
- NSW Environmental Protection Authority (2014), Waste Classification Guidelines Part 1: Classifying waste
- NSW Environmental Protection Authority (2014), Waste Classification guidelines part 4: Acid Sulfate Soils
- Queensland Acid Sulfate Soils Investigation Team (QASSIT) (2002), Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines

2.2. Objectives

The key objectives of this Procedure is to ensure ASS are managed in accordance with relevant legislation, guidelines and Sydney Metro's Construction Environmental Management Framework (CEMF).

2.3. Consultation

As this procedure forms an appendix to the SWMP, this was provided to DPI Fisheries and Penrith and Liverpool City Councils in accordance with CoA C5(c).

Community feedback and complaints relating to surface water quality will be managed in accordance with the Communication Strategy and Complaints Management System.

2.4. Compliance

The CoAs and REMMs relevant to this Program are detailed in Table 2.

Table 2 –CEMF for this Procedure.

ID	Type	Detail	How addressed
12 a (v)	CEMF	A contingency plan, consistent with the NSW Acid Sulfate Soils Manual (EPA 1998), to deal with the unexpected discovery of actual or potential acid sulfate soils both on and off-airport lands. The plan must including procedures for the investigation, handling, treatment and management of such soils and water seepage;	This document. Refer to Section 2.3 for consultation details. Refer to Section 3.2 for monitoring locations.

3. Background and potential impacts

Acid Sulfate Soils (ASS) are soils that contain sulphides that oxidise when exposed to air and produce sulfuric acid and toxic quantities of aluminium and other heavy metals (including arsenic). These reaction products are at a higher risk of being released into the surrounding environment and polluting nearby surface water.

These soils are naturally occurring and are found in coastal floodplains and in the soils adjacent to rivers and creeks at elevations below 5 metres.

ASS incorporates both Actual Acid Sulfate Soils (AASS), where iron sulphides have been exposed to air and have oxidised, and Potential Acid Sulfate Soil (PASS), where iron sulphides are located below the water table in waterlogged soil and are therefore oxygen deficient.

If drained into waterways, the acidic runoff of ASS can deoxygenate receiving waterways causing fish kills and mass mortalities of micro and macroscopic organisms. It can increase light penetration through water bodies and contribute to loss of habitat, including causing the death or stunted growth of aquatic flora and fauna. It can also mobilise metals from contaminated sediments as well as damage soil structure and built structures (ASSMAC, 1998).

The acid leachate can damage infrastructure by corroding concrete and limestone, and create persistent iron coatings.

ASS can also release hydrogen sulphide gas, which can be hazardous to humans at high concentrations, or if exposed for extended periods of time. Contact with ASS can cause skin irritation, eye damage, irritation of the gastrointestinal tract, respiratory and heart problems, headaches and insomnia. Prolonged exposure can lead to paralysis or meningitis.

Health and safety risks associated with ASS are to be determined on a site-specific basis.

3.1. High Risk Activities

In areas of potential or actual ASS, construction activities such as excavation, land clearing and drainage risk disturbing ASS. Dewatering activities also have the potential to oxidise PASS by lowering the groundwater table, thereby generating AASS and acidic run-off.

Other construction activities that can cause the oxidisation of PASS material include “settlement”, whereby the reduction in available pore space can force sub-surface water from soil material and produce acidic leachate where it flows through oxidised AASS.

Embankment settlement can depress underlying material and in some cases this can cause displacement at the toe of the embankment, raising PASS material above the water table.

Within the project alignment, there’s a low to very low likelihood of encountering ASS during construction, refer section 3.1.1), therefore a range of management measures will be necessary to identify, contain and monitor ASS.

3.1.1. Key Potential locations of risk

The EIS identified that the likelihood of Acid Sulfate Soils (ASS) from coastal processes is low to extremely low given elevation is >10 metres AHD, mapping does not indicate a risk of ASS/PASS and the project is not within a coastal area. ASS/PASS soil testing was undertaken by GHD during design investigations at the Western Sydney International in 2018. Ninety-seven (97) soil samples were tested for ASS/PASS and only two samples had a marginal presence of PASS, indicating that PASS are unlikely to be encountered. The EIS also identified that inland ASS can form within saline waterlogged soils with high quantities of organic matter. The EIS confirms that areas mapped as having high potential or known salinity risk (corresponding to the main watercourse crossings the project) as illustrated in Figure 1 have the potential to form ASS. The likelihood of inland Acid Sulfate Soils (ASS) occurs at three locations around the zones of Blaxland Creek, Unnamed Creek and Cosgroves Creek as detailed in Table16-3 of the EIS. The potential for ASS to be encountered comes from pilings and footing excavations for viaducts and surface disturbance for at-grade construction around the riparian zones.

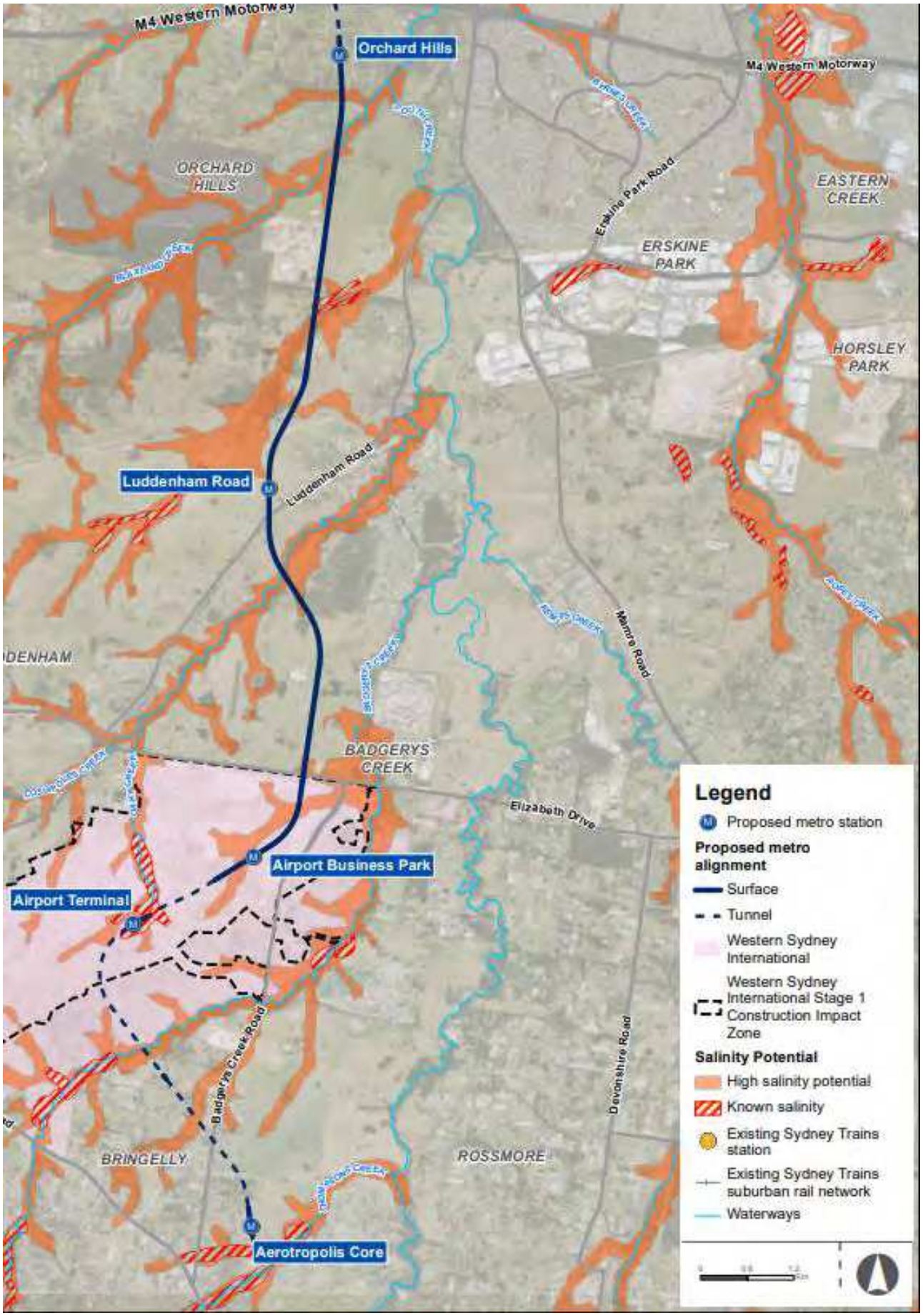

Figure 1 – Salinity Potential in Western Sydney
(Source: Extract from Figure 16-1 SMWSA EIS Ch16

3.2. Processes for Identifying AASS and PASS

3.2.1. AASS Characteristics

Any of the following characteristics may indicate the presence of acid sulfate soils ASS:

- Soil pH of <4
- A sulfurous smell following soil disturbance
- Pale yellow surface encrustations or iron oxide mottling in any excavated material left exposed, surface encrustations or in auger holes.
- Excessive iron staining on drain or pond surfaces or stream banks, or iron stained drain water and orange red ochre deposits around water bodies
- Excessive corrosion of concrete and/or steel structures exposed to ground or drainage waters, or rapid corrosion of fresh steel in the soil
- Water of <pH 5.5 in adjacent streams, drains, groundwater or ponding on the surface
- Clear or milky-blue green drain water flowing from or within the area (caused by aluminium released from the AAS acting as a fluctuating agent)

3.2.2. PASS Characteristics

High risk indicators for potential acid sulfate soils (PASS) could include:

- Low position in the landscape
- Native estuarine soils
- Waterlogged soil from beneath the water table
- Blue-grey, blue-green or grey waterlogged soils
- Sulfur odour (rotten egg odour)
- Neutral to acidic water or soil pH

Field inspections should investigate the presence of both actual and potential acid sulfate soils. Often, actual acid sulfate soils are found overlaying potential acid sulfate soils, and both are often covered by a non-acid sulfate alluvial topsoil.

3.2.3. Field pH test

A field soil pH (pH_F) test offers a quick indication of the presence and severity of “actual” acid sulfate soils. The field pH is a qualitative method only that cannot be used as a substitute for laboratory analysis in the identification of acid sulfate soils for assessment purposes. When using this test to provide an initial screen for the presence of PASS, field pH readings should be taken at regular intervals down the soil profile. It is recommended this test be done every 0.25m down the profile but at least every 0.5m interval or horizon whichever is the lesser.

- Field pH readings ≤4 suggest that “actual” acid sulfate soils are present where the sulphides have been previously oxidised, resulting in acid soils and soil pore water.
- Field pH values >4 and <5.5 are acid and may be the result of some previous or limited oxidation of sulfides, but is not a definite confirmation of actual ASS. Substantial exchangeable / soluble aluminium and hydrogen ions usually exist at these pH values. Other factors such as excessive fertiliser use, organic acids or strong leaching can cause pH >4 - <5.5. Field pH alone cannot indicate “potential” ASS as they may be neutral to slightly alkaline when unoxidised.

In order to test for PASS that contain unoxidised sulfides, 30% hydrogen peroxide is used to rapidly oxidise the iron sulphides (usually pyrite), which produces acid with a corresponding drop in pH.

3.2.4. Field Peroxide pH test

To test for the presence of unoxidised sulfides and therefore PASS, the oxidation of the soil with 30% (100 volume) hydrogen peroxide can be performed in the field. Please note that the pH of analytical grade peroxide may be as low as 3 as manufacturers stabilise technical grade peroxide with acid. The peroxide pH should be checked on every new container and regularly before taking to the field and

adjusted to 4.5 - 5.5 with a few drops of 0.1M sodium hydroxide (NaOH) if necessary. False field pH_{FOX} (pH post-reaction) readings could result if this step is not undertaken.

Note: Hydrogen peroxide of 30% is a strong oxidising agent and should be handled carefully with appropriate eye and skin protection. This test should be only undertaken by trained personnel.

The most common method for a field peroxide pH test is as follows:

A small soil sample of approximately 5 g is placed in a glass container and approximately 20 mL of hydrogen peroxide is dropped onto the soil.

The resulting reaction should be observed and the rate of reaction should be noted. The reaction could be instantaneous, or it could take more than 10 minutes. This could be (in part) due to ambient temperature, so heating the container over hot water or leaving it in direct sunlight could be necessary to start the reaction on cool days or if the peroxide is cold.

Note: Allow the digested solution to cool after the reaction. A pH probe will only measure to 60°C.

After oxidation, the pH is measured a second time, with the result referred to as pH_{FOX}. Potentially positive reactions for PASS include one or more of the following:

- A change in soil colour from grey tones to brown tones
- Effervescence
- The release of sulfurous odours including sulfur dioxide or hydrogen sulfide
- A final pH (of pH_{FOX}) of <3.5 and preferably < 3
- Lowering of soil pH by at least one pH unit (i.e. pH_F - pH_{FOX}) >1

The strength of the reaction is a useful indicator. The peroxide test is most useful and reliable with clays and loams containing low levels of organic matter. This is because high levels of organic matter (surface soil, peat, mangrove/estuarine mud, marine clays) and other soil constituents (particularly manganese oxides) can also react to generate acid and cause a false positive. The test is therefore less appropriate on coffee rock, sands or gravels, particularly dredged sands with low levels of sulfuric material (e.g. <0.05 % S). Please note that the pH of soils with organic matter and pyrite will not remain below 4 on extended oxidation. However, given the risk of false positives, it is generally advisable that positive tests on surface soils that appear well drained should still be treated with caution and confirmed with laboratory testing.

3.2.5. pH After Oxidation

Of particular importance is the change in pH following oxidation, as it's a powerful indicator for the presence of sulfuric material and can give an early indication of the distribution of sulfide down a core / profile or across the site. However, the pH after oxidation test is not a substitute for analytical test results.

If the pH_{FOX} value is at least one unit below field pH_F, it may indicate potential acid sulfate soils. The greater the difference between the two measurements, the more indicative the value is of a potential acid sulfate soils. The lower the final pH_{FOX} value is, the better the indication of a positive result.

- If the pH_{FOX} < 3 and there was a strong reaction to the peroxide, there is a high level of certainty of a potential acid sulfate soils. The further below a pH_{FOX} of 3, the more likely the presence of sulfides.
- A pH_{FOX} of 3-4 is less positive and laboratory analyses will be necessary to confirm if sulphides are present. Sands are particularly likely to give confusing field test results and must be confirmed by laboratory analysis.
- For pH_{FOX} of 4-5, the test results should be interpreted as neither positive nor negative. Sulphides may still be present in small quantities and could be poorly reactive under quick field test conditions. Other reasons for this result could include the presence of shell/carbonate in the sample that neutralises some or all of the acid produced by oxidation. In other cases, the pH_{FOX} value may be due to the production of organic acids and there may be no sulphides present. When this is suspected to be the case, analysis for sulfur using the Suspension Peroxide Oxidation Combined Acidity and Sulfate (SPOCAS) method is recommended to check for the presence of oxidisable sulphides.

- For pH >5 and little or no drop in pH from the field value, little net acid generating ability is indicated. However, the sulfur trail of the SPOCAS method is recommended to check samples and confirm the absence of oxidisable sulphides.

The interpretation of this test when conducted on highly reactive soils must be done with care. Some soil minerals such as manganese react vigorously with peroxide but may only show small pH changes.

It's recommended that certain controls are used to increase the consistency of field peroxide tests, particularly when multiple samples are taken. These include using a scoop to react a fixed volume of soil with a fixed volume of peroxide, and are left to react for a fixed amount of time (ie. 1 hour). The sample should also be made up to a fixed volume with deionised water before reading. However, these controls procedures take time in the field and may be better suited to a 'field shed' situation.

When effervescence has ceased, additional peroxide should be dropped into the solution until the reaction appears complete. If the reaction is violent, it is recommended that deionised water be added to cool and dilute the reaction before measuring the pH_{FOX}. With particularly violent reactions, the test may need to be repeated such that a small amount of water is added to the soil prior to peroxide addition.

4. Surface water quality construction monitoring

As the proposed works are likely to disturb ASS, detailed investigations must be conducted in accordance with Section 4 of the ASSMAC (1998) to verify the extent and severity of ASS in areas along the project alignment where construction activities such as excavation, surface works, or dewatering may intercept or generate ASS. These investigations are to include field screening and laboratory analysis, and should be undertaken prior to construction, during the detailed design stage. The results of which will inform more precise demarcation of ASS locations, and advise liming rates where treatment of PASS and AASS is necessary. Assessment, classification, handling, treatment and disposal of ASS on site will be undertaken in accordance with the Waste Classification Guidelines Part 4: Acid Sulfate Soils (NSW EPA, 2014).

The detailed design will need to consider the potential impacts on elements that are buried or in contact with identified ASS in the event they are discovered and determine management and mitigation measures for minimising impacts.

The proposed construction stage mitigation measures to be implemented on site are detailed in the table below

4.1. Excavation procedures

In areas where ASS is suspected to occur, the following excavation procedure is to be undertaken

1. A geotechnical engineer or contaminated land consultant will visually inspect material being excavated for the following observations, of which ASS material may have one or more characteristics (for a full list of identifying features, refer to section 8 of this Appendix):
   - A sulphurous or tar-like smell during excavation
   - Blue or green material
   - Pale yellow staining or mottling within excavated material
   - Water-logged soils, soft buttery blue-grey or dark green-grey mud
   - Mid to dark-grey estuarine silty sands or sand
   - Dark grey to black bottom sediments of estuaries
2. If ASS are identified during excavation or in excavated material, immediately stop excavation activities and notify the construction supervisor.
3. Immediately bund excavated material and await confirmation on whether ASS is present.
   - ASS bunds must be impervious and have a sump to collect acid leachate
   - Consider laying lime under the stockpile to neutralise leachate.
   - ASS must be kept wet at all times to reduce its exposure to oxygen during excavation, handling, transport and storage.
4. Conduct a visual assessment and testing to determine if materials are positive for the presence of ASS.
   - Field pH and Indicator Test Screening (refer to section 10 of this Appendix for process).
   - SPOCAS or equivalent to confirm liming requirements
   - Appoint specialist consultant to assess results and advise on management procedure.
5. If material is identified as ASS, site-specific actions are to be developed. This includes an ongoing, detailed management plan in consultation with the Project Environmental Consultant.
   - Agree on immediate action to manage ASS
   - Testing and treatment plans are to be consistent with ASSMAC (1998)
   - If disposal is to take place, it must be done in accordance with the NSW EPA (2014) Waste Classification Guidelines Part 4: Acid Sulfate Soils.
6. After use, wash equipment in contact with ASS and seek advice from specialist consultant for further action if required.

4.2. Dewatering Procedures

Dewatering on site will be in accordance with the Project specific dewatering procedure detailed in the Appendix C8 SWMP.

4.3. AASS/PASS Storage and Handling

In accordance with the ASSMAC (1998), the fundamental principles of ASS management are as follows:

- Avoid disturbance of ASS by modifying work practices when possible, including works that alter groundwater levels, such as dewatering.
- Minimise disturbance of ASS by excavation and dewatering procedures, and mitigate the potential for ASS to impact on the surrounding environment
- Neutralise excavated and disturbed soils, and acidified runoff or water created through dewatering using lime.

4.4. Temporary Stockpiles

Temporary stockpiles will be minimised on the Project due to restrictions on available space. If AASS/PASS cannot be immediately transported to the ASS Treatment Area, it is to be stockpiled in short term temporary stockpiles in accordance with the QASSIT (2002) Soil Management Guidelines

Table 3 – Short Term Stockpile Durations.

Texture range (McDonald *et al.* 1990)	Approx. clay content (%)	Short term stockpiles
Coarse texture Sands to loamy sands	≤ 5	Overnight
Medium texture Sandy loams to light clays	5 – 40	21/2 days
Fine texture Medium to heavy clays and silty clays	≥ 40	5 days

Organising the storage and handling of AASS/PASS is the responsibility of the Foreman.

Temporary stockpiles should be limited in both the volume and duration of acid sulfate soil storage. The location of temporary stockpiles must either be elevated or located outside of the 10% AEP flood level. Temporary stockpile locations must also be kept away from waterways and drainage lines and they must be assessed and approved by Project Environmental and Sustainability Manager. Where possible, temporary ASS stockpiles should be close to the excavation and stockpiled separately from other materials. Where possible, stockpiles should separated from the underlying soil by a guard layer and the ASS material kept moist to exclude air.

The total volume of ASS material in temporary stockpiles should not exceed 20% of a day's total extraction. The material should be removed for treatment as soon as possible, however if it's necessary to store ASS/PASS for more than three days, a bed of aglime (5kg/m^2) should be spread over the storage location. If it's necessary to store untreated ASS/PASS for more than five (5) days, the stockpile must be contained within adequately bunded areas. All runoff must be treated in the same way as leachate from ASS Treatment Areas.

Any required medium-term stockpiling must occur in a designated ASS Treatment Area.

4.5. Prevent the oxidation of sulfide

In the event that ASS are disturbed, it is important that mitigation strategies are taken immediately to prevent the soil from oxidising. Please note that if there is any soil or soil layers that have already been

oxidised and are currently acidic (field pH < 4.5), that denial of oxygen alone is unlikely to prevent further oxidation. As such, a neutralising agent such as lime is necessary in these circumstances.

To further prevent oxidation, the following steps can be taken:

1. In accordance with the NSW EPA (2014) Waste Classification guidelines part 4: Acid Sulfate Soils, ASS must be kept wet at all times to reduce its exposure to oxygen.
2. Reduce the time ASS is exposed to the air. It is worth assessing the type of soil as certain soils like sandy sediments can oxidise and leach more rapidly (with significant amounts of acid produced within a few hours) than other soil types, such as clays (a few days).
3. Keep ASS in anaerobic conditions wherever possible and minimise any time spent in oxygenated environments.
4. Short term disturbance of acid sulfate soils can be staged to minimise costs to the environment. This includes reburying ASS into anaerobic conditions as quickly as possible prior to the generation of acid.
    a. Neutralising agents can be mixed with excavated material to neutralise any acid that may have been or will be produced from the time spent aerated.
5. Place any excavated ASS immediately under water or raise the watertable to maintain saturation of potential acid sulfate soils.
    b. If immediate disposal is not possible, the material should be capped with water and/or with non-porous clay soils to limit oxidation. As a precaution, lime should be added and the pH of the water should be monitored and treated if below 6.5.

4.6. Transport of AASS/PASS material

AASS/PASS material must be transported by haulage trucks with adequate tailgates to prevent spillage of material or drainage water onto public or construction access roads.

Haulage routes should be regularly monitored and inspected for AASS/PASS material. Spills are to be cleaned appropriately and spilled material is to be moved to the ASS Treatment Area as soon as possible.

5. AASS/PASS Treatment

AASS/PASS treatment must occur within a designated ASS Treatment Area. Material contained in treatment cells must be treated and removed before new material is introduced to the area to ensure there is no mixing of treated with contaminated material.

The management of onsite treatment is the responsibility of the CPBUI JV Foreman, with assistance from the CPBUI JV Environmental team.

Aglime used in treatment is to be stored in 'dry areas' such as elevated holding bins or zero permeability bunded stockpiles. Stockpiles should be covered with tarpaulins to minimise dust generation and to keep the aglime dry as it is difficult to handle when wet.

5.1. Immediate reuse

Immediate reuse where excavations are backfilled within a day is only appropriate if PASS is of low strength, as temporary exposure can oxidise PASS and gradually generate AASS. It is therefore recommended that lime is applied prior to backfilling as a precautionary measure, and that material is backfilled in reverse order (last out, first in).

Immediate reuse is not appropriate for the majority of situations where PASS is excavated. A specialist consultant should be consulted and the decision to employ this technique can only be made by the Environment Manager.

5.2. ASS Treatment Area

Treatment zones are to be set up prior to the commencement of excavation. Designated ASS Treatment Areas should be constructed and discussed with construction personnel as part of ongoing toolbox talks. The foreman is to ensure these areas must be clearly signposted and for ASS/PASS material only. Material other than ASS/PASS that requires treatment needs to be assessed and treated in a separate location.

5.3. Mixing of Aglime (or alternative) and ASS

Aglime (or alternative) must be added according to the ratios defined by the results of Chromium Suite Validation testing. For details of the validation testing, see Acid Sulfate Soils: Laboratory Methods Guidelines (DNRME 2004).

Two options are available for aglime treatment processes:

The first option is for disturbed ASS/PASS material to be returned to the excavation site once the excavation is complete (ie. for service relocations). For these situations, aglime should be added over the area of disturbance in appropriate quantities prior to the commencement of excavation to encourage early mixing and neutralisation. Specific liming rates are to be advised according to laboratory analysis (see Figure 9.3.1).

The second option applies where ASS/PASS is excavated and relocated to the ASS Treatment Area. In these situations, the following process is to be followed:

1. One third of the total aglime required for the excavated material (determined from lab testing) would be placed as a bed over the proposed treatment location.
2. A layer of ASS or PASS material no more than 350 mm in depth must be placed on top of the aglime and allowed to dry.
3. When the material is dry (expected 1-2 days in hot dry weather, much longer in cool or wet weather), another 1/3 of the total lime shall be added to the top and sides of the stockpile and thoroughly mixed, using either small or large mechanical equipment such as a disc plough or rotary hoe attached to a tractor or other suitable equipment.
4. If necessary, the partially treated stockpile should again be allowed to dry.
5. The remaining 1/3 of lime should be added to the top and sides of the stockpile.
6. Thoroughly mix the stockpile using a rotary hoe (either on a tractor or as an excavator attachment). Where an excavator is to be used, increase the lime application rate using a safety factor to 2-2.5 dependent on the difficulty of mixing lime into the material.
7. Validation testing as required.

8. Once validated, the treated soil can be considered to be neutral and can be reused as general fill material. The final location of the neutral soil shall then be tracked and recorded in the Treated ASS Tracking Register.

Note: the ratios of aglime to be added may be varied on approval by the CPBUI JV ESM.

Any water contained within collection sumps will require sampling to assess requirements of water treatment prior to discharge.

The tonnes (t) of pure fine aglime, $CaCO_3$ required to fully treat the total weight/volume of acid sulfate soils (ASS) can be read from the table at the intersection of the weight of disturbed soil [row] with the existing plus potential acidity [column]. Where the exact weight or soil analysis figure does not appear in the heading of the row or column, use the next highest value.

Disturbed ASS (tonnes) (m^3xBD) †	Soil Analysis* – Existing Acidity plus Potential Acidity (converted to equivalent S% units)													
	0.03	0.06	0.1	0.2	0.4	0.6	0.8	1	1.5	2	2.5	3	4	5
1	0	0	0	0	0	0.03	0.04	0.05	0.1	0.1	0.1	0.1	0.2	0.2
5	0	0	0	0.05	0.1	0.1	0.2	0.2	0.4	0.5	0.6	0.7	0.9	1.2
10	0	0.03	0.05	0.1	0.2	0.3	0.4	0.5	0.7	0.9	1.2	1.4	1.9	2.3
50	0.1	0.1	0.2	0.5	0.9	1.4	1.9	2.3	3.5	4.7	5.9	7.0	9.4	12
100	0.1	0.3	0.5	0.9	1.9	2.8	3.7	4.7	7.0	9.4	12	14	19	23
200	0.3	0.6	0.9	1.9	3.7	5.6	7.5	9.4	14	19	23	28	37	47
250	0.4	0.7	1.2	2.3	4.7	7.0	9.4	12	18	23	29	35	47	59
350	0.5	1.0	1.6	3.3	6.6	10	13	16	25	33	41	49	66	82
500	0.7	1.4	2.3	4.7	9.4	14	19	23	35	47	59	70	94	117
600	0.8	1.7	2.8	5.6	11	17	22	28	42	56	70	84	112	140
750	1.1	2.1	3.5	7.0	14	21	28	35	53	70	88	105	140	176
900	1.3	2.5	4.2	8.4	17	25	34	42	63	84	105	126	168	211
1000	1.4	2.8	4.7	9.4	19	28	37	47	70	94	117	140	187	234
2000	2.8	5.6	9.4	19	37	56	75	94	140	187	234	281	374	468
5000	7.0	14	23	47	94	140	187	234	351	468	585	702	936	1170
10000	14	28	47	94	187	281	374	468	702	936	1170	1404	1872	2340

L	**Low treatment:** (≤0.1 tonnes lime)
M	**Medium treatment:** (>0.1 to 1 tonne lime)
H	**High treatment:** (>1 to 5 tonnes lime)
VH	**Very High treatment:** (>5 to 25 tonnes lime)
XH	**Extra High treatment:** (>25 tonnes lime)

Note: Lime rates are for pure fine aglime, $CaCO_3$ assuming an NV of 100% and using a safety factor of 1.5. A factor that accounts for Effective Neutralising Value is needed for commercial grade lime. (See the *Information Sheets on Neutralising Agents – Neutralising Considerations*).

† An approximate soil weight (tonnes) can be obtained from the calculated volume by multiplying volume (cubic m) by bulk density (t/m^3). (Use 1.7 if B.D. is not known.) Dense fine sandy soils may have a BD up to 1.7, and hence 100 m^3 of such soil may weigh up to 170 t. In these calculations, it is necessary to convert to dry soil masses, since analyses are reported on a dry weight basis.

* Potential acidity can be determined by Chromium Reducible Sulfur (S_{CRS}), Peroxide Oxidisable Sulfur (S_{POS}) and Total Oxidisable Sulfur (S_{TOS}). For samples with pH <5.5, the existing acidity must also be determined by appropriate laboratory analysis eg. Titratable Actual Acidity (TAA). Soils with retained acidity eg. jarosite or other similar insoluble compounds have a less available acidity and will require more detailed analysis. The amount of treatment required may be reduced if the self-neutralising capacity of the soil is appropriately measured. Consult the **Queensland Acid Sulfate Soils Technical Manual, Laboratory Methods Guidelines**.

Figure 2 – ASS neutralisation rates through aglime application.

(Source: Queensland Acid Sulfate Soils Technical Manual, Laboratory Methods)

5.4. Treated ASS/PASS Monitoring

Once treated and allowed to dry further (if necessary), laboratory testing of the mixture should be conducted according to the Chromium Suite Validation method to determine if the criteria for sulphur and acid trails have been met. The testing frequency is to be conducted at a minimum of once every 500 m3 of treated soil, but may be done more frequently on advice from the CPBUI ESM if considered necessary.

Composite samples containing a maximum of three discrete samples per composite may be used to account for potential variability that may occur with uneven mixing of lime. In situations requiring composite samples, suitable techniques must be employed to ensure the composite is representative of the treated material.

Field peroxide pH testing and tracking via the lime register can be used to assess the success of the treatment technique, and confirm the neutralisation of ASS material. Treated ASS/PASS would be determined to be neutral if results for the acid and/or sulphur trails are below the criteria agreed following consultation with the NSW Office of Water (NOW).

Further aglime mixing will be required until acid and sulphur criteria are met. The required amounts of any additional treatment product can be informed by the results of the acid and sulfur trails. The material must remain bunded until acceptable validation results are available. Once testing shows the criteria are met, and the pH of the soils and leachate pond are above 6.5, then no further treatment is required and the material can be reused on site. A record of where this treated material is transported to must be kept via a Treated ASS Tracking Register.

If the pH of the leachate pond falls below 6.5, the material must continue to be treated using hydrated lime in the appropriate ratio prior to discharge (see Figure 2).

ASS/PASS material should be treated and reused onsite as much as possible. In the unlikely event that the treated material is unable to be reused on-site for other purposes, the material must be disposed of

appropriately. The CPBUI JV Environmental Manager / Environmental Coordinator are responsible for coordinating the disposal process to an appropriate licensed waste disposal facility.

6. Monitoring Program

In the event that acid sulfate soils are identified, regular monitoring and inspections of sensitive areas and activities with the potential to impact identified acid sulfate material will occur for the duration of construction. The table below details proposed monitoring requirements in the event that ASS are identified.

Table 4 – General Monitoring Requirements

Monitoring	Record	Responsibility	When
Visual Surveillance of spoil / Excavations	N/A	Site Supervisor, Operators, Leading Hands	Daily
Regular monitoring for this Plan will be undertaken during inspections	Weekly Environmental Inspection	Environmental Manager, Environmental Coordinators, Project Engineers, Supervisors, Leading Hands	Weekly
Any incidents relating to acid sulfate soils will be reported as required	Incident Reports	Environmental Manager, Environmental Coordinators, Project Engineers, Supervisors, Project Manager	As required
Document volume of ASS excavated, Volumes of ASS treated and the volume and location of ASS disposal	Acid Sulfate Soils Tracking Sheet	Project Engineers, Supervisors	As required

7. Contingency

In the event of a management procedure failure, CPBUI and any associated subcontractors are to review and analyse the cause of the defect, and develop a corrective action plan to prevent reoccurrence.

CPBUI and any associated subcontractors will advise the Site Supervisor by creating a non-conformance report, a remedial action and/or restoration action plan, and the preventative action to be undertaken in order to correct the non-conformance.

Appendix C5 – Unexpected Contaminated Land and Asbestos Finds Procedure

UNEXPECTED FINDS SOIL CONTAMINATION AND ASBESTOS PROCEDURE

RESPONSIBILITY	MANAGEMENT ACTIONS
Environmental Coordinator	All personnel must receive **site inductions and on-going Toolbox Talks** which will include requirements of this Unexpected Finds Procedure.
All Personnel	Observe soil during excavations to identify signs of contamination. Examples of materials that could indicate presence of contamination can be found on the right side of this procedure.
	Evidence of Contamination observed? — No → If observations do not indicate the presence of contamination then excavation works can continue.
	Yes
All Personnel	If observations **indicate presence of potential contamination** then STOP ALL WORK in the immediate area and prevent further activity in the area. Notify the Site Supervisor and Environment Coordinator and cordon off area. **HOLD POINT**
Site Supervisor	**Potential Contaminated Area Isolation:** Do not touch or disturb the item/ material and delineate the find from the rest of the worksite. Inform the Project Manager regarding the potential contamination find, detail should include: • The location of the potential contamination; • Visual appearance; • Odour (if any); • Depth; • Surrounding material and works being undertaken at the time of discovering the material
Site Supervisor Environmental Manager	**Additional Assessment:** If required, the Environmental Manager is to obtain assistance from a suitably qualified environmental consultant in identifying the potential hazard to human health or the environment, this may include sampling and lab analysis at a NATA accredited laboratory. Any additional assessment to be conducted in accordance with NSW statutory guidelines, including but not limited to the: • *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (NSW EPA 2015) • *Guidelines for Consultants Reporting on Contaminated Land: Contaminated Land Guidelines* (NSW EPA 2020), and • *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPC 2013)
Environmental Manager Safety Manager	**Management Strategy**: Develop a plan for managing and/or remediating the suspect material. Notify Sydney Metro and the ER and obtain any required approvals. A Remediation Action Plan (RAP) will be developed where the contamination is above the: • Trigger criteria to report contamination established in the "Guidelines on the Duty to Report Contamination under the *Contaminated Land Management Act 1997*", or • the applicable land use criteria outlined in the NEPM and any Human Health Risk Assessment prepared for the site
Site Supervisor Environmental Coordinator	Implement the approved Site Management Plan and/or RAP. If the material is to be removed, refer to Waste Management and Recycling Procedure for classification and disposal. Undertake all validation requirements required by the RAP.
Site Supervisor Environmental Coordinator	Document compliance with the management plan and/or RAP. Provide documentation to Sydney Metro's representative, and the Site Auditor/ Regulator (if required).
Environment Manager Site Supervisor	Once contamination find has been addressed the Environment Manager is to approve recommencement of works in the vicinity of the remediation site
	Return to Work

NOTES

Indicators of Contamination:

Examples of materials that could indicate the presence of contamination include (but are not necessarily limited to):

- Asbestos cement fragments or other potentially asbestos containing materials • Odorous or stained soil;
- Buried chemical drums or containers;
- High proportion of waste materials or building debris;
- Tarry or ashy material;
- Brightly or unusually coloured material;
- A yellow and/or red mottling in the soil profile indicates there may be Acid Sulfate Soils (ASS);

Asbestos:

An unexpected find occurs when Asbestos Containing Materials (ACM) not identified in the Asbestos Register is found on site. Asbestos finds are to be managed in accordance with the **Project Health and Safety Management Plan / Asbestos Management Plan**

Acid Sulfate Soils (ASS)

ASS are naturally occurring soils, sediments or organic substrates that are formed under waterlogged conditions in coastal areas. When exposed to air after being disturbed, soils containing iron sulfides produce sulfuric acid and often release toxic quantities of iron, aluminum and heavy metals.

If ASS is encountered, poss ble management strategies include:

- Modifying the Project to avoid the area of ASS;
- Delineation and removal to a suitably licenced facility;
- Onsite treatment to neutralise the ASS, which could include the application of lime in accordance with recommendations of the Environmental Consultant.

Note: The management of any ASS needs to include appropriate erosion and sedimentation controls to minimise the potential for pollution to waters.

Monitoring

- Observation during excavation or following unexpected find
- As required by the contamination consultant in the event of an unexpected find

Recording

- As required by the Site Management Plan or RAP

Additional information on Contamination management is included in;

- Project CEMP
- Soil and Water Management Sub-Plan
- Waste Management and Recycling Procedure

Contact Details

- Environmental Manager – M ke Watts (CPBUI) 0419 413 641
- Senior Environmental Advisor – Josh Jenkins (CPBUI) 0434 823 439

Appendix C6 – Stockpile Management Protocol

Appendix C6 – Stockpile Management Protocol

Western Sydney Airport – Surface and Civil Alignment Works

Project Name	Sydney Metro – Western Sydney Airport, Surface and Civil Alignment Works
Project Number	N81150
Revision Date	01/12/2023
Revision	2
Document Number	SMWSASCA-CPU-1NL-NL000-WA-PLN-000001

Distribution and Authorisation

Document Control

The CPBUI JV Project Director is responsible for ensuring this plan is reviewed and approved. The Project Director is responsible for updating this plan to reflect changes to the project, legal and other requirements, as required.

The controlled master version will be maintained on Teambinder. All circulated hard copies are deemed to be uncontrolled.

Amendments

The implementation of this Plan is under the authority of the CPBUI Delegated Authority Matrix. All Contract personnel will perform their duties in accordance with this Plan, supporting plans, and related procedures.

Revision Details

Rev.	Details
A	First Draft
B	In response to Sydney Metro and ER comments
C	In response to Sydney Metro, Independent Certifier and ER comments
D	In response to final ER comments prior to endorsement
E	In response to minor ER comments prior to endorsement
F	Updated following DPE review
1	Issued for construction
2	Updated following internal audit

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1. Introduction

1.1. Description

This Stockpile Management Protocol (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 Sydney Metro – Western Sydney Airport, Surface and Civil Alignment Works (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)
- Stockpile Site Management Guidelines (Roads and Maritime, 2015)
- Sydney Metro's Construction Environmental Management Framework (CEMF)

1.2. Interface with other plans

This Protocol is an Appendix to the Soil and Water Management Sub-plan (SWMP), which is a sub-plan of the Construction Environmental Management Plan (CEMP). The SWMP sets out the requirements for soil and water management to minimise the risk of pollution.

1.3. 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 material unsuitable for reuse on the Project
- excess soils, concrete, rock, 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 10 days are not subject to this Protocol and will be subject to the requirements of the relevant Erosion and Sedimentation Control Plans (ESCP).

2. Process

2.1. Approval

Prior to the establishment of any long term (>10 day) stockpile CPB Contractors and United Infrastructure Joint Venture (CPBUI JV) will review and approve the stockpile location against the criteria established within this Stockpile Management Protocol.

CPBUI will include approved stockpile locations on the relevant ESCP and will maintain a record of stockpile locations in an onsite Stockpile Register.

The Stockpile Register will include:

- Stockpile Reference Number,
- Material Type,
- Compliance assessment against the Criteria presented in Section 2.2 and any additional requirements outlined in Section 3.
- Additional Mitigation measures and risk assessment, as required.

An example Stockpile Register is provided in Appendix A.

2.2. Location Criteria

Stockpiles at the Project will be located:

1. Outside of the tree protection zone of trees or native vegetation identified for retention
2. 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
3. At least 50 m from likely areas of concentrated water flows
4. So that any slump of the stockpile will not affect erosion and sediment control measures or infringe specified minimum clearance requirements
5. To ensure no cross contamination of contaminated materials with non-contaminated materials
6. In areas of low heritage conservation significance and not impact on heritage sites beyond those already impacted by the Project
7. A suitable distance (>50m) from sensitive noise and vibration receivers to minimise disruption
8. So that the appropriate erosion and sediment control measures can be installed and will operate effectively
9. Readily accessible via the Project or road network
10. To minimise the need for heavy vehicles to travel on local roads
11. On relatively level land
12. On land outside the 10% AEP flood extent (short term) or 5% AEP flood extent if longer than 10 days
13. Outside of utility easement corridors
14. Within the approved EPL boundary
15. With consideration of the potential contamination status of the material.

2.3. Stockpile Risk Assessment

Where a mitigation measure or location criteria identified in this Protocol is unable to be achieved for a particular stockpile, a risk assessment will be undertaken to determine appropriate controls that can be implemented to reduce any identified risks.

The risk assessment will be included as part of the stockpile register (Appendix A) and be updated regularly following site inspections.

3. Stockpile Management

3.1. General Management Requirements

The type of environmental controls required for stockpile management will depend on the location, surrounding environment and material being stored at the stockpile site. Any change in use will be reflected where required on the ESCPs and the Stockpile Register.

Site-specific mitigation measures, where they are necessary to further reduce impacts, will be detailed on the ESCP. Mitigation measures for each stockpile site will be determined based on a risk assessment and may include:

- Erosion and Sediment Controls, such as
  - delineation of the perimeter of the stockpile with a bund, fencing or barrier between the stockpile site and any drainage lines, down-slope areas and/or native vegetation.
  - temporary sediment basins
  - covers, or other erosion protections for stockpiles that will be in place for more than 10 days as well as any temporary stockpiles that have been identified as a dust generation risk during inspection
  - diversion of stockpile run-off through sediment traps and into pits and the stormwater drainage system
  - water diversion bunds
- Where practical, keep topsoil stockpile heights to no greater than 2m and slopes to no steeper than 2:1. Where topsoil stockpiles are required at greater than 2m or a 2:1 batter, further investigations would be undertaken to investigate if the anerobic conditions within the topsoil stockpile is suitable
- Dust management measures will be implemented in accordance with the Air Quality Management Sub-plan
- Monitoring of odours and odour control measures (where necessary)
- Progressively rehabilitate stockpile sites
- Avoid locating weed contaminated topsoil or other contaminated materials adjacent to areas of native vegetation (minimum setback of 5m).
- Stockpiles will be located outside the 10% AEP flood extent (short term) or 5% AEP flood extent if longer than 10 days.

Stockpiles should also be setback from threatened species, endangered ecological communities, or roosting habitat for listed threatened fauna species and native vegetation by an appropriate distance to avoid impacting these entities.

3.2. Vegetation and Mulch Stockpiles

Vegetation (such as timber, root balls) and Mulch stockpiles will be monitored and turned over as required to reduce the effects of nitrogen drawdown and tannin leaching and 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 of 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
- Located 20 m from waterways, for mulch stockpiles that will be in place for duration of less than 1-month
- Located on elevated ground
- Trimmed to a regular shape, with a height not exceeding 2m and batter slopes not steeper than 2:1
- 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 the PESCPs.

3.3. Topsoil Stockpiles

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

- 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 subsoil, other excavated materials, contaminated materials (including asbestos), refuse, clay lumps and stones, timber or other rubbish
  - Be subject to weed monitoring and treatment,
  - 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 to encourage vegetation cover

CPBUI 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 revegetation.

3.4. Contaminated Material Stockpiles

CPBUI will comply with the following measures in regard to stockpiles of contaminated material:

- All stockpiles containing contaminated (or suspected contaminated) materials will be placed on a suitable material and covered (with geotextile or plastic as required) to avoid spreading the contamination.
- Additional downslope controls (such as bund/sandbags and/or sump depending on location of stockpile) will be installed as required
- Stockpiles will be sign posted as a warning for potential contamination present.
- Following the removal, the footprint of the stockpile will be investigated by the project Environmental Consultant to confirm no residual contamination remains

Further details of stockpiling of contaminated materials will be contained in the Project Asbestos Management Plan or specific Remedial Action Plan prepared in the event that contamination is identified.

3.5. 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.

Decommissioning and rehabilitation of stockpile sites will involve the following activities:

- Clearing all stockpile material from the site and either reusing onsite in a nominated area or recycling/ disposing of it at a licensed facility
- Removing control measures such as erosion and sedimentation devices once the stabilisation has occurred
- Stabilising the site through topsoiling and revegetation
- Undertaking an inspection of the site
- Updating records in the Stockpile Register.

4. Adaptive Management

4.1. Inspection and Monitoring

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 and will include items such as:

- 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).

In the event of uncovering material with a noxious odour, or detection of nuisance odours (nuisance to workers or confirmed beyond boundaries), CPBUI JV will investigate and implement any necessary management measures identified in the investigation process per Air Quality Management Sub-plan.

Identified non-compliances with this protocol will be addressed through actions raised in accordance with the CPBUI JV Environmental Management System.

Appendix A – Stockpile Register

CPBUI JV Stockpile Register

Stockpile Reference	Material Type	Location (Chainage & east/west of alignment)	Location Criteria								Stockpile Height Requirement	Height Compliance	ERSED Considerations (Stockpiles >10days)	Compliant (Y/N)	Additional Mitigation Measures?	Residual Risk
			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?	At least 50 m from likely areas of concentrated water flows and sensitive noise and vibration receivers?	On relatively level land outside the 10% AEP flood extent (short term) or 5% AEP flood extent	Outside of utility easement corridors	Area of low heritage conservation significance and no impact on heritage sites	Readily accessible via the Project or road network	Within the approved EPL boundary						

Appendix C7 – Emergency Spill Response Procedure

EMERGENCY SPILL MANAGEMENT PROCEDURE

RESPONSIBILITY	ACTIONS	RESPONSIBILITY
Operator	Initial assessment of the spill: determine the **type of spill kit** to be used based on the substance spilled. Refer to Safety Data Sheet (SDS) for details.	
	Spill able to be contained?	
	No →	Contact the HAZMAT (NSW Fire Brigade: Ph. 000) if the spill is of a hazardous nature or not manageable with the resources available on site. — Site Supervisor
		Notify site warden, evacuate the area and cordon off. Refer to Site Emergency Response Plan. — Site Supervisor
		Activate the Pollution Incident Response Management Plan (if required) — Environmental Manager
	Yes	
Operator	**Locate closest spill kit.** Spill kits are available in the following locations: • Site locations as shown in Site Environmental Plans (SEPs)	
All attending the spill	Always wear appropriate **PPE for the type of spill**. As a minimum the following must be worn (refer to spill kit instructions and SDS): • Gloves • Protective footwear and site specific PPE • Face mask (where required)	
	Stop the source of the spill/leak if safe to do so.	
	Contain the spill and protect / prevent spill from entering any drains / waterways channels near the spill.	
	Notify site supervisor as soon as practicable. Supervisor notifies Environmental Manager who will investigate if the Pollution Incident Response Management Plan needs to be activated	
	Clean up the spill using absorbent materials from the spill kit.	
	Place used spill kit materials and any spill generated waste in the waste bag found within the spill kit, double bag where possible. Dispose of in designated bin. Spilled liquid waste to be placed into a labelled sealed container. The container is to comply with Australian/ New Zealand Standards.	
Site Supervisor	Transport and disposal by EPA approved licensed contractor (if required) to a licenced facility. Refer to Waste Management Sub-plan (SMWSASCA-CPU-1NL-NL000-VM-PLN-000001). Arrange for area to be investigated by Environment Manager and determine if validation of the surfaces is required to confirm the surface is free from contamination	
Site Supervisor	Replace spill kit equipment used immediately after the event.	

NOTES

Spill Kit Materials:

Booms

Deploy booms first to contain spill. Floating booms to be used for spills in waterways to prevent spreading. If there is a possibility of contamination of a waterway floating booms are to be installed before starting work.

Absorbent Material / Granules

Use absorbent granules to soak up spilled liquid. Absorbent granules are best for small spills/ leaks. Some absorbent material is not suitable to use in areas of high wind.

Pillows

Cushion shaped products containing absorbent fibres, used directly under a leak or drip.

Pads

Thin absorbent mats to place over and soak up spill. Hydrophobic pads to be used for spills in water.

Other items include:

- Safety Gloves
- Waste Bags
- Dustpan and Brush*
- Shovel*
- Overalls / Safety Goggles / Dust Mask*

** Not in all spill kits, depends on manufacturer / supplier*

Appendix C8 – Discharge and Dewatering Protocol

Dewatering and Discharge Protocol

1.1. Dewatering and Discharge

Water generated from construction activities is required to be managed in accordance with this Dewatering and Discharge Protocol.

Dewatering is the process of manually moving or pumping water from one place to another on site, within the project boundary. Dewatering onsite generally consist of one of the below options:

- Pump into a watercart and use as dust suppression.
- Pump into a sediment basin (for later treatment and discharge), where there is enough capacity, and no further rainfall is forecast.
- Spray over a grassed/landscaped area, ensuring water does not leave the project boundary or enter a waterway.

Discharge is the process of pumping water off site, in accordance with the project EPL and as detailed in this dewatering and discharge protocol.

1.2. Testing

Before any water can be dewatered or discharged, the water must meet the water quality parameter limits for pollutants to water set out in Section 1.3 of this Protocol.

Water quality testing will be undertaken within 24 hours prior to controlled dewatering/discharge and daily for any continued dewatering/discharge or when rainfall causes runoff to the source of water under control discharge.

Water quality testing will be conducted 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/NZS 5667.1:1998).
- Australian Standard 5667:1998 Water Quality – Sampling, Part 6: Guidance on sampling of rivers and streams (AS/NZS 5667.6:1998)

If the criteria are not met, treatment of water will occur in accordance with Section 1.4.

1.3. Water quality criteria

1.3.1. On site management or re-use (dewatering)

Dewatering will only occur if:

- There is no visible oil or grease,
- No identified erosion risk as a result of the proposed dewatering,
- Any runoff generated by dewatering is controlled entirely within the site boundary.

In addition to the above, reuse on site for watering of landscaped areas will only occur if:

- pH levels are between 6.5 – 8.5

1.3.2. Discharge off site

A Discharge Impact Assessment (SEEC 2022) to identify, assess and manage the potential impacts of construction water discharges from the SCAW project on the environmental values of the receiving environment. This assessment includes modelling that has been used to support the EPL application and in determining the discharge criteria set out for the project in Table 1.

The Project is subject to an EPL as a Scheduled Activity for '*Railway activities -railway infrastructure construction'*. The EPL prescribes water quality parameters to be measured and associated discharge criteria for licensed discharge points. The EPL will also details the monitoring and analytical requirements by reference to authority publications (e.g. *Approved Methods for Sampling and Analysis of Water Pollutants in NSW* (EPA, 2004)).

Before any water can be discharged offsite, it must meet the water quality parameter limits for discharges of pollutants to water set out in the EPL. The water quality discharge criteria from the EPL is identified below in Table 1.

Table 1 EPL Discharge water quality criteria

Parameter	Criteria	Sampling method	Analytical method
pH	6.5 – 8.5	Probe or Grab Sample	Field analysis and confirmed as required with laboratory assessment
Turbidity	50 NTU	Probe or Grab Sample	Field analysis and confirmed as required with laboratory assessment
Oil and Grease	Not visible	Visual observation	Field analysis and confirmed as required with laboratory assessment

1.4. Water Sampling and Treatment

Methods for treating water if the water does not meet the Water Quality Criteria are detailed below;

1.4.1. pH

1. Test water with appropriately calibrated pH meter.
2. No action if pH reading between 6.5 and 8.5.
3. Lime or pH increaser (soda ash) to be added if pH below 6.5.
4. Hydrochloric Acid (32% Muriatic) or Sulfuric Acid to be added if pH above 8.5.
5. Determine volume of water in basin or excavation.
6. Bucket Test - determine percentage of treatment chemical required by taking a 10 litre sample of basin or excavation water and adding a known amount of chemical. If the pH is still not acceptable, vary the amount of chemical until within the limits.
7. Once the required percentage has been determined, calculate the actual amount chemical to be added by multiplying the volume of water in the basin or excavation by the determined percentage.
8. Add the required amount of chemical to the basin or excavation.
9. Mix the water in the sediment basin or excavation by pumping water to recirculate.
10. Treat for pH prior to NTU.

Note: Refer to SDS for Hydraulic or Sulfuric Acid prior to handling. The following PPE must be worn at all times when handling Hydrochloric or Sulfuric Acid:

- ***Safety glasses with side shields, chemical goggles or full-face shields.***
- ***Impervious PVC or butyl rubber gloves.***

PVC overalls/jacket/apron and butyl rubber Wellington boots.

If handling indoors, approved respirator with replaceable vapour/mist filter.

Note: Refer to SDS for Lime/Soda ash prior to handling. The following PPE must be worn at all times when handling Lime:

- ***Safety glasses.***
- ***If handling indoors, approved P2 face mask.***

1.4.2. Turbidity (NTU)

1. Collect a sample of basin or excavation water using a laboratory supplied container (an appropriately calibrated water quality probe will be used to measure the NTU level.
2. If the NTU result is below nominated criteria dewatering can commence. If NTU is above nominated criteria, the water should treated with a flocculent.
3. If basin or excavation require flocculation, gypsum, Aluminium Chlorohydrate, or other flocculants will be used within 24 hours of the conclusion of each rain event causing runoff.
4. Methods of application to be as per manufacturers instructions.
5. Basins or excavations should be monitored and recorded daily after flocculation until desired turbidity is achieved and to assist in determination of optimal dosage levels.

Note: Refer to SDS for all flocculants prior to handling. The following PPE must be worn at all times when handling Gypsum:

- ***Safety glasses with side shields, chemical goggles.***
- ***If handling indoors, approved P2 face mask.***
- ***Some flocculants may require PVC gloves***

1.4.3. Oil and Grease, gross pollutants

1. Examine surface of water for evidence (e.g. sheen, discoloration).
2. Remove any gross pollutants / accumulated rubbish
3. No action if no visual contamination.
4. Oil to be removed if there is visual contamination with absorbent materials (e.g. Xtrasorb, floating booms, pads and socks) and/or an oil/water separator. Leave basins to compensate for 24 to 48 hours.

1.4.4. Storage of Water treatment chemicals

Flocculants and other water treatment chemicals will be appropriately stored on site. Bulk powdered flocculants like Gypsum and Lime 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 locations within secure compound areas that prevent unauthorised access. Requirements of the Safety Data Sheets will be followed.

1.5. Approval

1.5.1. Dewatering

If the Water Quality Criteria outlined in Section 1.3.1 are met, dewatering may be authorised by the CPBUI Environment Manager (or delegate) through the issue of a Permit to Dewater.

Note: A Permit to Dewater will not be issued for dewatering to watercarts for on-site re-use as dust suppression during construction.

1.5.2. Discharge

If the Water Quality Criteria outlined in Section 1.3.2 are met discharge may be authorised by the CPBUI Environment Manager (or delegate) through the issue of a Permit to Discharge.

Prior to the commencement of discharge, the permit issuer will inspect the entire system, including intakes and outlets, pumping and discharge locations.

If the discharge is not directly supervised, a risk assessment will be carried out and mitigation measures implemented to eliminate the risks of pollution and to prevent the occurrence of the following:

- Intake suction placed within the deposited sediments resulting in discharge of sediment laden waters
- Erosion at discharge locations and downstream areas
- Inadvertent or intentional controlled discharge of untreated waters.

Discharge will cease immediately if any negative environmental impact such as flooding, erosion or dirty water discharge is observed.

Permit to Dewater

Project:	Sydney Metro Western Sydney Airport – Surface and Civil Alignment Works			
Permit No:		**Expiry Date:**		**Works Area/ Chainage:**
Date Issued:		**Approx Volume to be released**		**Location to be discharged to:** (e.g.) watercourse, grassed area, sediment basin, sucker truck)

Dewatering Pathway:

1. Pump into a sediment basin where there is enough capacity and no further rainfall is forecast;
2. Discharge to land for infiltration, ensuring the water is not leaving the project boundary or entering a waterway.
3. Spray over revegetated or landscaped areas

CONTROL MEASURE	YES	NO	COMMENTS
Environment Team has been consulted on dewatering set up			
Water Quality Testing required			Test Results: pH (6.5-8.5):
Designated Pump supervisor assigned to dewatering			
Outlet of pump monitored to prevent off site discharge			
Pumping equipment checked and operational			

Dewatering Layout/Diagram

PERMIT Approval (Environment Manager or Delegate)		
Permit Approved by:	**Signature.:**	**Date & Time**
PERMIT ACCEPTANCE: (Supervisor or Leading Hand)		
Permit Holder:	**Signature.:**	**Date & Time**

WORK CREW SIGNOFF:

- **I THE UNDERSIGNED, CONFIRM THAT THE DEWATERING NOMINATED ABOVE HAS BEEN EXPLAINED AND ITS CONTENTS ARE UNDERSTOOD.**

Name	Signature	Date

Permit Close Out (Supervisor, Leading Hand or Environmental Site Rep)		
Name	Signature	Date

Permit to Discharge

Project:	Sydney Metro Western Sydney Airport – Surface and Civil Alignment Works			**Location / Chainage:**	
Permit No:		**Expiry Date:**		**Approx Volume to be released**	
Date inspected :		**Licenced Discharge point no:**		**Location to be discharged to: (eg: direct to creek, through grass swale)**	

CONTROL MEASURE	YES	NO	COMMENTS
Pipe intake sited to avoid discharge of silty water			
Pipe outlet sited to avoid scouring or environmental damage at discharge point			
Float or similar device installed to prevent inlet from sinking into mud			
Pumping equipment checked and operational			
Water Testing Equipment Cal brated			
Designated pump supervisor assigned to discharge			

Water Quality Criteria			ENTER THE FIELD TEST INFORMATION HERE	
Parameter	**Criteria**	**Result**	**SAMPLE COLLECTED BY:**	**DATE OF DISCHARGE:**
pH	6.5-8.5			
Turbidity (TSS or NTU)	Less than 50		**(BASIN) DISCHARGED BY:**	**TIME OF DISCHARGE:**
Visible Oil/Grease	None Visible			

What type and how much flocculent was applied?

Type:

Dose:

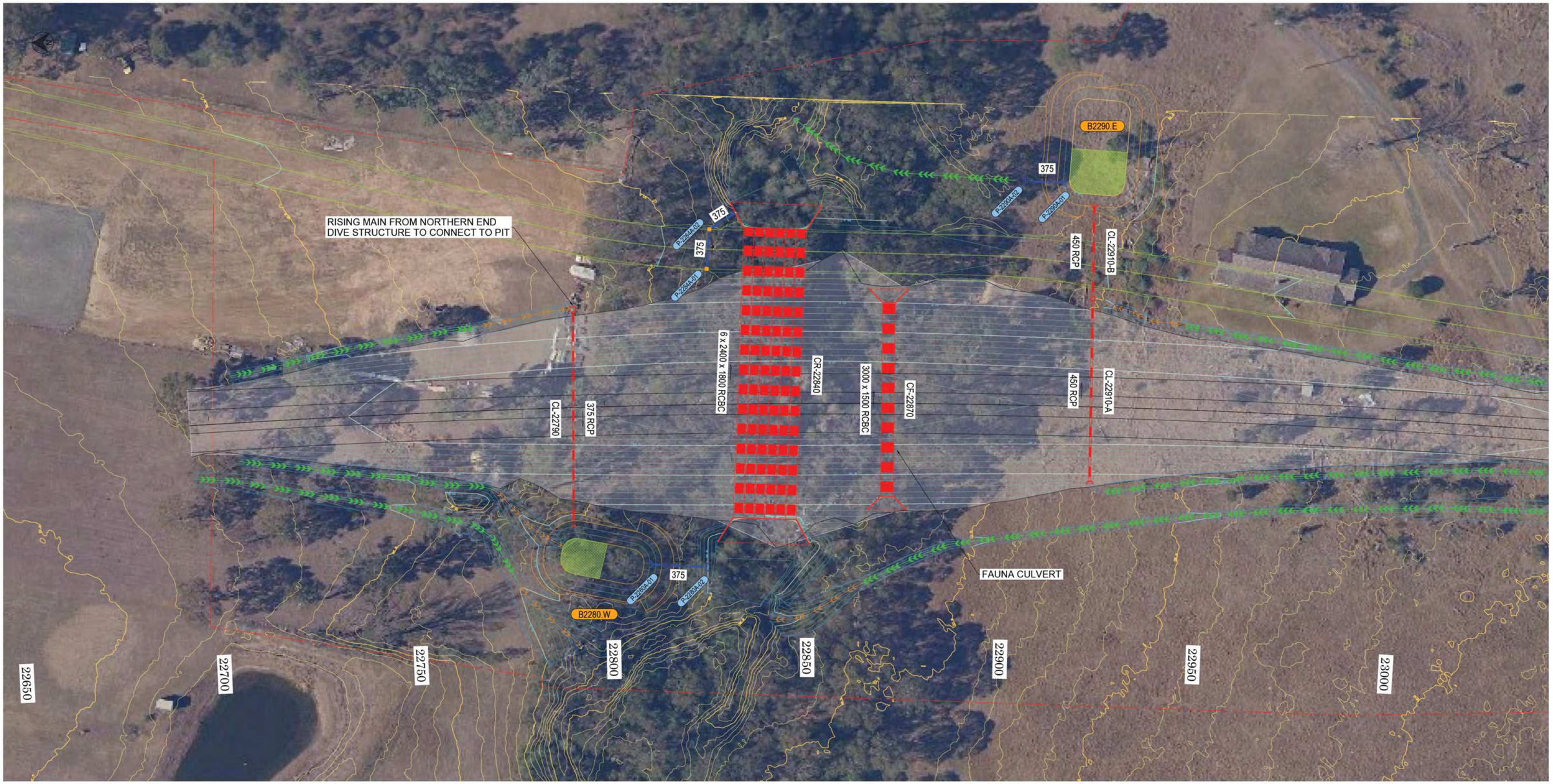
Kg/L

PERMIT Approval (Environment Manager or Delegate)		
Permit Approved by:	**Signature.:**	**Date & Time**
PERMIT ACCEPTANCE		
Permit Holder:	**Signature.:**	**Date & Time**

Discharge Map / Drawing

WORK CREW SIGNOFF: I THE UNDERSIGNED, CONFIRM THAT THE DISCHARGE NOMINATED ABOVE HAS BEEN EXPLAINED AND ITS CONTENTS ARE UNDERSTOOD.		
Name	**Signature**	**Date**
Permit Close Out (Supervisor, Leading Hand or Environmental Site Rep)		
Name	**Signature**	**Date**

Appendix C9 – Preliminary ESCP



LEGEND - DRAINAGE

- 450 / 600 — DRAINAGE PIPE, SIZE AND FLOW DIRECTION
- CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
- GRATED BOX CESS DRAIN
- B0100.E — COMBINED DETENTION/WATER QUALITY BASIN
- BASIN IDENTIFIER
- BIO FILTRATION GARDEN

GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

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

0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

TITLE	NAME	
DESIGN		
DESIGN		02/07/21

CLIENT

A1

RMS REGISTRATION No. | PART

ISSUE STATUS | EDMS No. | SHEET No. | IS

PLOT FILE: Page 1

LEGEND - DRAINAGE

- DRAINAGE PIPE, SIZE AND FLOW DIRECTION (450)
- CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN (600)
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
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- PROPOSED MINOR CONTOURS (0.5 METRES)
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- EXISTING MINOR CONTOURS (0.5 METRES)

12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE.12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION

WVR No. | APPROVAL

SCALES ON A3 SIZE DRAWING

CO-ORDINATE SYSTEM: MGA ZONE 55 | HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

PLOT DATE / TIME: Fri Jul 2 14:10:53 2021

TITLE	NAME	DATE
DRAWN	[redacted]	[redacted]
DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS
DRAINAGE PLANS

A1

RMS REGISTRATION No. | PART

ISSUE STATUS: FOR INFORMATION | EDMS No. | SHEET No. | ISSUE: TAN A

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

PLOT FILE: Page 2

LEGEND - DRAINAGE

- 450 — DRAINAGE PIPE, SIZE AND FLOW DIRECTION
- 600 — CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
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GENERAL

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- PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

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

0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE.12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:10:59 2021

CLIENT: NSW GOVERNMENT Transport for NSW

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

	TITLE	NAME	DATE
DRAWN		[redacted]	[redacted]
DRG CHECK			
DESIGN		[redacted]	[redacted]
DESIGN CHECK			
DESIGN MNGR		[redacted]	02/07/21
PROJECT MNGR			

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS
DRAINAGE PLANS

A1

RMS REGISTRATION No. | PART

ISSUE STATUS: FOR INFORMATION | EDMS No. | SHEET No. | ISSUE: TAN A

PLOT FILE: Page 3

LEGEND - DRAINAGE

- 450 / 600 — DRAINAGE PIPE, SIZE AND FLOW DIRECTION
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- M12 CULVERTS - BY OTHERS
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- BASIN IDENTIFIER
- BIO FILTRATION GARDEN

GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- 36.0 — PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- 36.0 — EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

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

0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE 12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:11:04 2021

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

TITLE	NAME	DATE
DRAWN	[redacted]	[redacted]
DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS

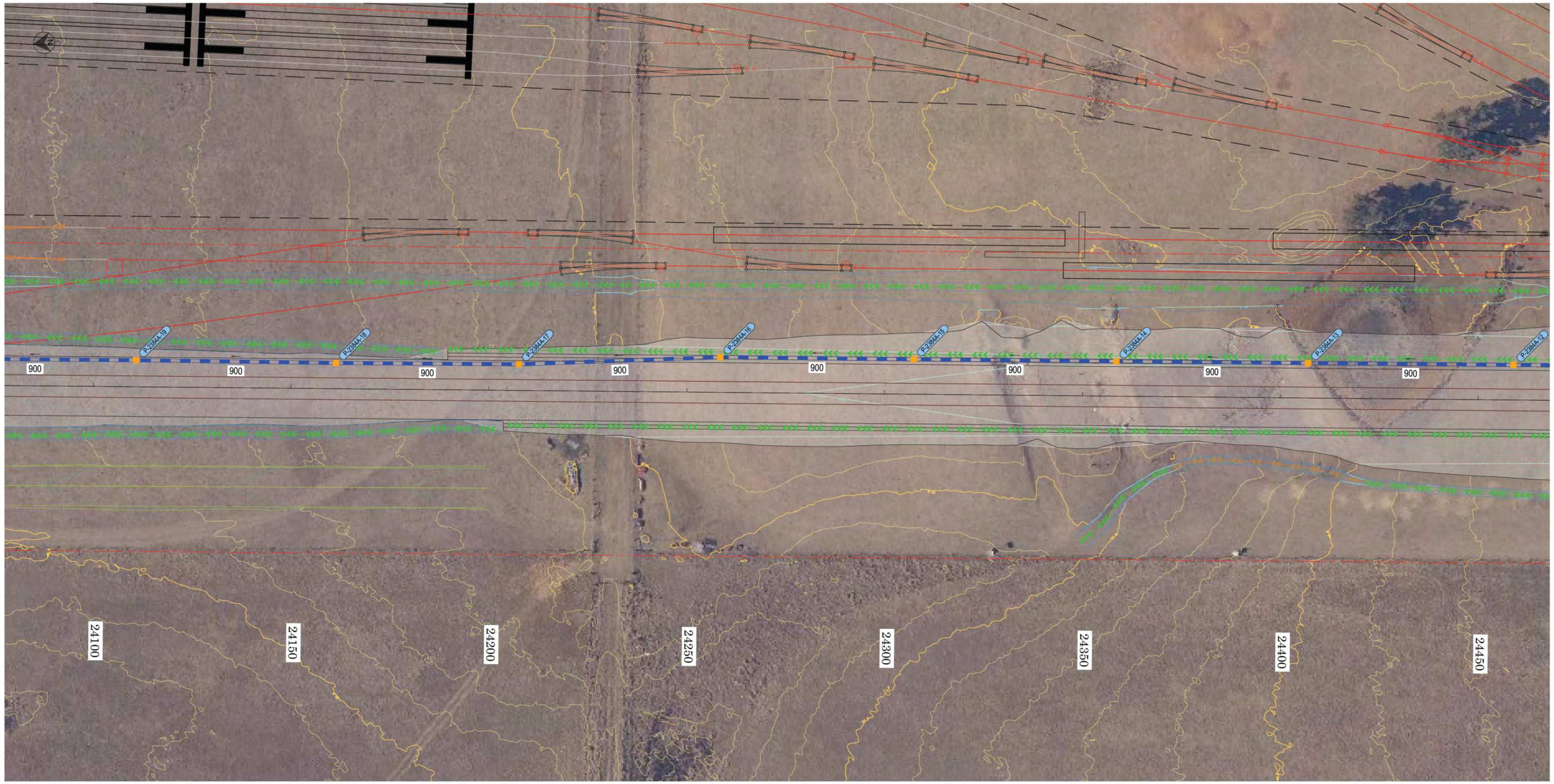
DRAINAGE PLANS

A1

RMS REGISTRATION No. | PART

ISSUE STATUS: FOR INFORMATION | EDMS No. | SHEET No. | ISSUE: TAN A

PLOT FILE: Page 4



LEGEND - DRAINAGE

- 450 — DRAINAGE PIPE, SIZE AND FLOW DIRECTION
- 600 — CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
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- PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE.12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

PLOT DATE / TIME: Fri Jul 2 14:11:10 2021

TITLE	NAME	DATE
DRAWN	[redacted]	[redacted]
DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS
DRAINAGE PLANS

A1

RMS REGISTRATION No. | PART

ISSUE STATUS: FOR INFORMATION | EDMS No. | SHEET No. | ISSUE

TAN A

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

LEGEND - DRAINAGE

- DRAINAGE PIPE, SIZE AND FLOW DIRECTION (450)
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0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE 12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:11:22 2021

CLIENT: NSW GOVERNMENT Transport for NSW

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

TITLE	NAME	DATE
DRAWN	[redacted]	[redacted]
DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT

SURFACE CIVIL ALIGNMENT WORKS

DRAINAGE PLANS

A1

RMS REGISTRATION No. | PART

ISSUE STATUS: FOR INFORMATION | EDMS No. | SHEET No. | ISSUE: TAN A

PLOT FILE: Page 7

LEGEND - DRAINAGE

- DRAINAGE PIPE, SIZE AND FLOW DIRECTION (450)
- CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN (600)
- M12 CULVERTS - BY OTHERS
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12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE.12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:11:16 2021

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY
CO-ORDINATE SYSTEM: MGA ZONE 55	HEIGHT DATUM: AHD

TITLE	NAME	DATE
DRAWN	[redacted]	[redacted]
DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS
DRAINAGE PLANS

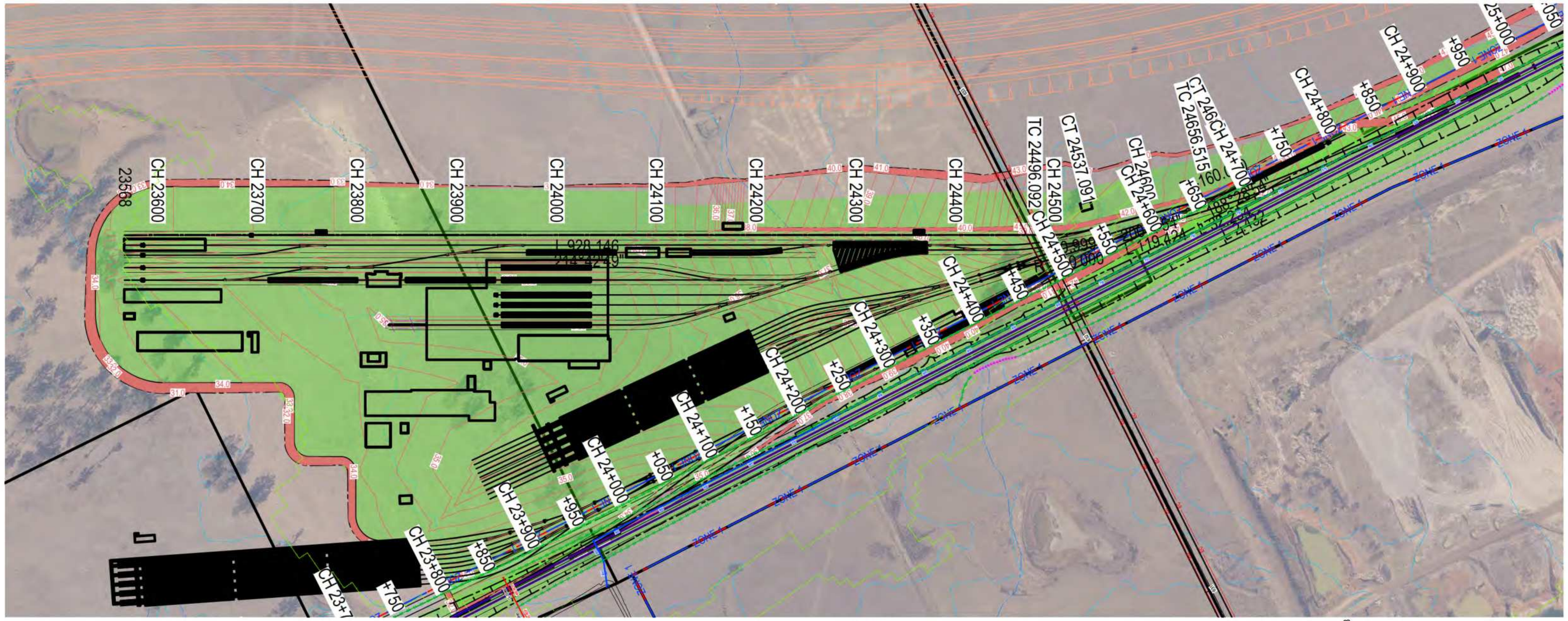
A1

RMS REGISTRATION No. | PART

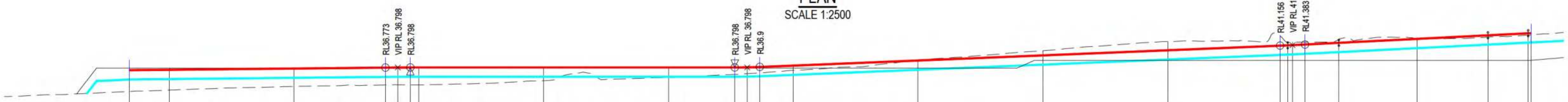
ISSUE STATUS: FOR INFORMATION | EDMS No. | SHEET No. | ISSUE: TAN A

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

PLOT FILE: Page 6



PLAN
SCALE 1:2500



VERTICAL CURVE LENGTH (m) / VERTICAL CURVE RADIUS (m)	VC 20 R 8000	VC 20 R 1959.42	VC 20 R 8722.58	
VERTICAL GEOMETRY GRADE (%) / VERTICAL GEOMETRY LENGTH (m)	0.3% 215.26	0% 279.94	1% 436.91	1.2% 191.15
HORIZONTAL CURVE DATA	R -160	R -160		

DATUM RL = -11.600

STABLING YARD RAIL LEVEL	36.260	36.340	36.590	36.773	36.792	36.798	36.798	36.798	36.798	36.798	36.824	36.900	37.174
REFERENCE DESIGN LEVEL	36.700	36.700	36.700	36.700	36.700	36.700	36.700	36.700	36.700	36.700	36.700	36.700	36.700
BULK EARTHWORKS LEVEL	34.410	34.490	34.740	34.923	34.941	34.948	34.948	34.948	34.948	34.948	34.979	35.050	35.324
EXISTING SURFACE LEVEL	32.023	32.306	33.011	33.316	33.348	33.326	33.336	34.164	34.790	35.416	35.570	35.729	36.217
RAIL TO EXISTING LEVEL	4.237	4.034	3.579	3.457	3.443	3.472	3.462	2.634	2.008	1.382	1.253	1.171	0.957
KILOMETRAGE	23567.945	23600	23700	23773.201	23783.201	23793.201	23800	23900	24000	24053.136	24063.136	24073.136	24100

STABLING YARD RAIL LEVEL	38.195	39.216	40.236	41.156	41.219	41.263	41.263	41.383	41.721	42.507	43.213	43.617	43.647
REFERENCE DESIGN LEVEL	36.700	38.200	38.200	38.200	38.200	38.200	38.200	38.200	38.200	38.200	38.200	38.200	38.222
BULK EARTHWORKS LEVEL	36.345	37.366	38.386	39.306	39.369	39.413	39.413	39.533	39.871	40.657	41.363	41.767	41.797
EXISTING SURFACE LEVEL	38.342	40.151	41.974	43.131	41.844	41.845	41.842	41.858	42.396	42.646	42.842	43.252	43.271
RAIL TO EXISTING LEVEL	-0.147	-0.935	-1.737	-1.976	-0.625	-0.582	-0.579	-0.475	-0.676	-0.139	0.372	0.365	0.376
KILOMETRAGE	24200	24300	24400	24490.05	24496.092	24500	24500.05	24510.05	24537.091	24600	24656.515	24688.769	24691.201

LONGINTUDINAL SECTION
SCALE H 1:2500, V 1:500

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

LEGEND - ALIGNMENT

GENERAL
- CADASTRAL
- SURVEY
- RAIL CENTRELINE AND TRACKS
- RS2 RAIL CENTRELINE AND TRACKS
- PERMANENT ACQUISITION BOUNDARY
- M12 PERMANENT BOUNDARY WORKS
- M12 EIS BOUNDARY
- RAIL EASEMENT BOUNDARY
- SUBTERRANEAN CORRIDOR BOUNDARY
- GROUND LEVEL CORRIDOR BOUNDARY
- WESTERN SYDNEY AIRPORT BOUNDARY
- RS1 PERMANENT INF BOUNDARY
- MODIFIED CORRIDOR BOUNDARY
- BATTER 3(H):1(V) SLOPE
- BURIED WATER MAIN
- CONTOURS EXISTING
- ACCESS POINT
- ACCESS ROAD

PROJECT ZONES
- ZONE 1 — PROJECT ZONE 1
- ZONE 2 — PROJECT ZONE 2
- ZONE 3 — PROJECT ZONE 3
- ZONE 4 — PROJECT ZONE 4
- ZONE 5 — PROJECT ZONE 5

DESIGN SEGMENTS
- TROUGH OR CUTTING
- DRIVEN TUNNEL
- CUT AND COVER
- AT GRADE
- BRIDGE OR VIADUCT
- MINED TUNNEL
- PORTAL DIVE STRUCTURE
- TRANSITION SLAB

EXISTING UTILITIES
- EXISTING WATER MAIN
- EXISTING ELECTRIC
- EXISTING COMMS
- EXISTING GAS
- EXISTING SEWER

DRAINAGE
- 750 RCP — DRAINAGE CULVERT
- 900 — DRAINAGE PIPE WITH PIT AND HEADWALL
- DRAINAGE SLOTTED PIPE
- CONCRETE CHANNEL
- GRASS CHANNEL
- ROCK CHANNEL
- TEMPORARY PERMANENT BASIN
- 1% AEP FLOOD LEVEL

NOT FOR CONSTRUCTION

REV.	BY	DATE	DESCRIPTION	APPD.
A	LA		ISSUED FOR INFORMATION	RM

WORK IN PROGRESS

SCALES: 5 0 10 20m SCALE 1:500; 25 0 50 100m SCALE 1:2500

CCRNo

A1 Original | Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D. | This sheet may be prepared using colour and may be incomplete if copied | NOTE: Do not scale from this drawing. | ALT. DRG No.

CLIENT: NSW GOVERNMENT | sydney METRO

SERVICE PROVIDERS: CPB CONTRACTORS; AHJV AURECON HATCH JV

DRAWN [redacted] 21.06.2021
DESIGNED
DRG CHECK
DESIGN CHECK
APPROVED [redacted] 21.06.2021

SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS
PROJECT WIDE
GENERAL
STABLING YARD LONGITUDINAL SECTION

STATUS: FOR INFORMATION | SHEET 1 OF 1 | ©
DRG No SCA-0300-020-SK-AHJV-DCW-0021 | REV. A

LEGEND - DRAINAGE

- DRAINAGE PIPE, SIZE AND FLOW DIRECTION (450)
- CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN (600)
- M12 CULVERTS - BY OTHERS
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GENERAL

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0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE.12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:11:28 2021

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

TITLE	NAME	DATE
DRAWN	[redacted]	[redacted]
DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS

DRAINAGE PLANS

A1

RMS REGISTRATION No. | PART

ISSUE STATUS: FOR INFORMATION | EDMS No. | SHEET No. | ISSUE: TAN A

PLOT FILE: Page 8

LEGEND - DRAINAGE

- 450 — DRAINAGE PIPE, SIZE AND FLOW DIRECTION
- 600 — CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN
- M12 CULVERTS - BY OTHERS
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- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

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

0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE 12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:11:33 2021

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

TITLE	NAME	DATE
DRAWN	[redacted]	[redacted]
DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR

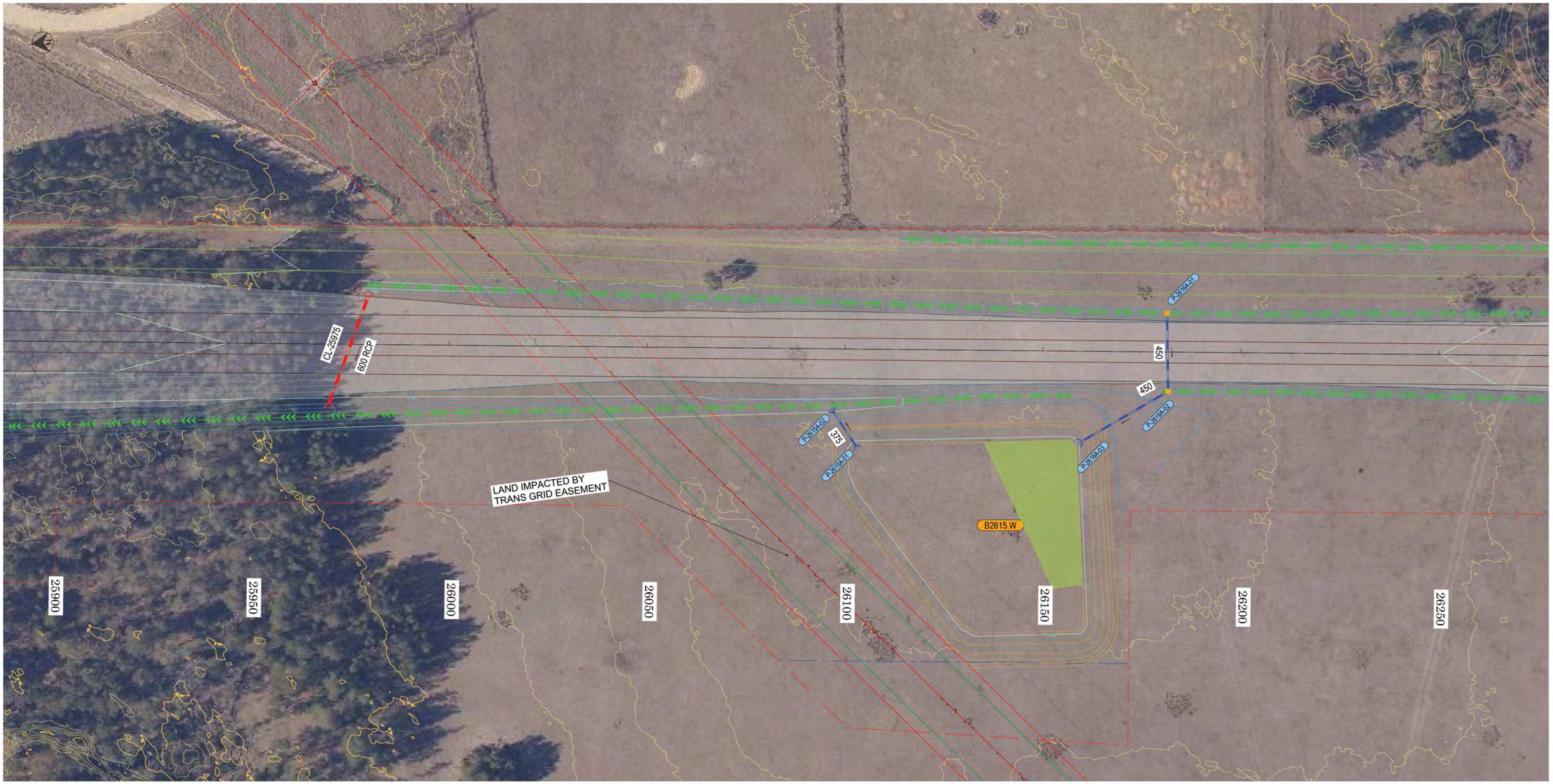
SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS
DRAINAGE PLANS

A1

RMS REGISTRATION No. | PART

ISSUE STATUS: FOR INFORMATION | EDMS No. | SHEET No. | ISSUE: TAN A

PLOT FILE: Page 9



LEGEND - DRAINAGE

- 450 — DRAINAGE PIPE, SIZE AND FLOW DIRECTION
- 600 — CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
- GRATED BOX CESS DRAIN
- B0100.E — BASIN IDENTIFIER
- COMBINED DETENTION/WATER QUALITY BASIN
- BIO FILTRATION GARDEN

GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- 96.0 — PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- 96.0 — EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

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

0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE.12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:11:39 2021

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

TITLE	NAME	DATE
DRAWN	[redacted]	[redacted]
DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS

DRAINAGE PLANS

A1

RMS REGISTRATION No. | PART

ISSUE STATUS: FOR INFORMATION | EDMS No. | SHEET No. | ISSUE: TAN A

PLOT FILE: Page 10

LEGEND - DRAINAGE

- 450 — DRAINAGE PIPE, SIZE AND FLOW DIRECTION
- 600 — CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
- GRATED BOX CESS DRAIN
- B0100.E — BASIN IDENTIFIER
- COMBINED DETENTION/WATER QUALITY BASIN
- BIO FILTRATION GARDEN

GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- 36.0 — PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- 36.0 — EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

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

0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE.12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:11:45 2021

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

	NAME	DATE
TITLE		
DRAWN	[redacted]	[redacted]
DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT — A1
SURFACE CIVIL ALIGNMENT WORKS

DRAINAGE PLANS

RMS REGISTRATION No. — PART

ISSUE STATUS: FOR INFORMATION — EDMS No. — SHEET No. — ISSUE: TAN A

PLOT FILE: Page 11

LEGEND - DRAINAGE

- DRAINAGE PIPE, SIZE AND FLOW DIRECTION (450)
- CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN (600)
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
- GRATED BOX CESS DRAIN
- COMBINED DETENTION/WATER QUALITY BASIN
- B0100.E — BASIN IDENTIFIER
- BIO FILTRATION GARDEN

GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE.12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

PLOT DATE / TIME: Fri Jul 2 14:11:51 2021

TITLE	NAME	DATE
DRAWN	[redacted]	[redacted]
DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS

DRAINAGE PLANS

A1

RMS REGISTRATION No.

PART

ISSUE STATUS: FOR INFORMATION

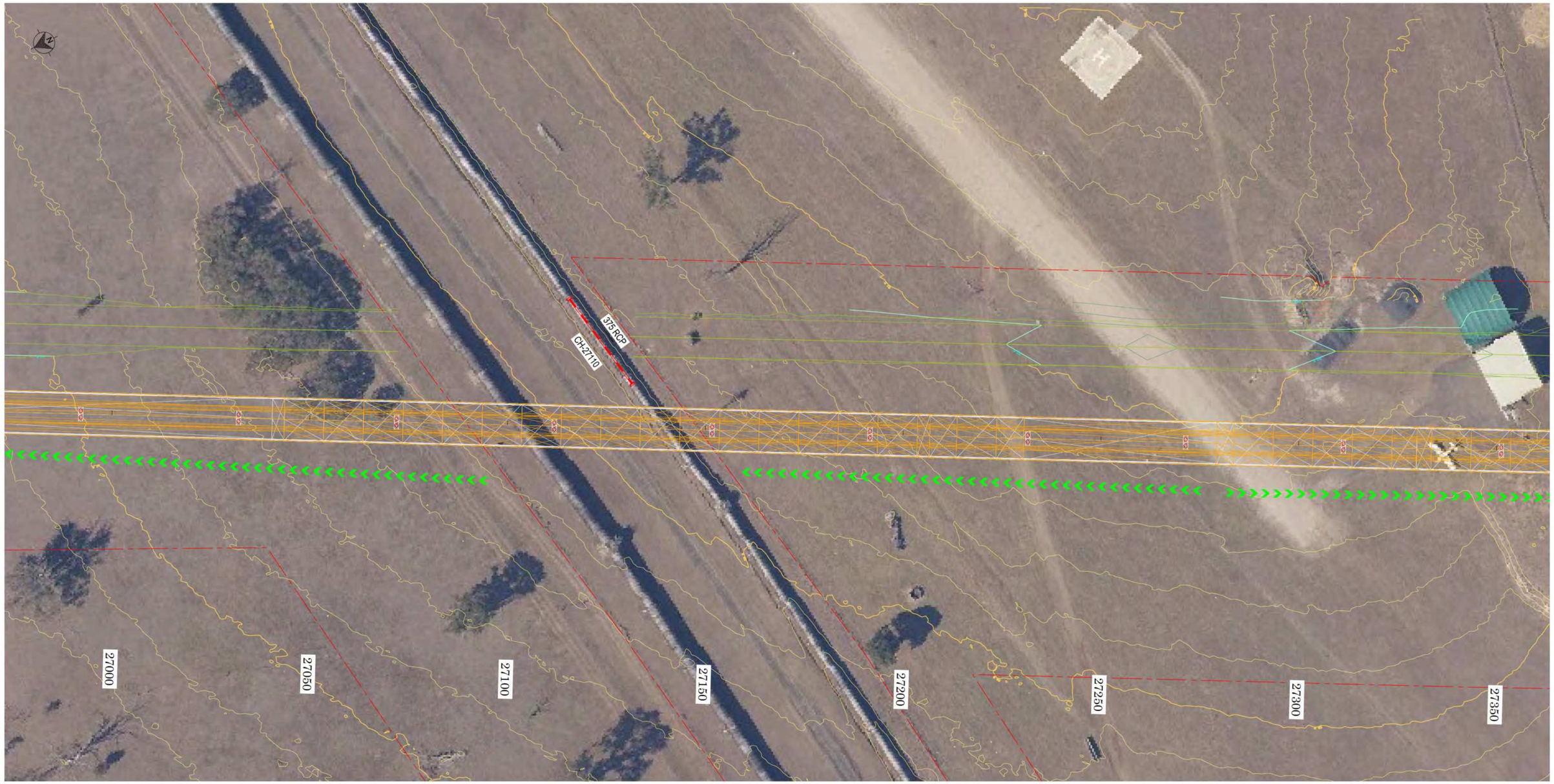
EDMS No.

SHEET No.

ISSUE: TAN A

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

PLOT FILE: Page 12



LEGEND - DRAINAGE

- 450 — DRAINAGE PIPE, SIZE AND FLOW DIRECTION
- 600 — CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
- GRATED BOX CESS DRAIN
- B0100.E — BASIN IDENTIFIER
- COMBINED DETENTION/WATER QUALITY BASIN
- BIO FILTRATION GARDEN

GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

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

0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_4647135 Deliver design\502 Modelling\12d\400 DRAINAGE 12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:11:56 2021

CLIENT: NSW GOVERNMENT Transport for NSW

SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS
DRAINAGE PLANS
A1

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

TITLE	NAME	DATE
DRAWN	[redacted]	[redacted]
DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CO-ORDINATE SYSTEM: MGA ZONE 55
HEIGHT DATUM: AHD

PREPARED FOR

RMS REGISTRATION No.

PART

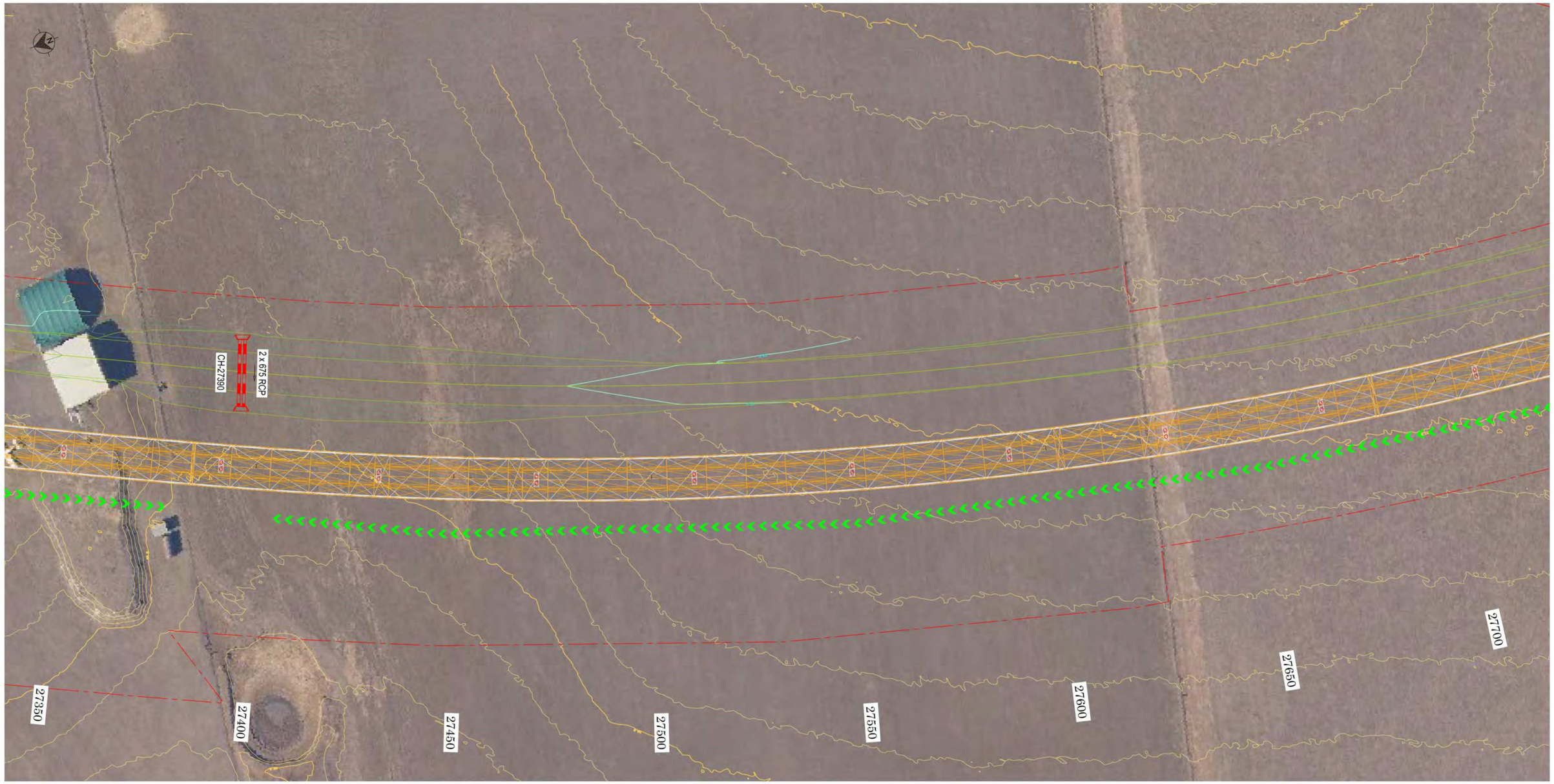
ISSUE STATUS: FOR INFORMATION

EDMS No.

SHEET No.

ISSUE: TAN A

PLOT FILE: Page 13



LEGEND - DRAINAGE

- DRAINAGE PIPE, SIZE AND FLOW DIRECTION (450)
- CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN (600)
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
- GRATED BOX CESS DRAIN
- B0100.E — BASIN IDENTIFIER
- COMBINED DETENTION/WATER QUALITY BASIN
- BIO FILTRATION GARDEN

GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE\12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:12:02 2021

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

	TITLE	NAME	DATE
DRAWN		[redacted]	[redacted]
DRG CHECK			
DESIGN		[redacted]	[redacted]
DESIGN CHECK			
DESIGN MNGR		[redacted]	02/07/21
PROJECT MNGR			

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS
DRAINAGE PLANS

A1

RMS REGISTRATION No. | PART

ISSUE STATUS: FOR INFORMATION | EDMS No. | SHEET No. | ISSUE: TAN A

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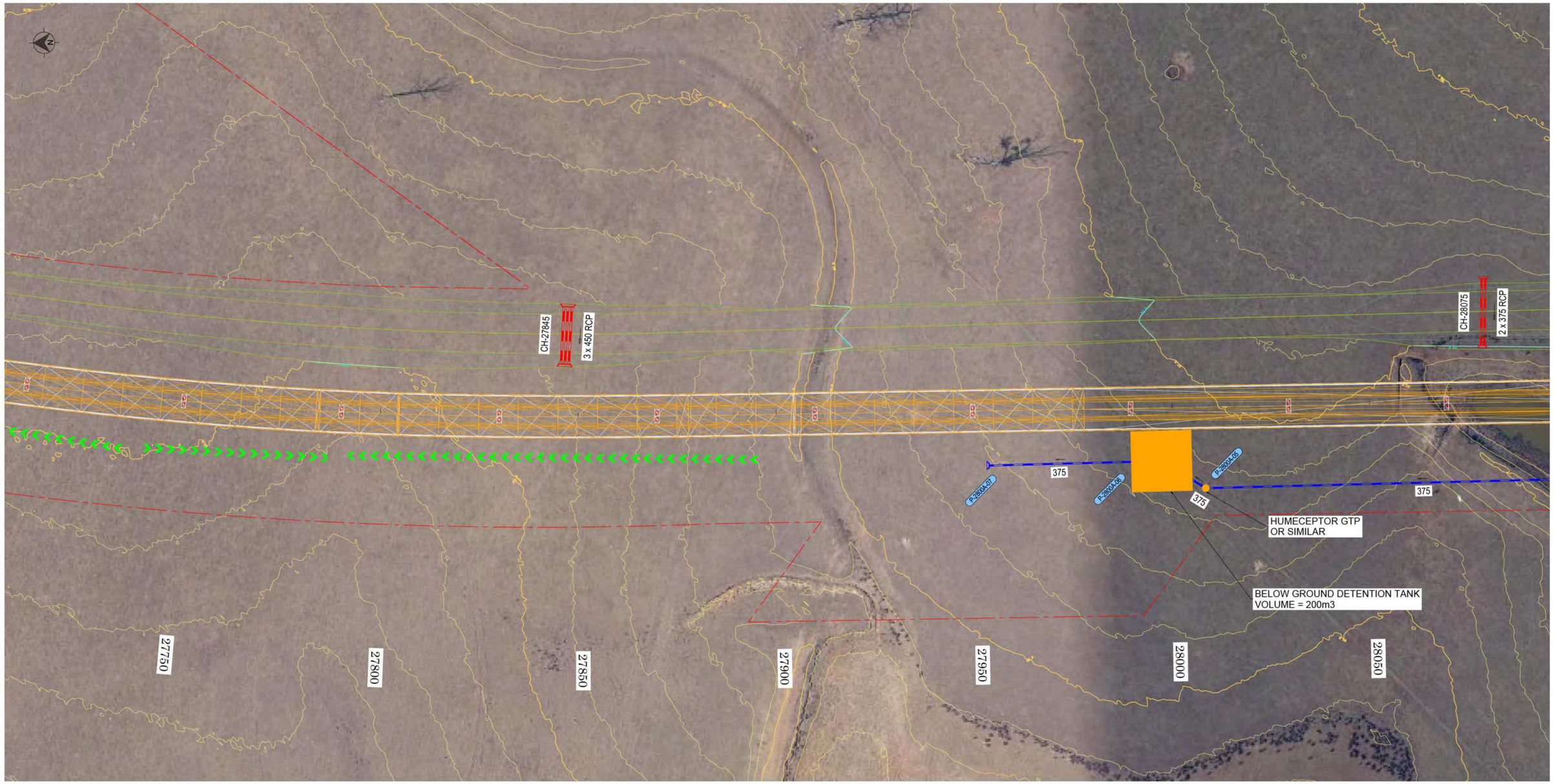

LEGEND - DRAINAGE

- DRAINAGE PIPE, SIZE AND FLOW DIRECTION (450)
- CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN (600)
- M12 CULVERTS - BY OTHERS
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- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
- GRATED BOX CESS DRAIN
- COMBINED DETENTION/WATER QUALITY BASIN
- B0100.E — BASIN IDENTIFIER
- BIO FILTRATION GARDEN

GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project,
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE.12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:12:08 2021

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM	HEIGHT DATUM
MGA ZONE 55	AHD

TITLE	NAME	DATE
DRAWN	[redacted]	[redacted]
DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR

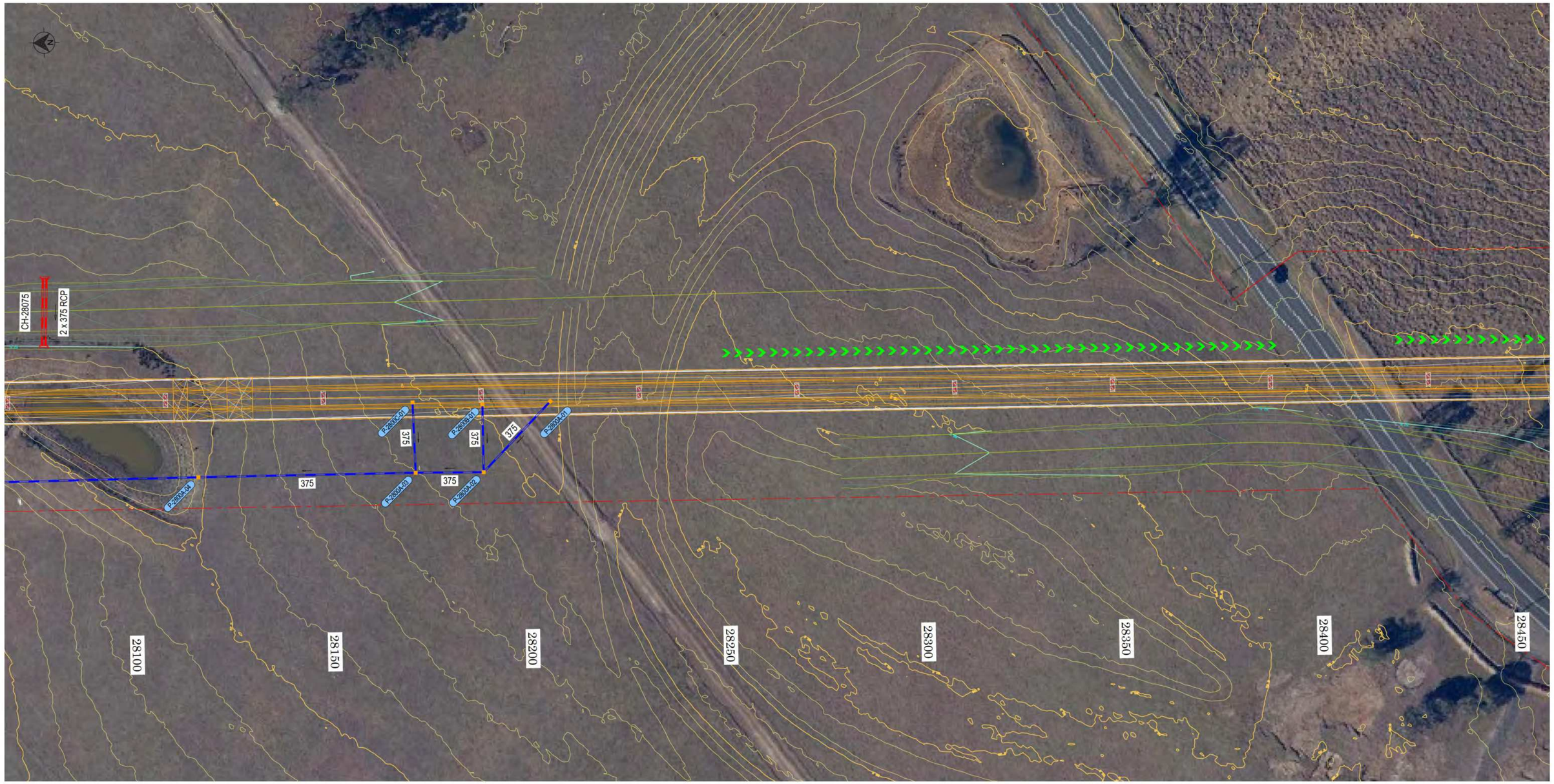
SYDNEY METRO WESTERN SYDNEY AIRPORT — A1
SURFACE CIVIL ALIGNMENT WORKS

DRAINAGE PLANS

RMS REGISTRATION No. — PART

ISSUE STATUS: FOR INFORMATION — EDMS No. — SHEET No. — ISSUE: TAN A

PLOT FILE: Page 15



LEGEND - DRAINAGE

- DRAINAGE PIPE, SIZE AND FLOW DIRECTION (450)
- CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN (600)
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
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- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
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- COMBINED DETENTION/WATER QUALITY BASIN
- B0100.E — BASIN IDENTIFIER
- BIO FILTRATION GARDEN

GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

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

0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_4647135 Deliver design\502 Modelling\12d\400 DRAINAGE 12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:12:14 2021

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

	TITLE	NAME	DATE
DRAWN		[redacted]	[redacted]
DRG CHECK			
DESIGN		[redacted]	[redacted]
DESIGN CHECK			
DESIGN MNGR		[redacted]	02/07/21
PROJECT MNGR			

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS
DRAINAGE PLANS

A1

RMS REGISTRATION No.

PART

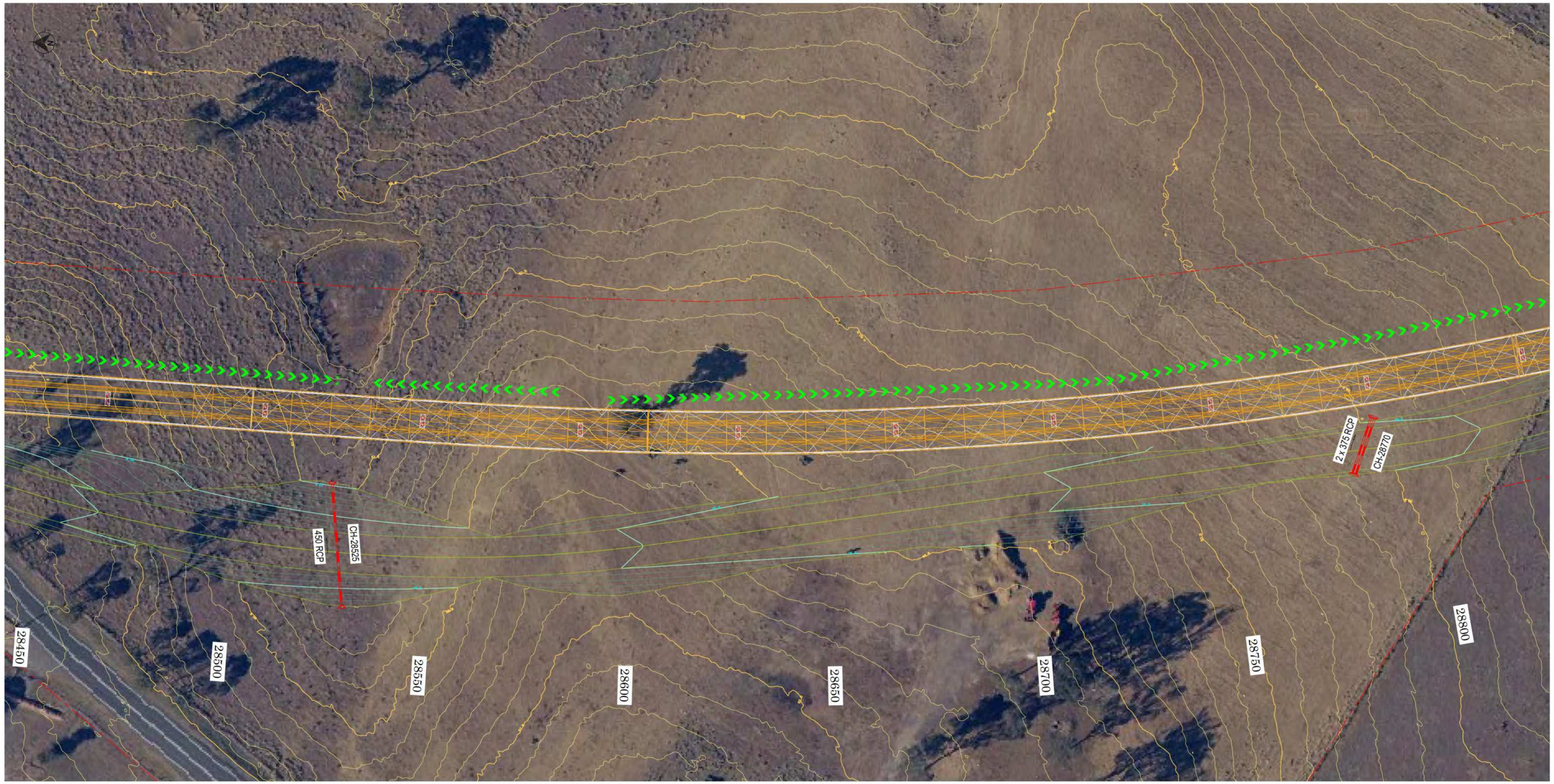
ISSUE STATUS: FOR INFORMATION

EDMS No.

SHEET No.

ISSUE: TAN A

PLOT FILE: Page 16



LEGEND - DRAINAGE

- DRAINAGE PIPE, SIZE AND FLOW DIRECTION (450)
- CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN (600)
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
- GRATED BOX CESS DRAIN
- COMBINED DETENTION/WATER QUALITY BASIN
- B0100.E — BASIN IDENTIFIER
- BIO FILTRATION GARDEN

GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

12d Model Project,
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE 12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:12:20 2021

CLIENT: NSW GOVERNMENT Transport for NSW

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

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TITLE		
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DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT — A1
SURFACE CIVIL ALIGNMENT WORKS

DRAINAGE PLANS

RMS REGISTRATION No. — PART

ISSUE STATUS: FOR INFORMATION — EDMS No. — SHEET No. — ISSUE: TAN A

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

PLOT FILE: Page 17

LEGEND - DRAINAGE

- 450 — DRAINAGE PIPE, SIZE AND FLOW DIRECTION
- 600 — CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
- GRATED BOX CESS DRAIN
- B0100.E — BASIN IDENTIFIER
- COMBINED DETENTION/WATER QUALITY BASIN
- BIO FILTRATION GARDEN

GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- 96.0 — PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- 96.0 — EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

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

50mm ON A3 SIZE ORIGINAL

12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE.12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:12:26 2021

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS
DRAINAGE PLANS

A1

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 HEIGHT DATUM: AHD

TITLE	NAME	DATE
DRAWN	[redacted]	[redacted]
DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

RMS REGISTRATION No.

PART

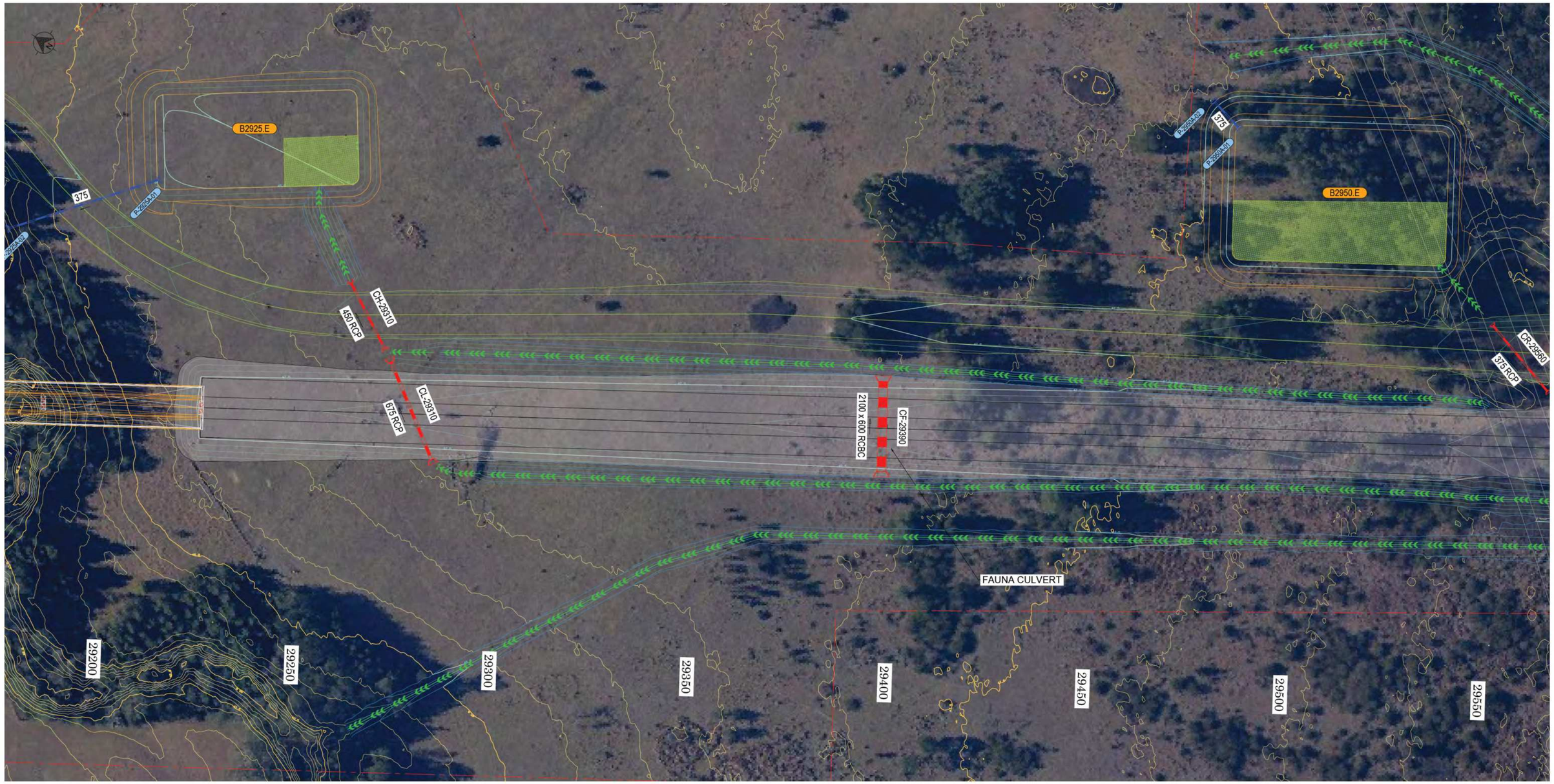
ISSUE STATUS: FOR INFORMATION

EDMS No.

SHEET No.

ISSUE: TAN A

PLOT FILE: Page 36



LEGEND - DRAINAGE

- DRAINAGE PIPE, SIZE AND FLOW DIRECTION (450)
- CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN (600)
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
- GRATED BOX CESS DRAIN
- COMBINED DETENTION/WATER QUALITY BASIN (B0100.E)
- BASIN IDENTIFIER
- BIO FILTRATION GARDEN

GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

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

0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project, [redacted]

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION

WVR No. [redacted] APPROVAL

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 HEIGHT DATUM: AHD

PLOT DATE / TIME [redacted]

TITLE	NAME	
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DESIGN	[redacted]	
DESIGN CHECK		
[redacted]	[redacted]	02/07/21

CLIENT [redacted]

[redacted]

A1

RMS REGISTRATION No. PART

ISSUE STATUS [redacted] EDMS No. SHEET No. ISSUE [redacted]

PLOT FILE: Page 18

LEGEND - DRAINAGE

- 450 — DRAINAGE PIPE, SIZE AND FLOW DIRECTION
- 600 — CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
- GRATED BOX CESS DRAIN
- B0100.E — COMBINED DETENTION/WATER QUALITY BASIN
- BASIN IDENTIFIER
- BIO FILTRATION GARDEN

GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- 36.0 — PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- 36.0 — EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

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

0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE 12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:12:37 2021

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

TITLE	NAME	DATE
DRAWN	[redacted]	[redacted]
DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS
DRAINAGE PLANS

A1

RMS REGISTRATION No. | PART

ISSUE STATUS: FOR INFORMATION | EDMS No. | SHEET No. | ISSUE: TAN A

PLOT FILE: Page 19

LEGEND - DRAINAGE

- 450 — DRAINAGE PIPE, SIZE AND FLOW DIRECTION
- 600 — CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
- GRATED BOX CESS DRAIN
- B0100.E — BASIN IDENTIFIER
- COMBINED DETENTION/WATER QUALITY BASIN
- BIO FILTRATION GARDEN

GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- 36.0 — PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- 36.0 — EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

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

0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;
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SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

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DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CLIENT: NSW GOVERNMENT Transport for NSW

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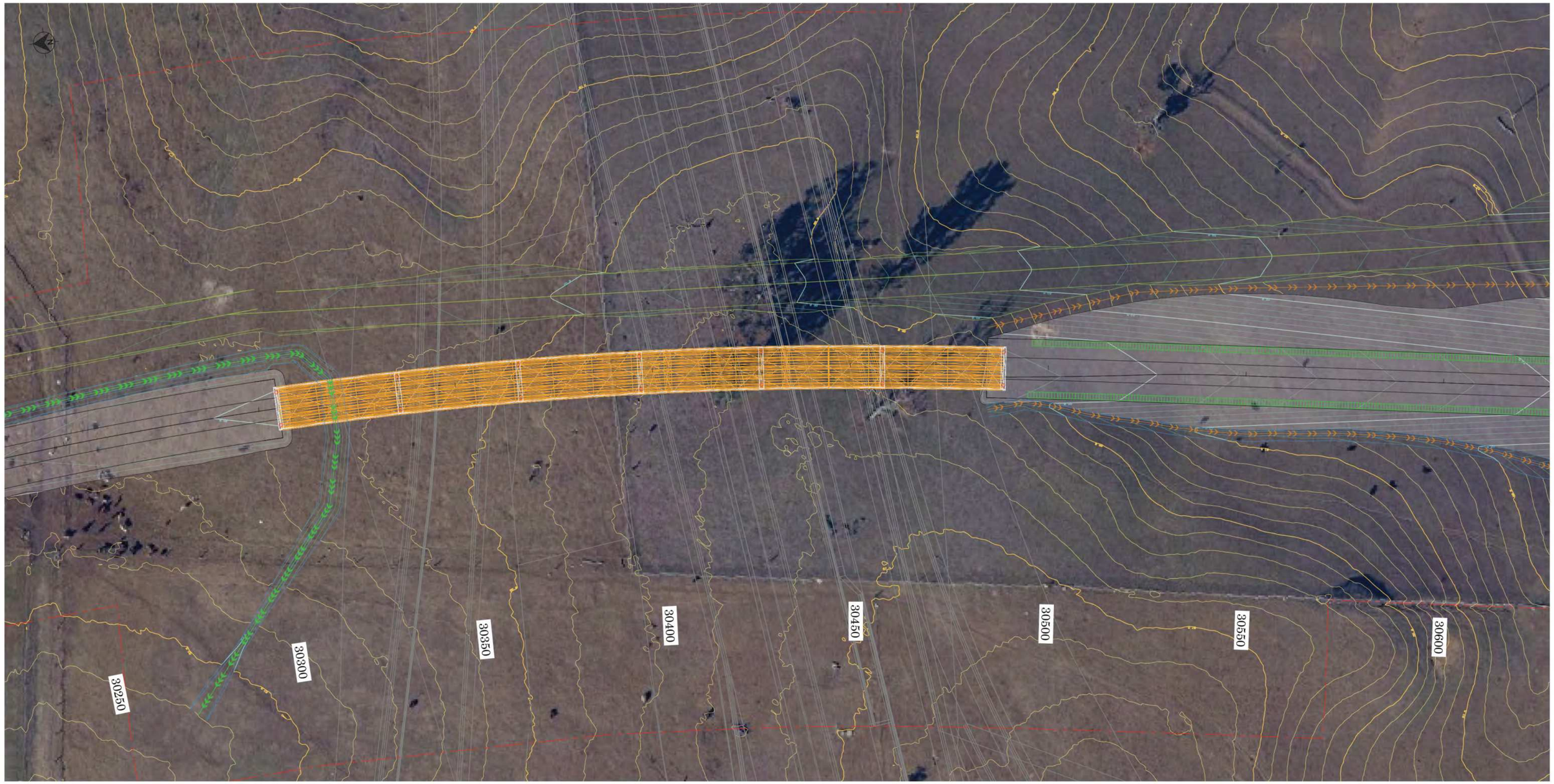
SURFACE CIVIL ALIGNMENT WORKS

DRAINAGE PLANS

RMS REGISTRATION No. — PART

ISSUE STATUS: FOR INFORMATION — EDMS No. — SHEET No. — ISSUE: TAN A

PLOT FILE: Page 20



LEGEND - DRAINAGE

- DRAINAGE PIPE, SIZE AND FLOW DIRECTION (450)
- CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN (600)
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
- GRATED BOX CESS DRAIN
- COMBINED DETENTION/WATER QUALITY BASIN
- B0100.E — BASIN IDENTIFIER
- BIO FILTRATION GARDEN

GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

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

0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project,
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE.12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:12:49 2021

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

TITLE	NAME	DATE
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DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CLIENT: NSW GOVERNMENT Transport for NSW

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SYDNEY METRO WESTERN SYDNEY AIRPORT — A1
SURFACE CIVIL ALIGNMENT WORKS

DRAINAGE PLANS

RMS REGISTRATION No. — PART

ISSUE STATUS: FOR INFORMATION — EDMS No. — SHEET No. — ISSUE: TAN A

PLOT FILE: Page 21

LEGEND - DRAINAGE

450	DRAINAGE PIPE, SIZE AND FLOW DIRECTION
600	CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN
	M12 CULVERTS - BY OTHERS
	PITS / HEADWALLS
	OPEN CHANNEL - GRASS LINED
	OPEN CHANNEL - ROCK LINED
	OPEN CHANNEL - CONCRETE LINED
	BIO SWALE
	GRATED BOX CESS DRAIN
	COMBINED DETENTION/WATER QUALITY BASIN
B0100.E	BASIN IDENTIFIER
	BIO FILTRATION GARDEN

GENERAL

	ACQUISTION BOUNDARY
	RAIL EMBANKMENT
	HAUL ROAD (ALIGN UNDER DEVELOPMENT)
	PROPOSED MAJOR CONTOURS (2.0 METRES)
	PROPOSED MINOR CONTOURS (0.5 METRES)
	EXISTING MAJOR CONTOURS (2.0 METRES)
	EXISTING MINOR CONTOURS (0.5 METRES)

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50mm ON A3 SIZE ORIGINAL

12d Model Project;
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SCALES ON A3 SIZE DRAWING

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CO-ORDINATE SYSTEM: MGA ZONE 55

HEIGHT DATUM: AHD

TITLE	NAME	DATE
DRAWN	[redacted]	[redacted]
DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT

SURFACE CIVIL ALIGNMENT WORKS

DRAINAGE PLANS

A1

RMS REGISTRATION No.

PART

ISSUE STATUS: FOR INFORMATION

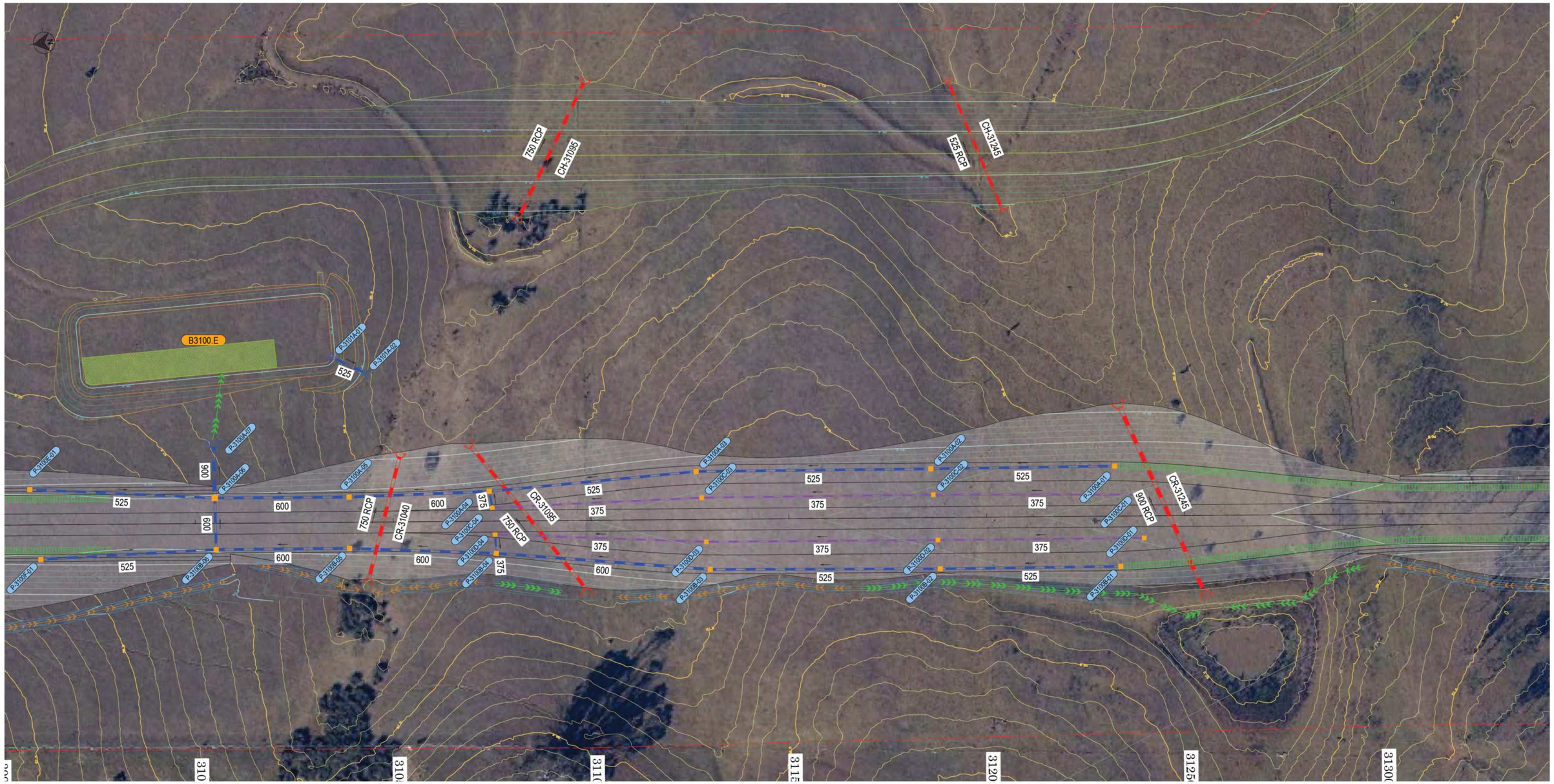
EDMS No.

SHEET No.

ISSUE

TAN A

PLOT FILE: Page 22



LEGEND - DRAINAGE

- DRAINAGE PIPE, SIZE AND FLOW DIRECTION (450)
- CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN (600)
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
- GRATED BOX CESS DRAIN
- COMBINED DETENTION/WATER QUALITY BASIN (B0100.E)
- BASIN IDENTIFIER
- BIO FILTRATION GARDEN

GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- EXISTING MAJOR CONTOURS (2.0 METRES)
- EXISTING MINOR CONTOURS (0.5 METRES)

12d Model Project,
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DESIGN LOT CODE

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CLIENT: NSW GOVERNMENT Transport for NSW

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 HEIGHT DATUM: AHD

TITLE	NAME	DATE
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DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

PREPARED FOR

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SURFACE CIVIL ALIGNMENT WORKS
DRAINAGE PLANS

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SHEET No.

ISSUE: TAN A

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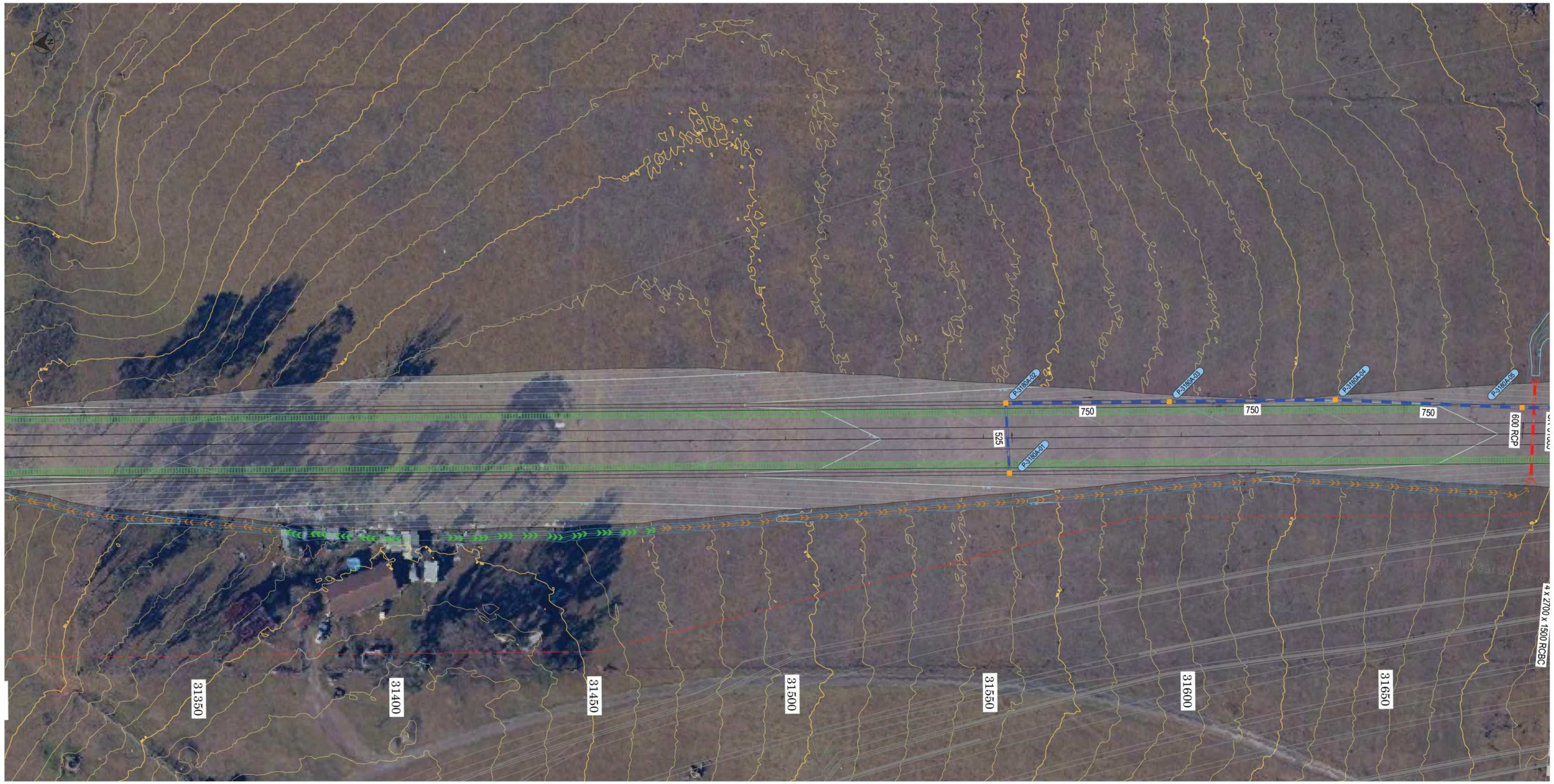
0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

PLOT FILE: Page 23



LEGEND - DRAINAGE

- DRAINAGE PIPE, SIZE AND FLOW DIRECTION (450)
- CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN (600)
- M12 CULVERTS - BY OTHERS
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- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
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- PROPOSED MAJOR CONTOURS (2.0 METRES)
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THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;
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DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:13:06 2021

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

TITLE	NAME	DATE
DRAWN	[redacted]	[redacted]
DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CLIENT: NSW GOVERNMENT Transport for NSW

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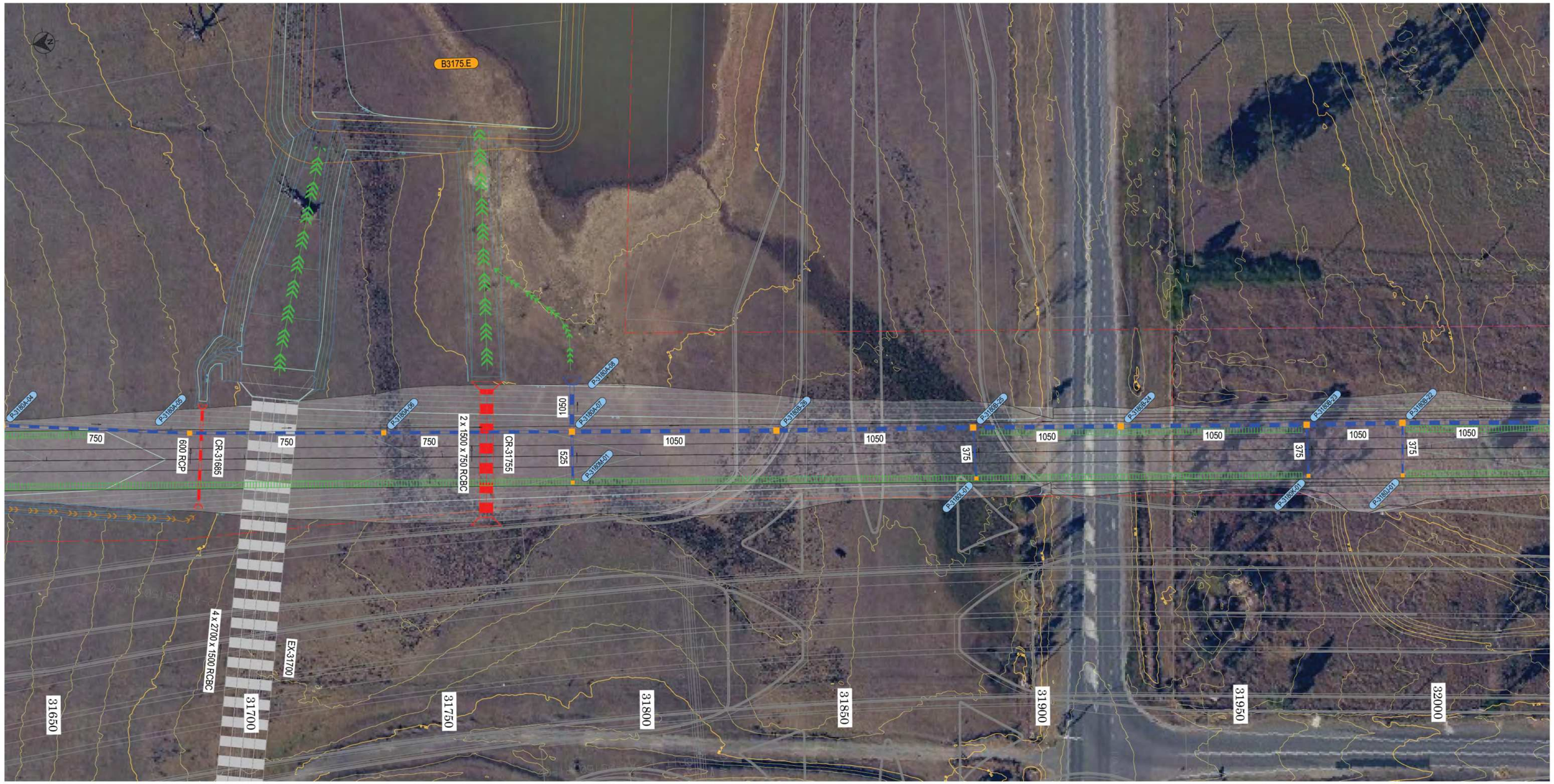
SYDNEY METRO WESTERN SYDNEY AIRPORT — A1
SURFACE CIVIL ALIGNMENT WORKS

DRAINAGE PLANS

RMS REGISTRATION No. — PART

ISSUE STATUS: FOR INFORMATION — EDMS No. — SHEET No. — ISSUE: TAN A



LEGEND - DRAINAGE

- DRAINAGE PIPE, SIZE AND FLOW DIRECTION (450)
- CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN (600)
- M12 CULVERTS - BY OTHERS
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GENERAL

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- RAIL EMBANKMENT
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- PROPOSED MAJOR CONTOURS (2.0 METRES)
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THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;
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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:13:12 2021

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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM	HEIGHT DATUM
MGA ZONE 55	AHD

TITLE	NAME	DATE
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DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS
DRAINAGE PLANS

A1

RMS REGISTRATION No.

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ISSUE STATUS: FOR INFORMATION

EDMS No.

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ISSUE: TAN A

PLOT FILE: Page 25

LEGEND - DRAINAGE

- 450 — DRAINAGE PIPE, SIZE AND FLOW DIRECTION
- 600 — CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN
- M12 CULVERTS - BY OTHERS
- PITS / HEADWALLS
- OPEN CHANNEL - GRASS LINED
- OPEN CHANNEL - ROCK LINED
- OPEN CHANNEL - CONCRETE LINED
- BIO SWALE
- GRATED BOX CESS DRAIN
- B0100.E — COMBINED DETENTION/WATER QUALITY BASIN
- BASIN IDENTIFIER
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GENERAL

- ACQUISTION BOUNDARY
- RAIL EMBANKMENT
- HAUL ROAD (ALIGN UNDER DEVELOPMENT)
- 35.0 — PROPOSED MAJOR CONTOURS (2.0 METRES)
- PROPOSED MINOR CONTOURS (0.5 METRES)
- 36.0 — EXISTING MAJOR CONTOURS (2.0 METRES)
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THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;
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DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: Fri Jul 2 14:13:17 2021

CLIENT: NSW GOVERNMENT Transport for NSW

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55 HEIGHT DATUM: AHD

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	DESIGN	[redacted]	[redacted]
	DESIGN CHECK		
	DESIGN MNGR	[redacted]	02/07/21
	PROJECT MNGR		

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SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS

DRAINAGE PLANS

A1

RMS REGISTRATION No.

PART

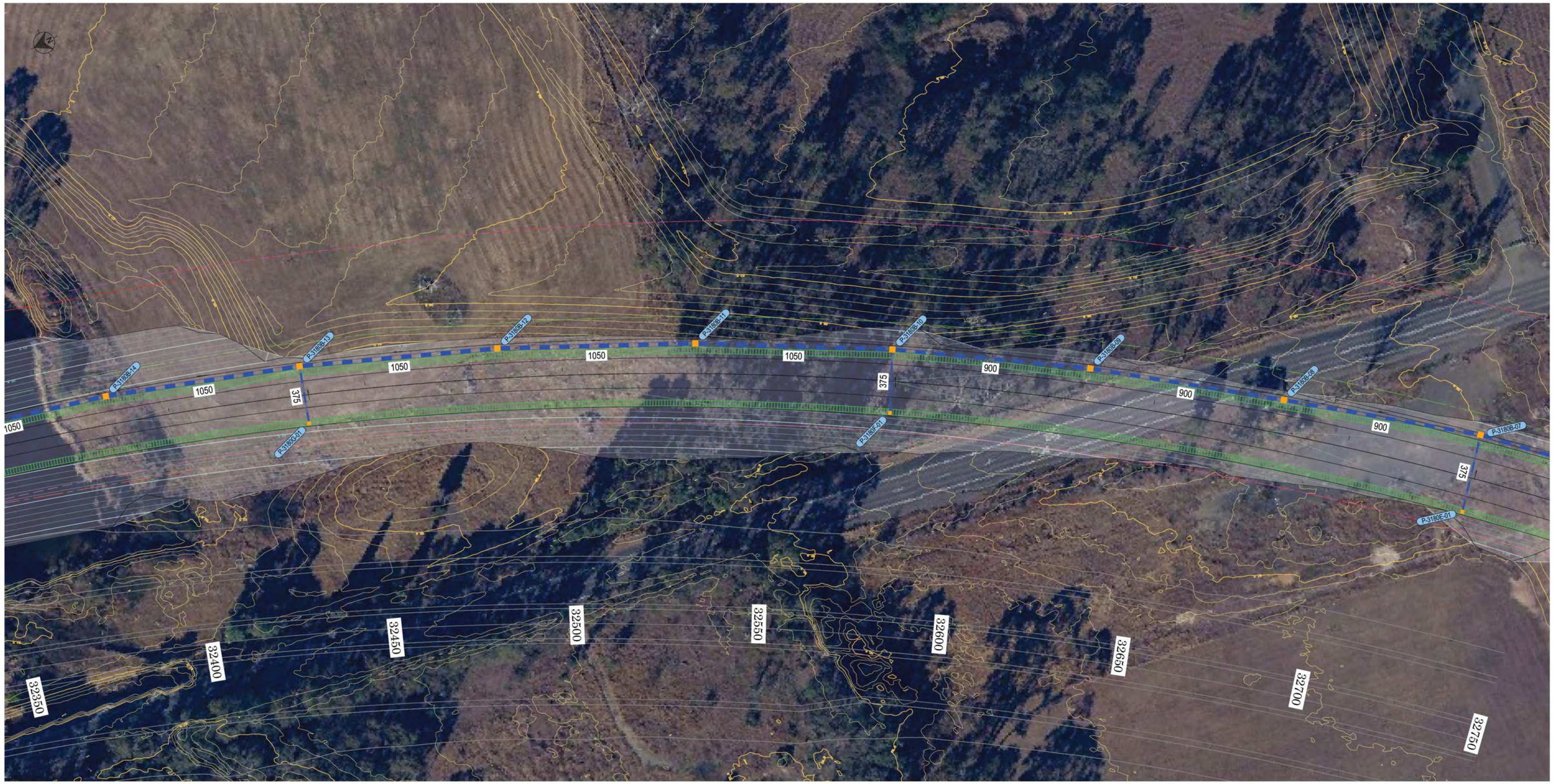
ISSUE STATUS: FOR INFORMATION

EDMS No.

SHEET No.

ISSUE

TAN A



LEGEND - DRAINAGE

- DRAINAGE PIPE, SIZE AND FLOW DIRECTION (450)
- CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN (600)
- M12 CULVERTS - BY OTHERS
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GENERAL

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0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;
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PLOT DATE / TIME: Fri Jul 2 14:13:23 2021

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

DRAWINGS / DESIGN PREPARED BY

CO-ORDINATE SYSTEM: MGA ZONE 55

HEIGHT DATUM: AHD

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DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CLIENT: NSW GOVERNMENT Transport for NSW

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SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS
DRAINAGE PLANS

A1

RMS REGISTRATION No.

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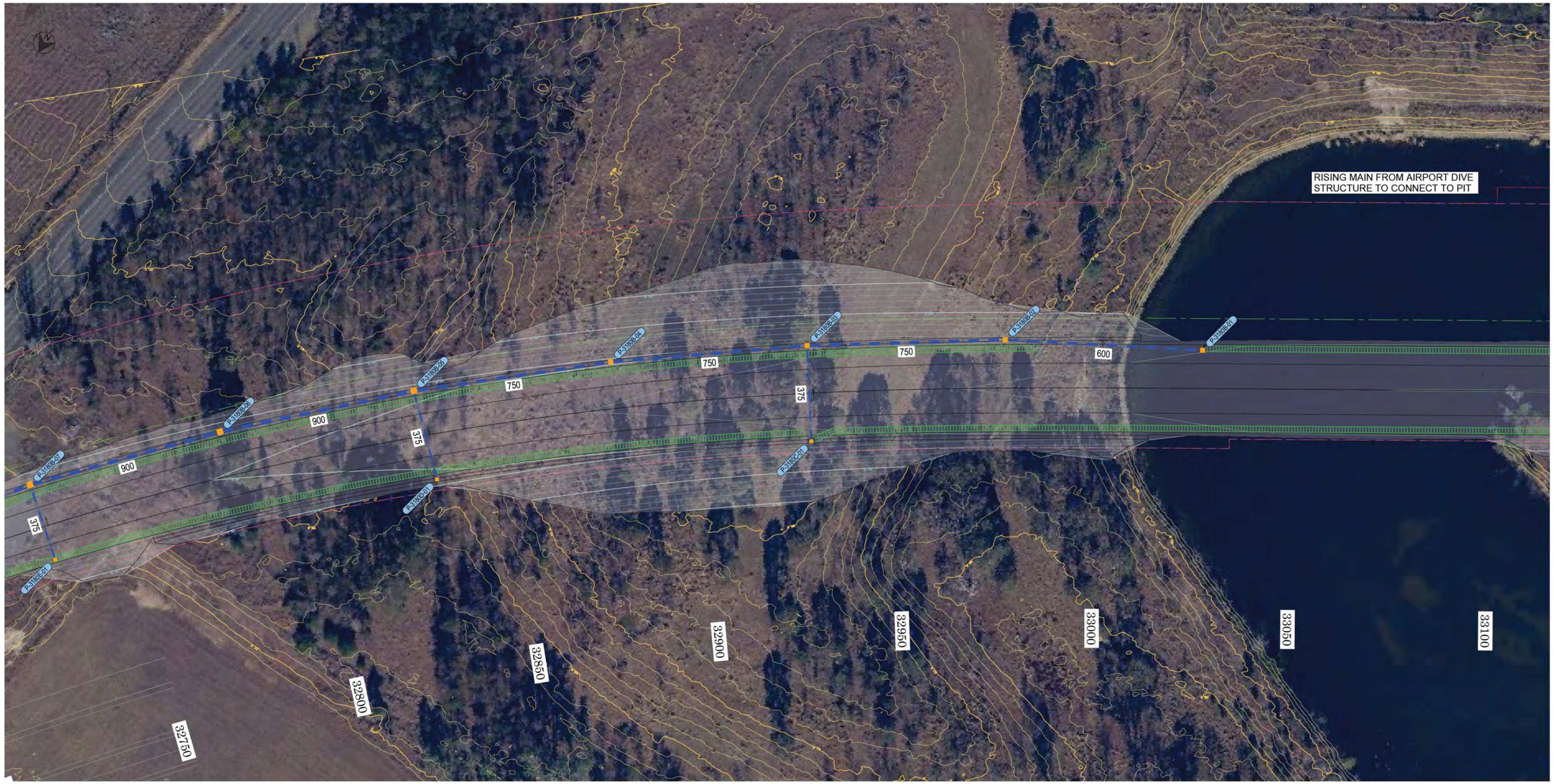
ISSUE STATUS: FOR INFORMATION

EDMS No.

SHEET No.

ISSUE: TAN A



LEGEND - DRAINAGE

- 450 — DRAINAGE PIPE, SIZE AND FLOW DIRECTION
- 600 — CROSS DRAINAGE CULVERT, SIZE AND FLOW DIRECTN
- M12 CULVERTS - BY OTHERS
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GENERAL

- ACQUISTION BOUNDARY
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- 36.0 — PROPOSED MAJOR CONTOURS (2.0 METRES)
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0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

12d Model Project;
c:\Synergy_work\data\AUDC1P12DSYN01\512033 - Metro WSA SCAW D&C Tender_464713\5 Deliver design\502 Modelling\12d\400 DRAINAGE.12dmodel\400 DRAINAGE

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

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CO-ORDINATE SYSTEM: MGA ZONE 55 — HEIGHT DATUM: AHD

PLOT DATE / TIME: Fri Jul 2 14:13:29 2021

TITLE	NAME	DATE
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DRG CHECK		
DESIGN	[redacted]	[redacted]
DESIGN CHECK		
DESIGN MNGR	[redacted]	02/07/21
PROJECT MNGR		

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR

SYDNEY METRO WESTERN SYDNEY AIRPORT
SURFACE CIVIL ALIGNMENT WORKS

DRAINAGE PLANS

A1

RMS REGISTRATION No. | PART

ISSUE STATUS: FOR INFORMATION | EDMS No. | SHEET No. | ISSUE: TAN A

PLOT FILE: Page 28

Appendix C10 – Discharge Impact Assessment

[redacted]

Hi [redacted]

To cover the requested detail below please find attached:

• CPB to please provide us with likely timing of sediment basins and definitions (i.e. temporary, permanent, biofiltration basins)	The proposed first sediment basins that would be constructed are likely to be for late September/early October at Elizabeth Drive Compound. The three definitions in the Proposed Temporary Basin Location spreadsheet is: **Temporary** = basins that will only be in the location for temporary period of time, and then back filled and rehabilitated upon completion of construction in the area. **Permanent** = the location of a temporary basin used during construction within the location of a permanent / operational basin. By locating our temporary basins within the location of final design operational basins, we limit additional disturbance areas throughout the project footprint **Biofiltration basins** = as per the definition of Permanent above, however the operation basin at this location is a proposed bioretention system to treat operational stormwater discharges when the metro is operational.
• CPB to please provide ERSED plans for Orchard Hills and Elizabeth Drive sites	**22000122_P01_ESCP_REV A** – Orchard Hills **22000122_P02_ESCP_REV A** – Elizabeth Dive Site These are currently draft and we are working with the soil conservationist to finalise these before commencing any work. Note the basin is provided on the Elizabeth Drive Compound, but is subject to site survey and would not be installed until after the haul road is constructed and the stripping of topsoil is required for the compound footprint (late September/early October)
• CPB to update SCAW Noise and Vibration Assessment noting the following EPA comments: ○ Very simple and brief document and easy to understand – appropriate for lower risk	Rev 1 of the Noise Assessment which includes: - RBLs in the tables (and reference to NML being RBL+10 during daytime construction hours)

sites such as works currently prepared for Orchard Hills and Elizabeth Drive o Would be helpful to add RBLs into the table beside the NMLs (so you can clearly see under the one table where the NML has come from) o Limited mitigation measures are proposed where predicted noise is 5 or 9 above the NMLs, as well as informing impacted community. Measures outlined are largely communication tools rather than measures to actually mitigate the noise. Under the interim Interim Construction Noise Guidelines (ICNG), CPB are required to implement mitigation measures to address/ameliorate noise impacts that above the NMLs, as well as informing impacted community. As part of this, CPB needs to demonstrate to the EPA what mitigation measures have been considered and why you will or won't adopt these. This is to demonstrate to the EPA that all reasonable and mitigation measures are being implemented to mitigate noise above the NML. The mitigation measures should ideally quantify the effectiveness of measures. P23-32 of ICNG provides examples of work practices that could be considered and/or implemented if reasonable and feasible.	- Additional section **Further consideration of mitigation measures** and **Attachment 4 - Consideration of reasonable and feasible mitigation measures** to outline the further detail we went through with the team
• more detail in the CDIA on how the sediment basins will meet the 50 NTU, including specific information in terms of dosing, settlement times, etc, to demonstrate that CPB are implementing a reasonable level of performance in accordance with the National Water Quality Management Strategy	A copy of our permit to dewater which will be contained in the Soil and Water Management Sub-plan and used for all sediment basin discharges. We feel this provides the suitable detail to cover how we will ensure our basins meet or get below 50 NTU prior to discharge.

I will send confirmation to you about our acceptance of the Draft EPL shortly once I get the updated premise maps back from our GIS team

Regards

[redacted]

CPB CONTRACTORS | UNITED INFRASTRUCTURE

SYDNEY METRO - WESTERN SYDNEY AIRPORT
SURFACE AND CIVIL ALIGNMENT WORKS

[redacted]

[redacted]

[redacted]

[redacted]

Hi [redacted]

[redacted] and I spoke to water tech this morning letting them know that CPB have committed to a discharge limit of 50 NTU for the SCAW sediment basins and sought advice on updates to your CDIA. [redacted] would like to see more detail in the CDIA on how the sediment basins will meet the 50 NTU, including specific information in terms of dosing, settlement times, etc, to demonstrate that CPB are implementing a reasonable level of performance in accordance with the National Water Quality Management Strategy.

Following this, the EPA's proposal will be that the SCAW EPL will include NTU, oil and grease and pH limits for SCAW sediment basins, which is consistent with other projects in the area.

Just also confirming that for the first version of the licence that you won't need discharge points? We are currently in the process of drafting up the licence for review this week.

Kind regards,

[redacted]

www.epa.nsw.gov.au @NSW_EPA

The EPA acknowledges the traditional custodians of the land and waters where we work. As part of the world's oldest surviving culture, we pay our respect to Aboriginal elders past, present and emerging.

Report pollution and environmental incidents 131 555 or +61 2 9995 5555

[redacted]

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SYDNEY METRO - WESTERN SYDNEY AIRPORT
SURFACE AND CIVIL ALIGNMENT WORKS

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- EPA will speak to the Water team to determine the extent of detail they require from you for the CDIA, noting that you already agree to a turbidity limit of 50 NTU
- CPB to please provide us with likely timing of sediment basins and definitions (i.e. temporary, permanent, biofiltration basins)
- CPB to please provide ERSED plans for Orchard Hills and Elizabeth Drive sites
- CPB to update SCAW Noise and Vibration Assessment noting the following EPA comments:
    - Very simple and brief document and easy to understand – appropriate for lower risk sites such as works currently prepared for Orchard Hills and Elizabeth Drive
    - Would be helpful to add RBLs into the table beside the NMLs (so you can clearly see under the one table where the NML has come from)
    - Limited mitigation measures are proposed where predicted noise is 5 or 9 above the NMLs, as well as informing impacted community. Measures outlined are largely communication tools rather than measures to actually mitigate the noise. Under the interim Interim Construction Noise Guidelines (ICNG), CPB are required to implement mitigation measures to address/ameliorate noise impacts that above the NMLs, as well as informing impacted community. As part of this, CPB needs to demonstrate to the EPA what mitigation measures have been considered and why you will or won't adopt these. This is to demonstrate to the EPA that all reasonable and mitigation measures are being implemented to mitigate noise above the NML. The mitigation measures should ideally quantify the effectiveness of measures. P23-32 of ICNG provides examples of work practices that could be considered and/or implemented if reasonable and feasible.

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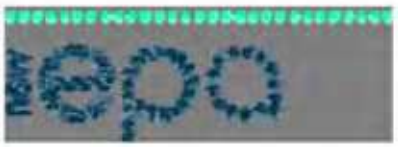

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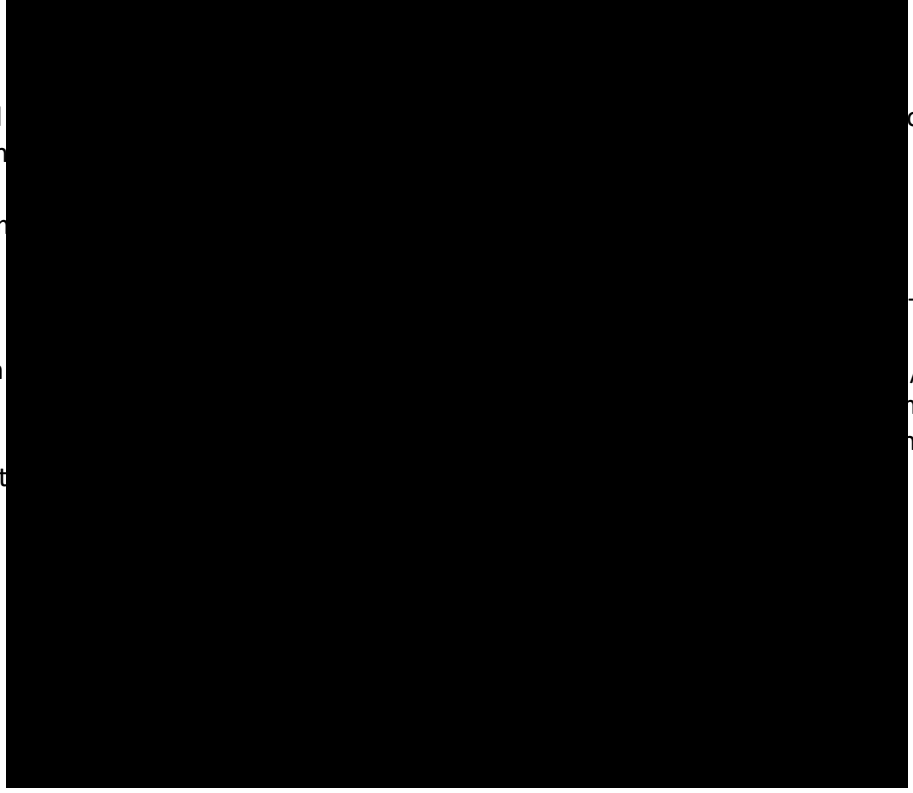

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SEEC

Construction Discharge Impact Assessment

Sydney Metro – Surface Civil & Alignment Works

Prepared for CPBUI JV and Sydney Metro

Revision 01

13 July 2022

Strategic Environmental & Engineering Consulting

SEEC

Strategic Environmental and Engineering Consulting

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Document Certification

This document has been developed based on agreed requirements as understood by SEEC at the time of investigation. It applies only to a specific task on the nominated lands. Other interpretations should not be made, including changes in scale or application to other projects.

Any recommendations contained in this report are based on an honest appraisal of the opportunities and constraints that existed at the site at the time of investigation, subject to the limited scope and resources available. Within the confines of the above statements and to the best of my knowledge, this report does not

[redacted]

[redacted]

Version Register

Version	Date	Author	Reviewer	Notes	Other
Rev 00	10/06/2022	BJ	AM	Issue as Rev 00	
Rev 01	13/07/2022	BJ	AM	Issue as Rev 00	

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1 INTRODUCTION

1.1 Project Description

Sydney Metro – Western Sydney Airport is a key element to delivering an integrated transport system for the Western Parkland City. The new railway line will become the city's transport spine, connecting communities and travellers with the rest of Sydney's public transport system with a fast, safe and easy metro service. The Sydney Metro – Western Sydney Airport will enable the realisation of the vision for Western Sydney and the Aerotropolis, by connecting people to employment, education, shops, services and recreation facilities. It will also provide important access to Western Sydney International Airport (WSIA) for airport workers and aviation travellers.

CPB and United Infrastructure Joint Venture (CPBUI JV) is undertaking the design and construction of the Surface Civil and Alignment Works (SCAW) of the Sydney Metro Western Sydney Airport (the Project). The Project forms part of the broader Sydney Metro network. It involves the construction and operation of a 23km new metro rail line that extends from the existing Sydney Trains suburban T1 Western Line at St Marys in the north and the Aerotropolis at Bringelly in the south.

Major features of the Sydney Metro – Western Sydney Airport include:

- A new metro station connecting to, and providing interchange with, the existing Sydney Trains suburban rail network at St Marys, north of Western Sydney International.
- Two new metro stations between the existing Sydney Trains suburban rail network at St Marys and Western Sydney International; one at Orchard Hills and one at Luddenham within the Northern Gateway precinct.
- Two new metro stations within the Western Sydney International Airport site; one at the Airport Terminal and one at the Airport Business Park.
- A new metro station within the Aerotropolis Core precinct, south of Western Sydney International Airport.

The Project includes:

- 3.6 kilometres of viaduct including:
  - 400 metres of viaduct over Blaxlands Creek.
  - 660 metres of viaduct over the Patons Lane area and un-named creek.
  - 2.5km of viaduct in the Luddenham Road area including across the Warragamba pipeline, at Luddenham Station, across Luddenham Road and across Cosgrove Creek.
- 205 metres of bridges including:
  - an over rail bridge, approximately 180m long, over the proposed M12 Motorway.
  - an over rail bridge, approximately 25m long, over the drainage swale on the WSI airport site.

- 6.9km of at-grade alignment including:
  - 600m at Orchard Hills, south of Landsdowne Road.
  - 1.6km alongside the stabling maintenance facility in Orchard Hills.
  - 900m to the north of the Warragamba pipelines.
  - 1.1km north of the proposed M12 motorway.
  - 1.4km south of the proposed M12 Motorway on Elizabeth Drive.
  - 1.3km within the Airport site from the northern boundary to the Airport Business Park Station.
- Temporary and permanent access roads.

Figure 1-1 illustrates the Project overview.

CPBUI JV has engaged Strategic Environmental and Engineering Consulting (SEEC) Pty Ltd to prepare this Construction Discharge Impact Assessment, to determine appropriate limits for key potential pollutants discharged to surface waters during construction of the Project.

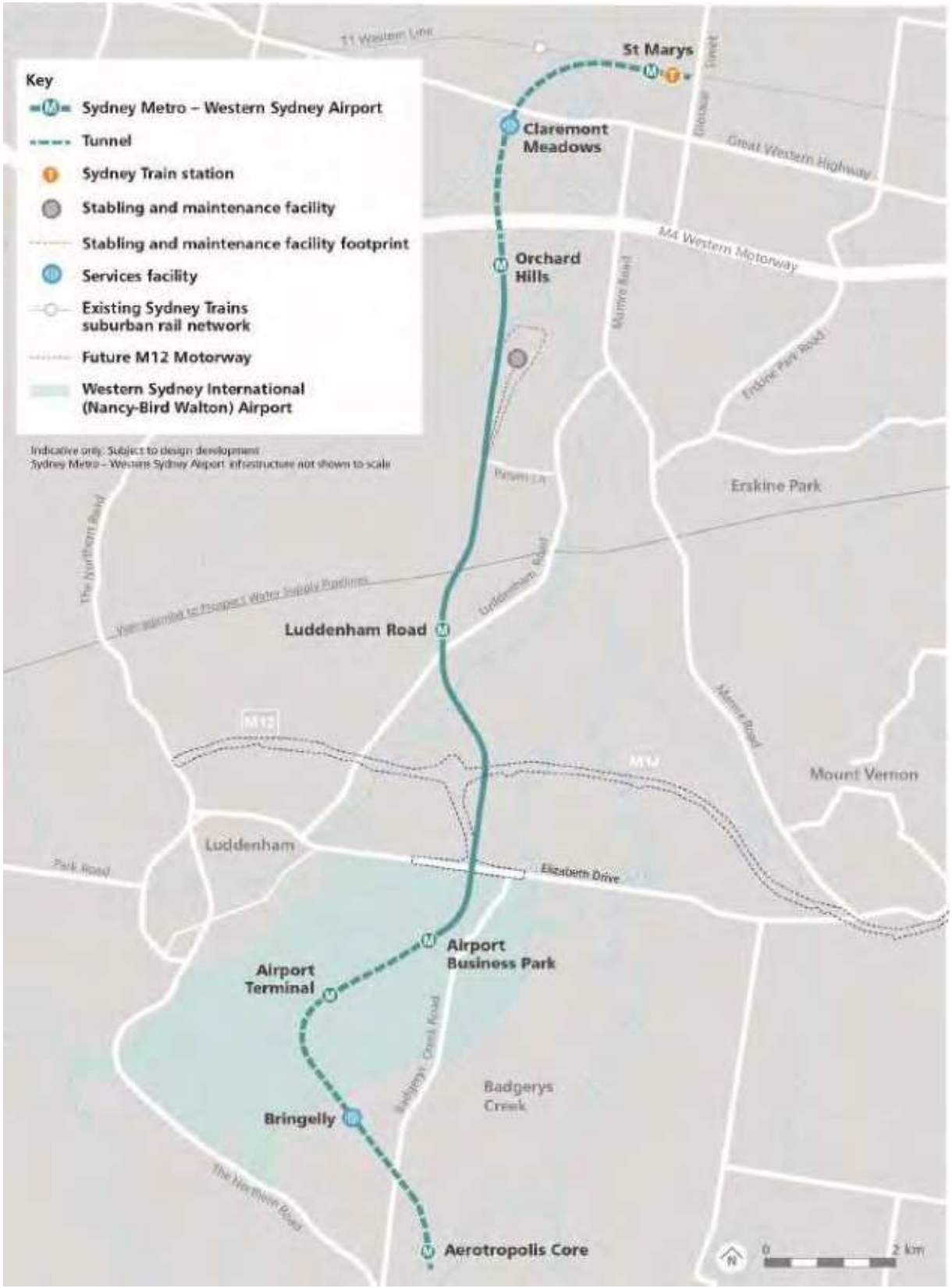

Figure 1-1: Project overview and key features (from TfNSW, 2020b)

1.2 Purpose of This Report

This report has been prepared for CPBUI JV and Sydney Metro by Strategic Environmental and Engineering Consulting (SEEC).

The purpose of this report is to address the relevant Conditions of Approval (CoAs) for the Project, to inform conditions to be included in the Environment Protection Licence (EPL) for the Project.

The Construction Discharge Impact Assessment includes an assessment of the impacts of proposed construction-phase discharges from the Project premises against the NSW Water Quality Objectives (WQOs) for the potentially-impacted watercourses around the Project site. It follows the methodology outlined in the draft Guideline for assessing the Impacts of Treated Water Discharge from Water Quality Treatment Controls developed by TfNSW (TfNSW, 2020a).

This report should be read in conjunction with the following documents:

- Sydney Metro – Western Sydney Airport Environmental Impact Statement (Sydney Metro, 2020a).
- Surface Water Monitoring Report April 2021 Western Sydney Airport (Cardno, 2021).

1.3 Scope and Limitations

This report has been prepared in general accordance with or in reference to the following documents:

- DRAFT Guideline for Assessing the Impacts of Treated Water Discharge from Water Quality Treatment Controls (TfNSW, 2020a).
- Managing Urban Stormwater – Soils and Construction, Volume 1, 4th Edition, (Landcom, 2004) – Blue Book 1.
- Managing Urban Stormwater – Soils and Construction, Volume 2D, Main Road Construction (DECCW, 2009) – Blue Book 2D.
- Requirements of the Environmental Assessment and NSW and Federal conditions of approval.
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC Water Quality Guidelines, 2000) - Volume 1.
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC Water Quality Guidelines, 2018).
- National Water Quality Management Strategy (NWQMS).
- Technical Guideline - Temporary stormwater drainage for construction (RMS, 2011).
- Technical Guideline – Environmental Management of Construction Site Dewatering (RTA, 2011).
- QA Specification G38 Soil and Water Management (TfNSW, 2020c).
- QA Specification G36 Environmental Protection (TfNSW, 2020b).

This report has been prepared by Strategic Environmental and Engineering Consulting (SEEC) Pty Ltd on behalf of CPBUI JV and Sydney Metro, and may only be used and relied on for the purpose agreed between CPBUI JV and Sydney Metro as set out in Section 1.2 of this report.

CPBUI JV and SEEC otherwise disclaim responsibility to any person other than Sydney Metro arising in connection with this report. CPBUI JV and SEEC also exclude implied warranties and conditions, to the extent legally permissible.

The services undertaken by CPBUI JV and SEEC in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. CPBUI JV and SEEC have no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by CPBUI JV and SEEC described in this report. CPBUI JV and SEEC disclaim liability arising from any of the assumptions being incorrect.

CPBUI JV and SEEC have prepared this report on the basis of information provided by Sydney Metro and others who provided information to CPBUI JV and SEEC (including Government authorities), which CPBUI JV and SEEC have not independently verified or checked beyond the agreed scope of work. CPBUI JV and SEEC do not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2 DOCUMENTATION AND REVIEW

2.1 Environmental Conditions and Constraints

In preparing this Construction Discharge Impact Assessment, relevant environmental conditions and constraints have been described and assessed as to how those conditions might affect the discharge of surface water detained on the Project premises into local watercourses.

Relevant environmental conditions and constraints include climate, topography, soils, surface waters, flooding, and groundwater. This information was sourced from:

- The Sydney Metro – Western Sydney Airport Environmental Impact Statement (EIS) (Sydney Metro, 2020a).
- Water quality samples collected for this Project (Cardno, 2021) and the M12 Motorway Upgrade (GHD, 2021 and 2022).
- Estimates of site stripping areas provided by CPBUI JV.

2.2 Methodology: Overview

As noted in Section 1.2, this Construction Discharge Impact Assessment includes an assessment of the impacts of proposed construction-phase discharges from the Project premises against the NSW Water Quality Objectives (WQOs) for the potentially-impacted watercourses around the Project site.

The water quality parameters most likely to be impacted in waters detained within the Project premises during construction include:

- Turbidity (and suspended sediment);
- pH;
- Oils and greases.

pH can be adjusted simply and easily in discharges to match ambient conditions and so is not included in this Assessment. Oils and greases in discharges would be managed via a dewatering protocol/procedure, so are also excluded.

As this Project does not include any tunneling or significant interactions with ground water, water treatment plants are not expected to be used, so potential pollutants associated with groundwater and tunneling are not included in this Assessment (e.g. heavy metals). Nutrient pollution (primarily from phosphorus and nitrogen) are also excluded because:

- The main source of turbidity and suspended sediment into sediment basins would be from exposed subsoils, which are typically low in nutrients. Topsoils are higher in nutrients but they would be stripped from the construction area; and

- The majority of nutrients within soils are bound onto soil particles, so targeting sediment removal in stormwater translates to significant nutrient removal. (Davis and Koop, 2006).

Water quality testing results are available for local waterways adjacent to the proposed Western Sydney Airport (Cardno, 2021). Additional turbidity and suspended sediment results are provided in the M12 surface water monitoring program for local waterways downstream of the airport site. As such, this assessment focuses on turbidity.

This Assessment has adopted the Draft Guideline for Assessing the Impacts of Treated Water Discharge from Water Quality Treatment Controls (TfNSW, 2020a) to estimate the potential impact from the discharge of detained stormwater from the Project. The guideline is based on the risk-based framework for waterways developed by the NSW Environmental Protection Authority (EPA) and NSW Office of Environment and Heritage (OEH) and the water management framework adopted in ANZECC (2018). The framework is shown as Figure 2-1.

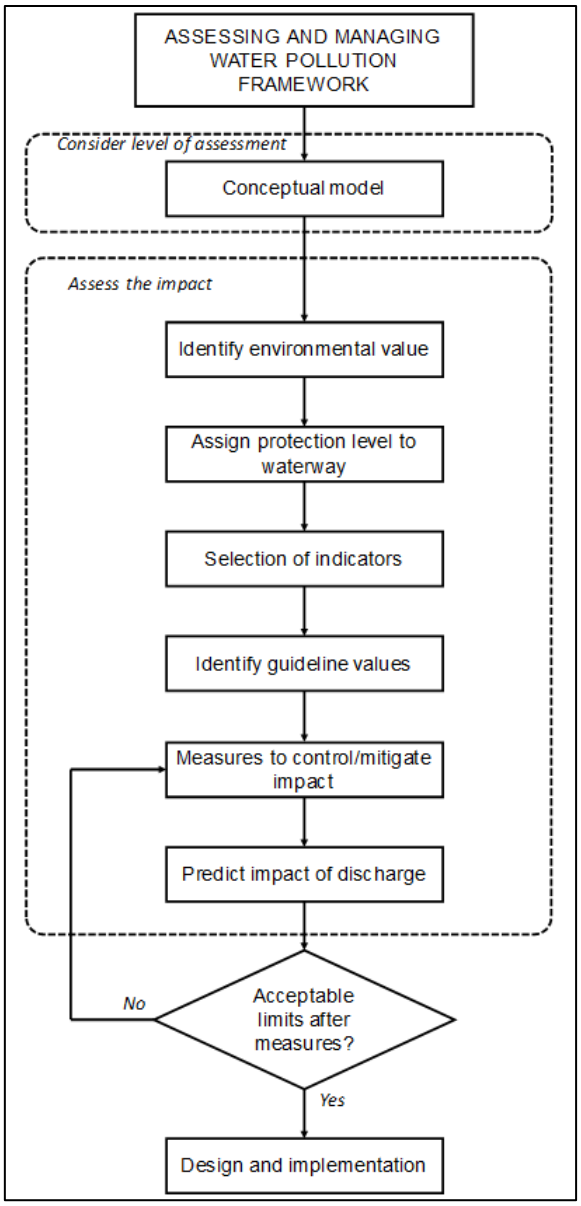

Figure 2-1: Framework for assessing and managing water pollution (TfNSW 2020a).

The key component of the assessment is developing a conceptual model that incorporates an understanding of the existing environment, expected discharge volumes and water quality to assess potential impacts. The purpose of a conceptual model is to ensure that all activities, processes and responses are identified and considered without overly quantifying the hydraulic and water quality processes.

The catchments have been assumed to be large enough to generate baseflow between rainfall events. Discharges will therefore be pumped into the waterways after the rainfall event when flows have reduced as shown in Figure 2-2. The assimilation capacity will depend on the flow of the waterway compared to the discharge flow rate.

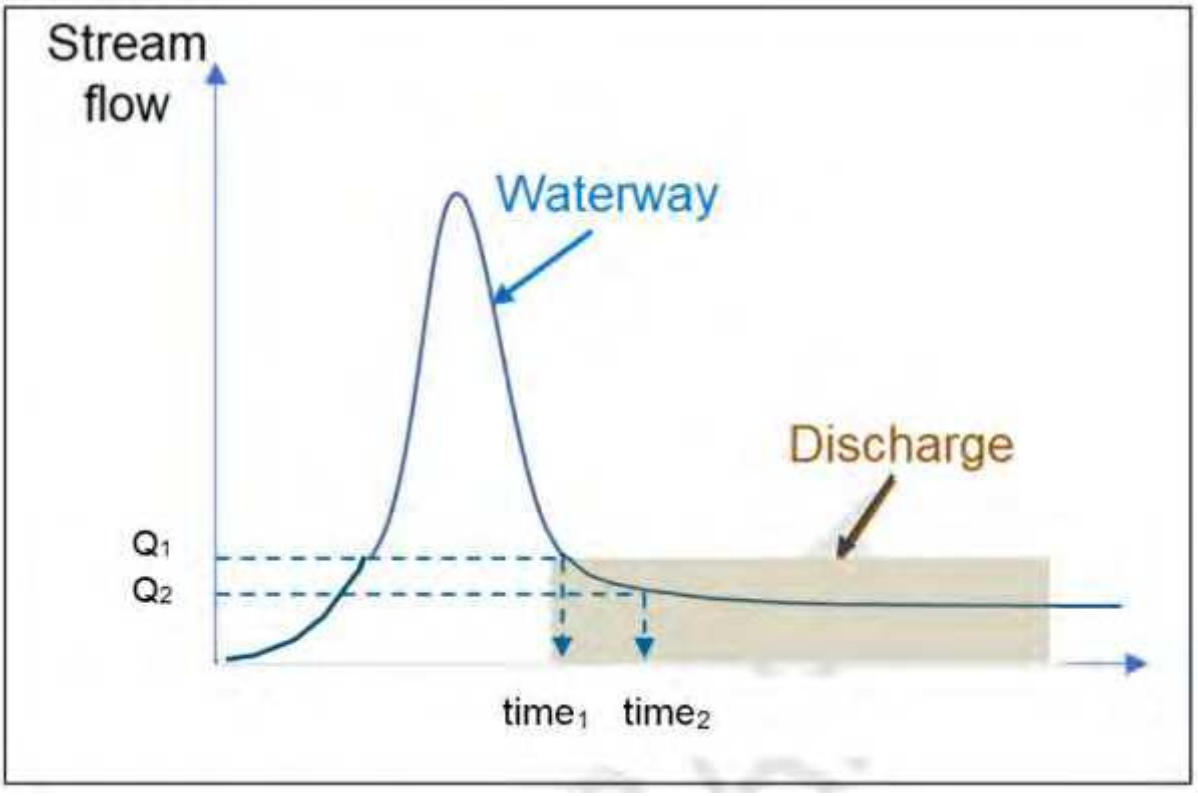

Figure 2-2: Conceptual model for treated water for sediment control basin discharging into a waterway (based on TfNSW 2020a).

2.3 Review of water quality

As part of preparing this Assessment, SEEC conducted a review of:

- Proposed Surface Civil and Alignment (SCAW) route (Sydney Metro, 2020a and b), to determine if any inherent design issues might impact on constructability and effective implementation of erosion and sediment controls.
- The EIS (Sydney Metro, 2020a).
- Historical water quality results provided by Cardno for the Western Sydney Airport (Cardno, 2021) and additional samples collected by GHD as part of the M12 Motorway Upgrade Project (GHD, 2021 and 2022).

SEEC also developed rainfall runoff models to estimate streamflow in watercourses where no historical events have been recorded.

3 ENVIRONMENTAL CONDITIONS

3.1 Climate

Bureau of Meteorology (BoM) has a number of rainfall stations adjacent to the Project site as shown in Figure 3-1.

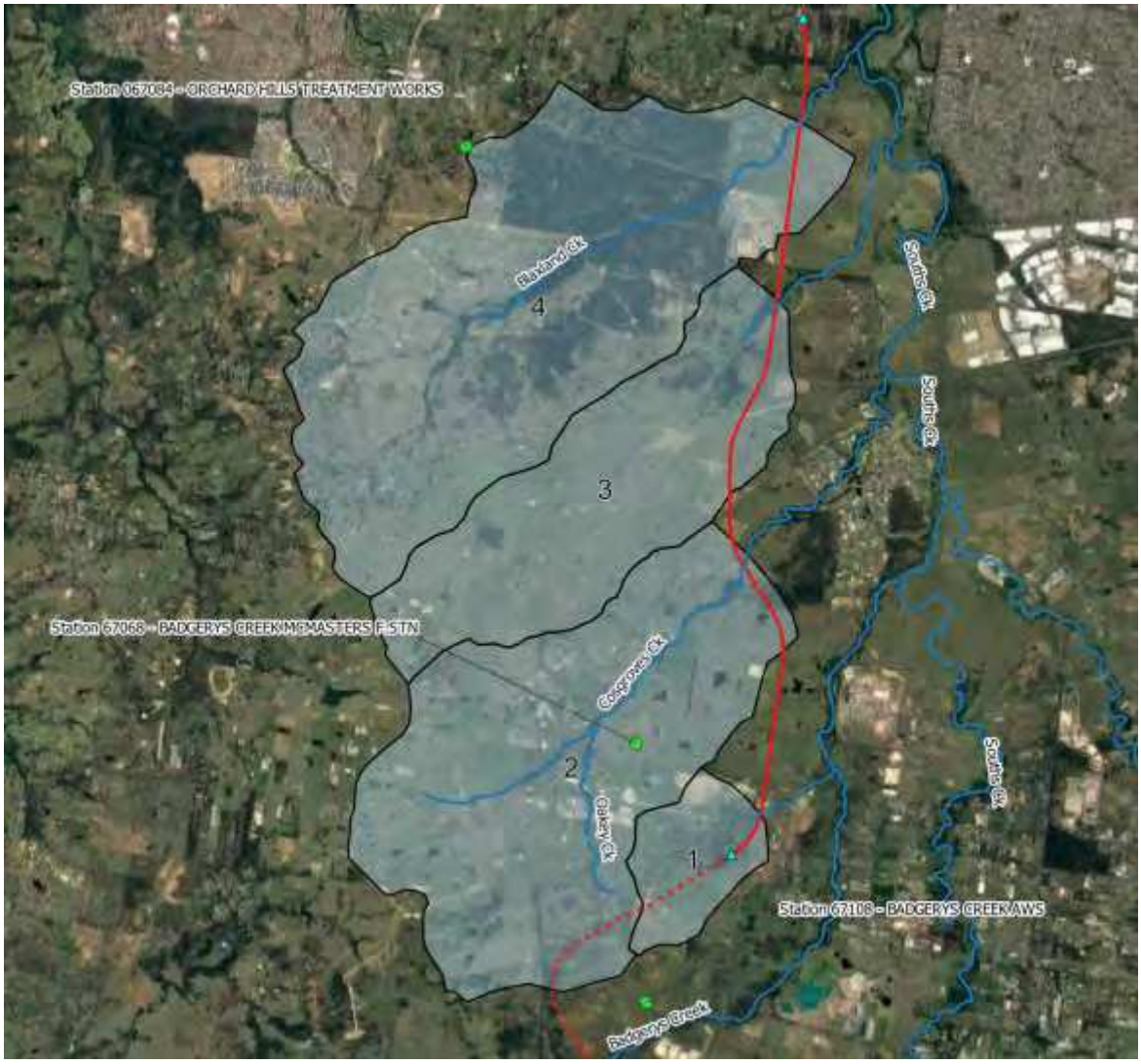

Figure 3-1: Bureau of Meteorology rainfall station locations

Historical rainfall statistics for nearby Orchard Hills (Station 67084) and Badgerys Creek AWS (station 067108) are contained in Table 3-1. The Orchard Hills station data is available from 1971 and the Badgerys Creek AWS station data is available from 1996.

Table 3-1 Rainfall statistics for Orchard Hills (Station 067084) and Badgerys Creek AWS (Station 067108)

BOM Station	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Orchard Hills 67084	Average rainfall (mm)	99.4	114.5	109.2	63.3	55.0	55.6	35.8	40.2	36.3	55.1	80.5	74.5	828.0
	Mean no of days with rain >1mm	8.5	8.8	8.5	6.3	5.4	5.3	4.4	3.8	5.0	6.7	7.8	7.5	78.0
Badgerys Creek 67108	Average rainfall (mm)	78.3	111.6	112.4	47.9	38.5	58.6	24.5	36.7	34.2	54.0	69.9	56.5	675.0
	Mean no of days with rain >1mm	7.1	7.7	8.3	5.7	3.9	5.6	3.8	3.3	4.7	5.8	6.8	6.4	69.1

From BoM website, accessed June 2022.

The variance in rainfall for both stations is provided below in Figure 3-2.

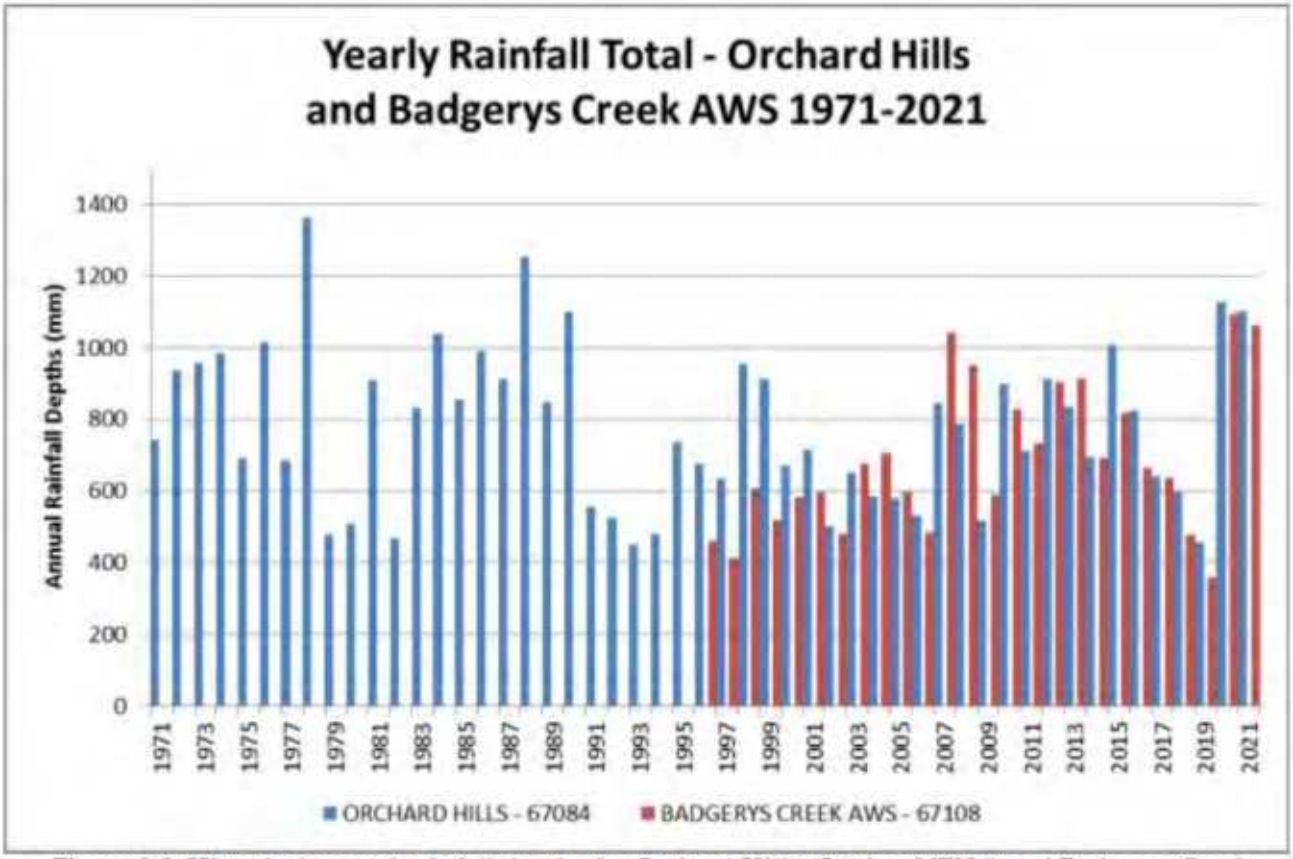

Figure 3-2: Historical annual rainfall depths for Orchard Hills (Station 067084) and Badgerys Creek AWS (Station 067108)

3.2 Topography

The Badgerys Creek catchment divide is at an elevation of 110 m AHD and joins South Creek at an elevation of 40 m AHD. Cosgroves Creek has an upper catchment elevation of 90 m AHD and joins South Creek at 32 m AHD. Blaxland Creek has an upper catchment

elevation of 70 m AHD and joins South Creek at 30 m AHD. The overall catchment slope is less than 0.5% with isolated steeper sections in the upper reaches but generally the catchment gently slopes to the north (TfNSW, 2020c). Site topography is split roughly into two as follows:

- Gentler slopes (less than 3%) occur along most of the metro alignment; and
- Steeper slopes (mostly 5 to 10%) occur around waterway crossings.

3.3 Soils – General

Soil Landscape Mapping from the Penrith 1:100,000 mapsheet and accessed via the NSW Government eSpade portal reveals that the Project lies on several different soil types (Bannerman and Hazelton, 1990). Figure 3-3 shows the soil landscapes (sourced from NSW Office of Environment and Heritage eSpade portal) with the proposed Project alignment.

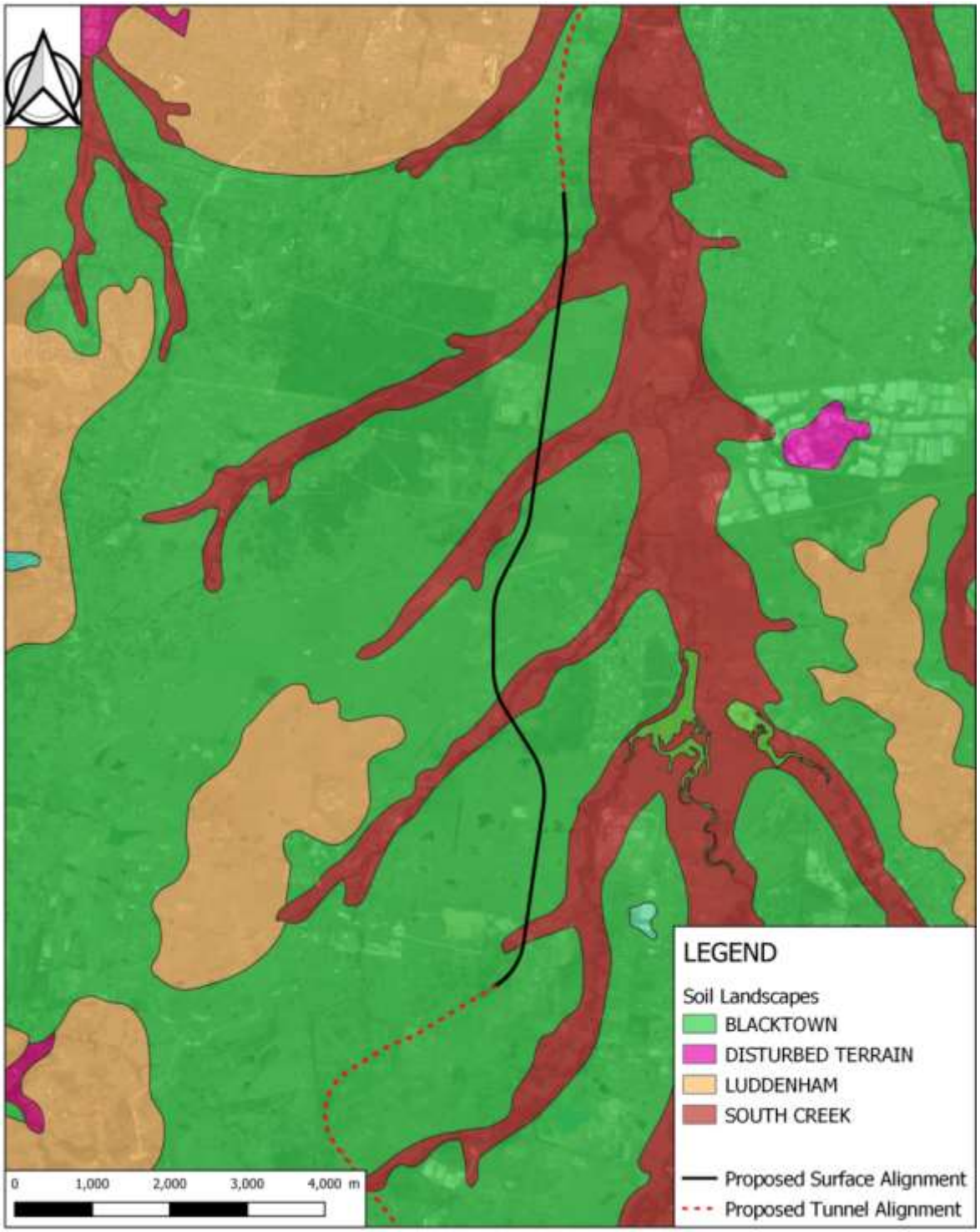

Figure 3-3: Soil landscapes Soil landscapes in and around the Project alignment (from NSW Government eSpade portal, based on mapping by Bannerman and Hazelton, 1990).

Table 3-2 contains a summary of soil landscape descriptions, key features and potential constraints that might influence soil and water management during construction.

Table 3-2 Soil landscape summary (from Bannerman and Hazelton, 1990, with interpretations based on Hazelton and Murphy, 2016, IECA, 2008 and Landcom, 2004).

Soil landscape name	Soil landscape description	Dominant K-factor and Soil type	Key landscape and soil constraints for erosion and sediment control
South Creek	Alluvial deposits associated with major creeklines. Slopes generally less than 5%. Soils primarily consist of Quaternary alluvium derived from Wianamatta Group sediments. Deep sandy, sandy clay and clay soils were deposited by the present South Creek drainage network.	0.05 Type D	• Flooding hazard. • Seasonal waterlogging of soils. • Localised salinity. • Localised high water tables. • Localised sodicity (dispersive soils).
Blacktown	Broad rounded crests and ridges with gently inclined slopes and undulating rises on Wianamatta Group shales. Local relief to 30 m and slopes usually >5%. Red and brown duplex soils on crests and midslopes, grading to yellow duplex soils on lower slopes and around drainage lines.	0.038 Type D	• Localised impermeable highly plastic subsoil. • Moderately reactive soils. • Low wet strength soils. • Low plant-available waterholding capacity. • Low permeability soils. • Low fertility subsoils. • Localised dispersive (sodic) subsoils. • Highly acidic topsoils with aluminium toxicity potential. • Localised salinity

3.4 Acid sulfate soils

Acid Sulfate Soil Risk Mapping (DLWC, 1997) did not identify the Project site as having a risk of acid sulfate soils (confirmed via the NSW Government eSpade portal). Site observations did not identify any landscape indicators that suggest acid sulfate soils might be present within the Project boundaries.

3.5 Salinity

The Salinity Potential in Western Sydney Map (DIPNR, 2003) shows that soils along the majority of the Project alignment have a moderate salinity potential (Figure 3-4). Around the major watercourses, salinity potential is noted as being high.

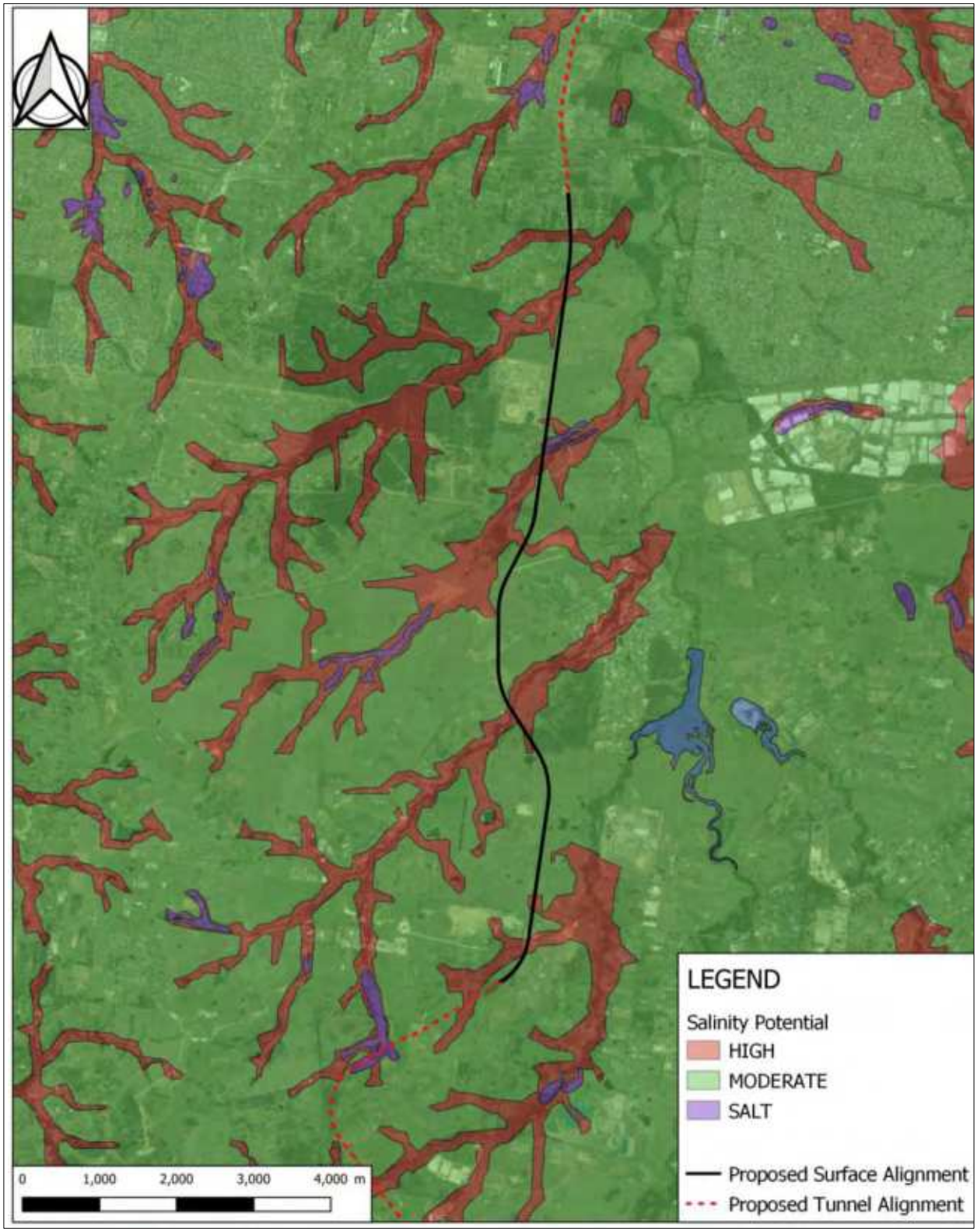

Figure 3-4: Salinity potential in and around the Project (based on mapping by DIPNR, 2003).

Areas classified as moderate risk for salinity are unlikely to show significant expressions of salinity (e.g. vegetation decline, excessive erosion, salt damage to built structures). However, excessive groundwater recharge in areas of moderate risk can cause or exacerbate surface expressions of salinity in high risk areas. The construction of the Project is unlikely to increase the amount of groundwater infiltration.

3.6 Surface water

3.6.1 Catchments and receiving waters

The Project lies within the South Creek catchment, which covers a total area of approximately 620 km² and falls entirely within the Cumberland Lowlands physiographic region, consisting of low lying gently undulating plains and low hills formed on sediments of the Wianamatta Group (Rae, 2007). The catchment extends the length of Western Sydney, with South Creek beginning 4 km north-east of Narellan and 7 km west of Minto in the south-west.

The South Creek catchment is a typical example of a peri-urban catchment with significant urban development surrounded by peri-urban agriculture activities, including market gardens, greenhouses, nurseries, orchards, turf farming, and improved pastures (Singh *et al*., 2009). South Creek is a major tributary of the Hawkesbury-Nepean River, and flows in a generally northerly direction before joining the Hawkesbury River at Windsor.

The Project alignment crosses Blaxland Creek, a tributary of South Creek, Cosgroves Creek and a tributary of Badgerys Creek as shown in Figure 3-5.

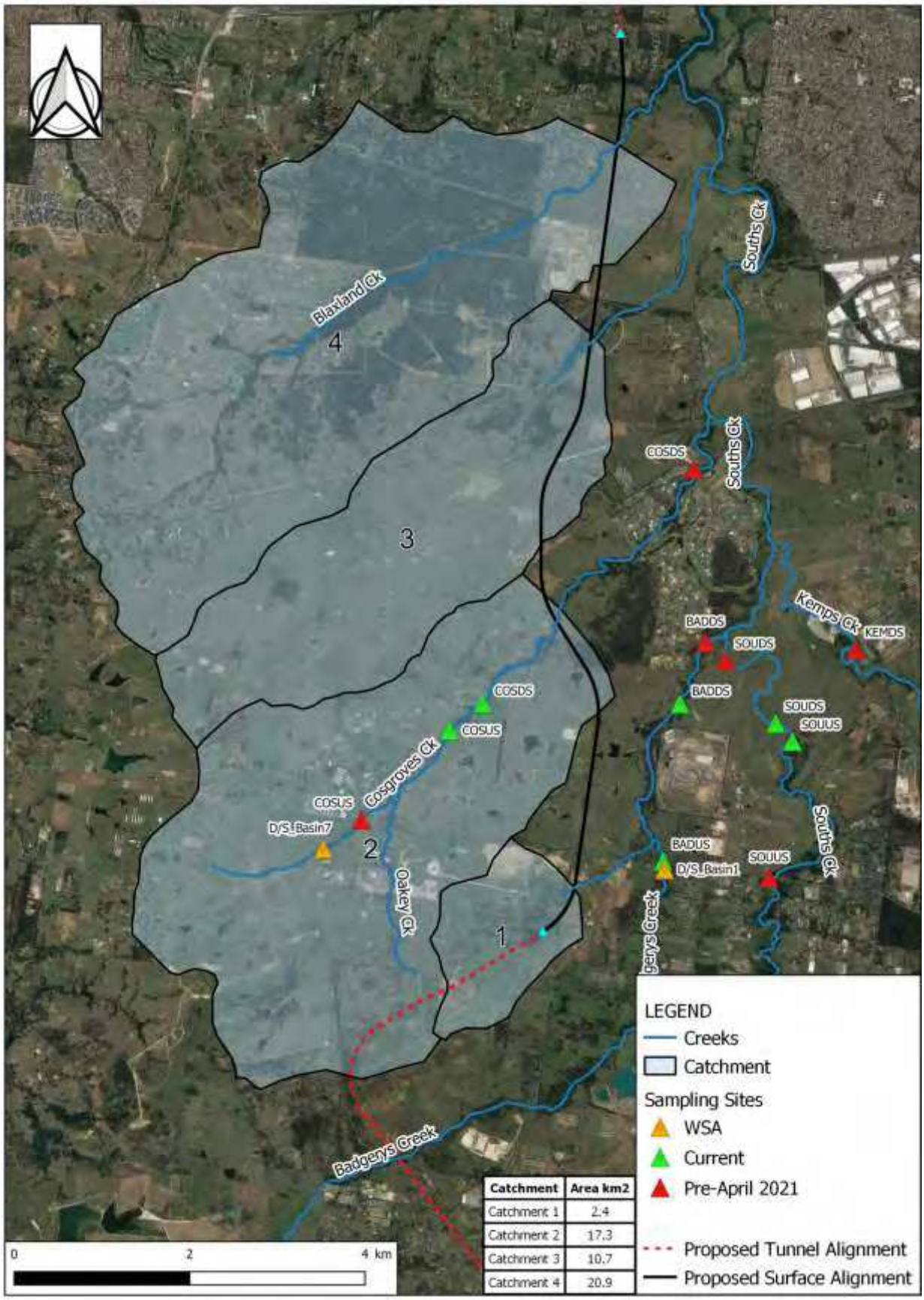

Figure 3-5: Catchment areas draining from the Project site (based on Digital Elevation Model (DEM) 5 Metre Grid Australian Government).

A stream gauge managed by WaterNSW (Station 21320) is located in South Creek just upstream of Elizabeth Drive adjacent to the Project area as shown in Figure 3-6. The gauge has an upstream catchment area of 88km^2 and has reported streamflow since 1955. There is another stream gauge (Station 212048) on South Creek at the Great Western Highway with an upstream catchment of 250km^2. The Elizabeth Drive gauge was adopted for the study as the catchment areas receiving discharges from sediment basins are less than 21km^2 which is closer to the contributing catchment of the Elizabeth Drive gauge.

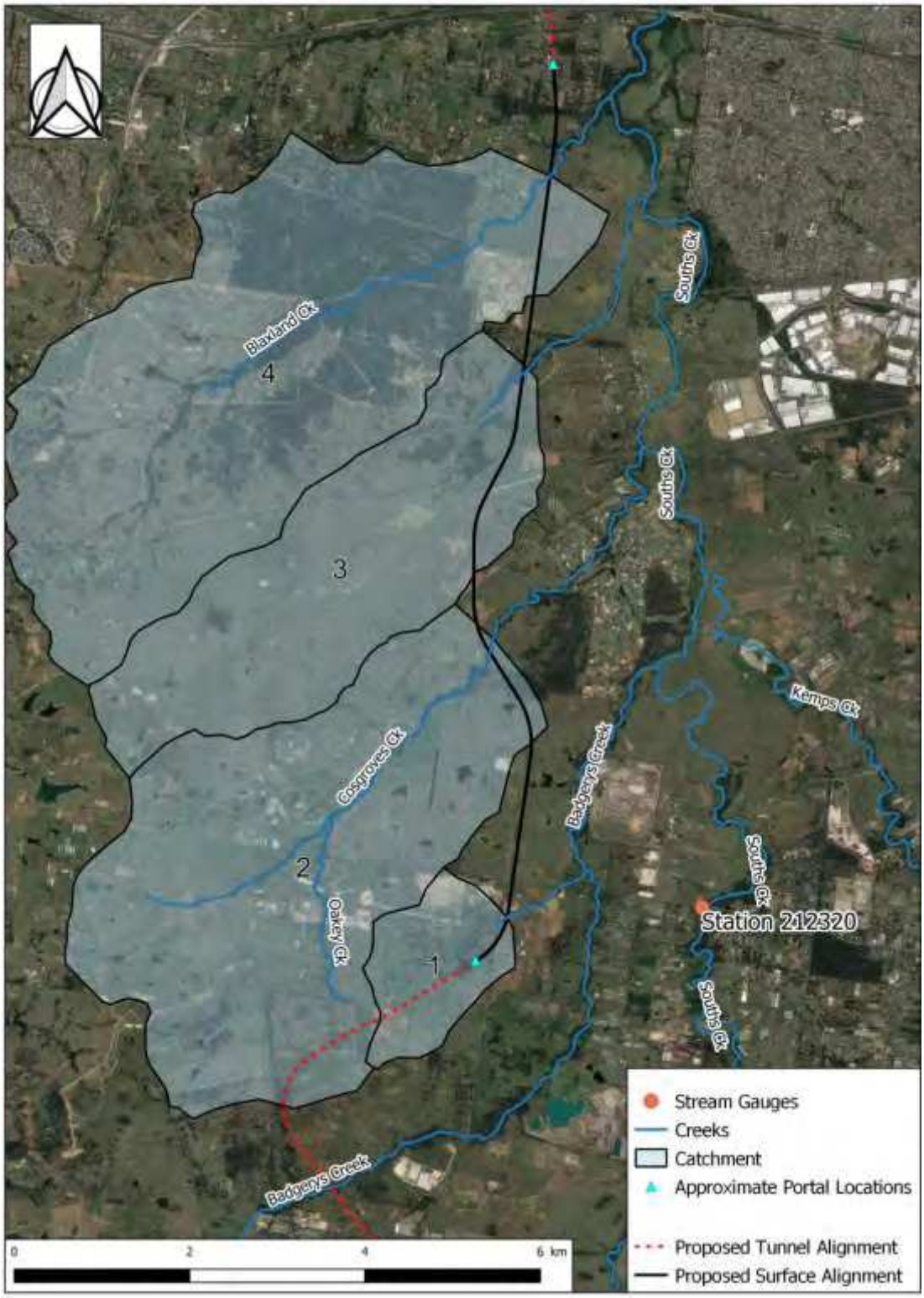

Figure 3-6: Stream gauge location in South Creek (Source: Water New South Wales).

3.6.2 Existing drainage

The proposed rail alignment and surface work areas are mostly greenfield sites and, as such, there is no existing underground drainage to consider. Where the alignment crosses an existing road there is often informal surface drainage. As a result, existing drainage is unlikely to significantly influence the management of surface water during construction.

3.7 Flooding

Flooding can impact on the ability to install and/or operate erosion and sediment controls. The Blue Book (Landcom, 2004) suggests that special erosion and sediment control measures should apply to any works below the 2-year average recurrence interval (ARI) flood level. This includes:

- Sediment controls should be placed above the 2-year ARI flood level (e.g. basins, sediment fences etc).
- Requirements to stabilise lands using temporary ground cover whenever rain is falling or imminent.
- Scheduling works for lower-risk times of year, based on historical rainfall figures.

Flood modelling has been undertaken as part of the EIS (Sydney Metro, 2020a) which indicates that around 3.5 kilometres of the Project alignment would be located on flood prone land (inundated during the Probable Maximum Flood event) in the South Creek, Blaxland Creek and Cosgroves Creek floodplains.

As basins are temporary, smaller more frequent flood flows are more relevant to construction sediment basins. Flood modelling for the EIS included the 1 in 2 year (0.5 Events per year (EY)) flood event which occurs locally at major crossings and gullies. The potential impacts at each crossing are likely to be negligible, of limited duration and localised, with minimal impacts beyond the construction footprint. No afflux impacts are expected on upstream infrastructure or properties

Based on this flooding is not anticipated to impact the design and implementation of erosion and sediment control structures, in particular sediment basin location and operation.

3.8 Groundwater

According to Sydney Metro (2020a), groundwater is not a significant factor in the Project area, and is unlikely to impact on the installation and operation of temporary erosion and sediment controls during construction. The SCAW project will be undertaken in areas where there is low likelihood of groundwater interception as identified in Chapter 15 of the EIS.

3.9 Sediment Basins

3.9.1 Sediment Basin Design

In accordance with the Blue Book Volumes 1 and 2D (Landcom, 2004 and DECC, 2008), sediment basins are required where the erosion hazard in any disturbed catchment exceeds the threshold of 150 m^3 (200 tonnes of saturated sediment) per year.

In addition to numerous other erosion and sediment controls, it is expected that numerous sediment basins will be required during construction to temporarily detain dirty onsite water generated when rainfall runs off disturbed areas.

Conceptual construction-phase sediment basins have been sized based on the following criteria (Landcom, 2004):

- Design rainfall depth: 35.0 mm (5-day, 85th percentile for Penrith)
- Basins designed for Type F/D (dispersible) sediment;
- Volumetric runoff coefficient (Cv): 0.64 (Hydrologic Group D) for all areas.

A total basin settling volume of 23,072m^3 was determined based an estimated total stripping area of 103 ha, which is considered to be a conservative estimate. The topography indicates that 14 basins would be required across the four catchments (Figure 3-5) and this has been adopted in this Assessment when determining the potential volume of discharge following each rain event.

3.9.2 Coagulants and Flocculants

Chemical coagulants and/or flocculants might be required to treat detained surface water and achieve the discharge limits determined in this Assessment and included in the EPL.

Residual coagulants and/or flocculants in discharge waters will not been included in this Assessment because it is assumed that:

- Only coagulants and/or flocculants with known low-toxicity or well-established low-risk ecotoxicity data would be used (e.g. gypsum); and
- Procedures for the use of those coagulants and/or flocculants would minimise the risk of residual active coagulant and/or flocculant being present in discharge waters (i.e. the coagulant and/or flocculant has been detained onsite because it is bonded onto the settled sediment).

3.10 Management of Detained Water

The flow chart in Figure 3-7 shows how surface water management would occur on the Project site. This demonstrates how the Project aims to avoid discharge if at all possible through:

- Beneficial re-use of detained surface water from sediment basins, sumps and excavations; or
- Land application of detained surface water onto vegetated or rehabilitation areas.

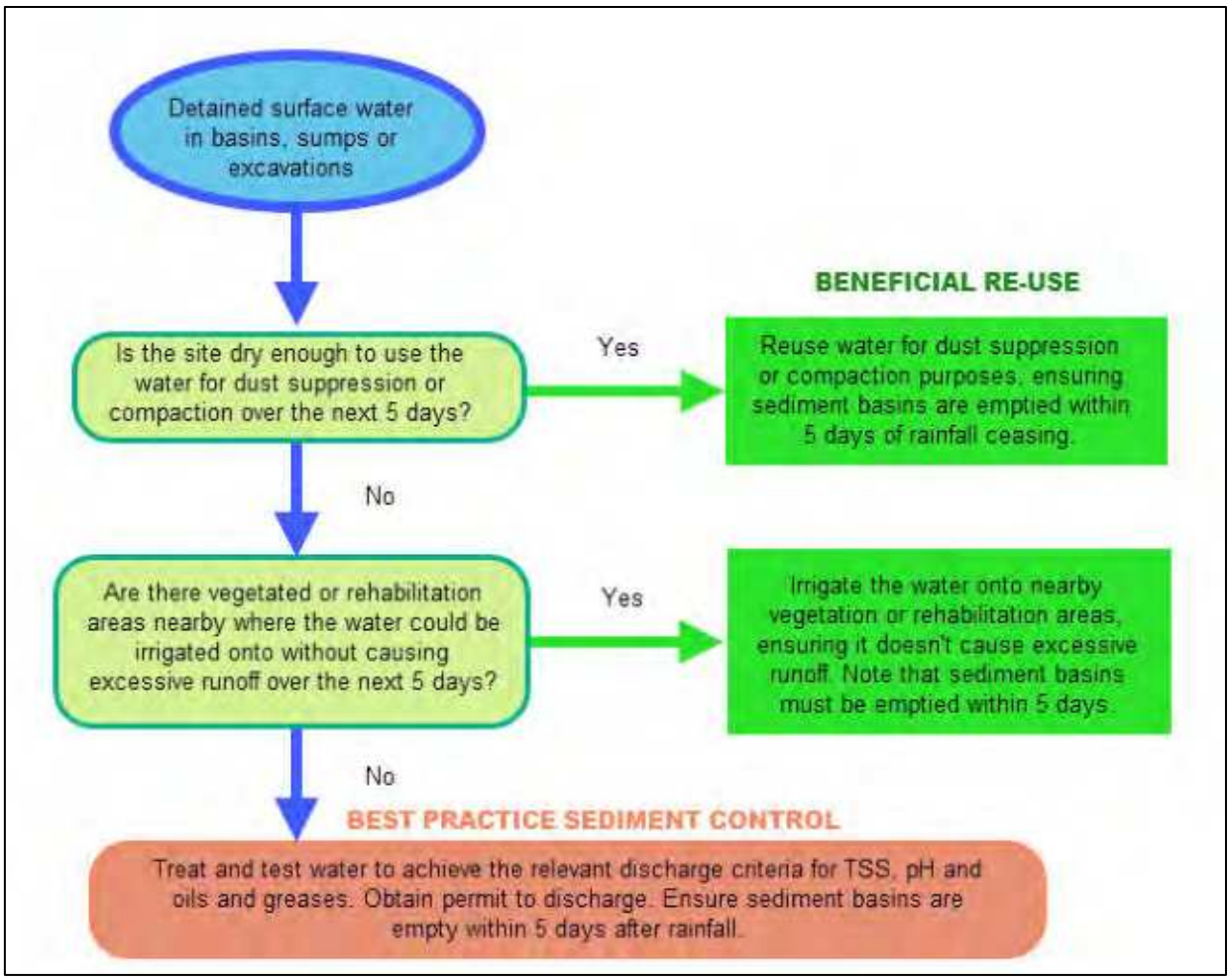

Figure 3-7: Flow chart for management of surface water on the Project.

A discharge from the Project would only occur when the above options are exhausted. This typically occurs when:

- Heavy rainfall has made the site too wet for beneficial onsite re-use such as dust suppression; and/or
- The volume of detained surface water exceeds what can be feasibly re-used onsite prior to the next rainfall event; and/or
- Heavy rainfall has made land application onto nearby vegetated or revegetation areas impossible; and/or
- There are no suitable onsite re-use options available in reasonable proximity to the detained body of surface water.

Consequently, the capture and retention of sediment on site using the best practice management principles outlined in the Blue Book (Landcom, 2004 and DECC, 2008) decreases the potential for a range of other pollutants degrading the receiving environment.

3.11 Surface Water Quality Data

Surface water quality data has been collected by Sydney Metro and their consultants as part of the project (Cardno, 2021). Additional samples have also been collected as part of the M12 Motorway Environmental Impact Statement (EIS) and as part of an ongoing water quality monitoring program. Both datasets has been used to establish a baseline for existing water quality.

The samples have been collected monthly from each site and then tested for a range of parameters including *in situ* turbidity and Total Suspended Solids (TSS), which is the primary pollutant of concern in discharges from a construction site. The sites have yielded results for most months since testing commenced in 2015, with some variance depending on rainfall and access after flood events.

The location of monitoring sites is shown in Figure 3-8.

The Turbidity levels for the sites that will receive runoff from the sediment basins are provided in Table 3-3 and Table 3-4.

Note that the monitoring sites for the M12 project were moved in April 2021.

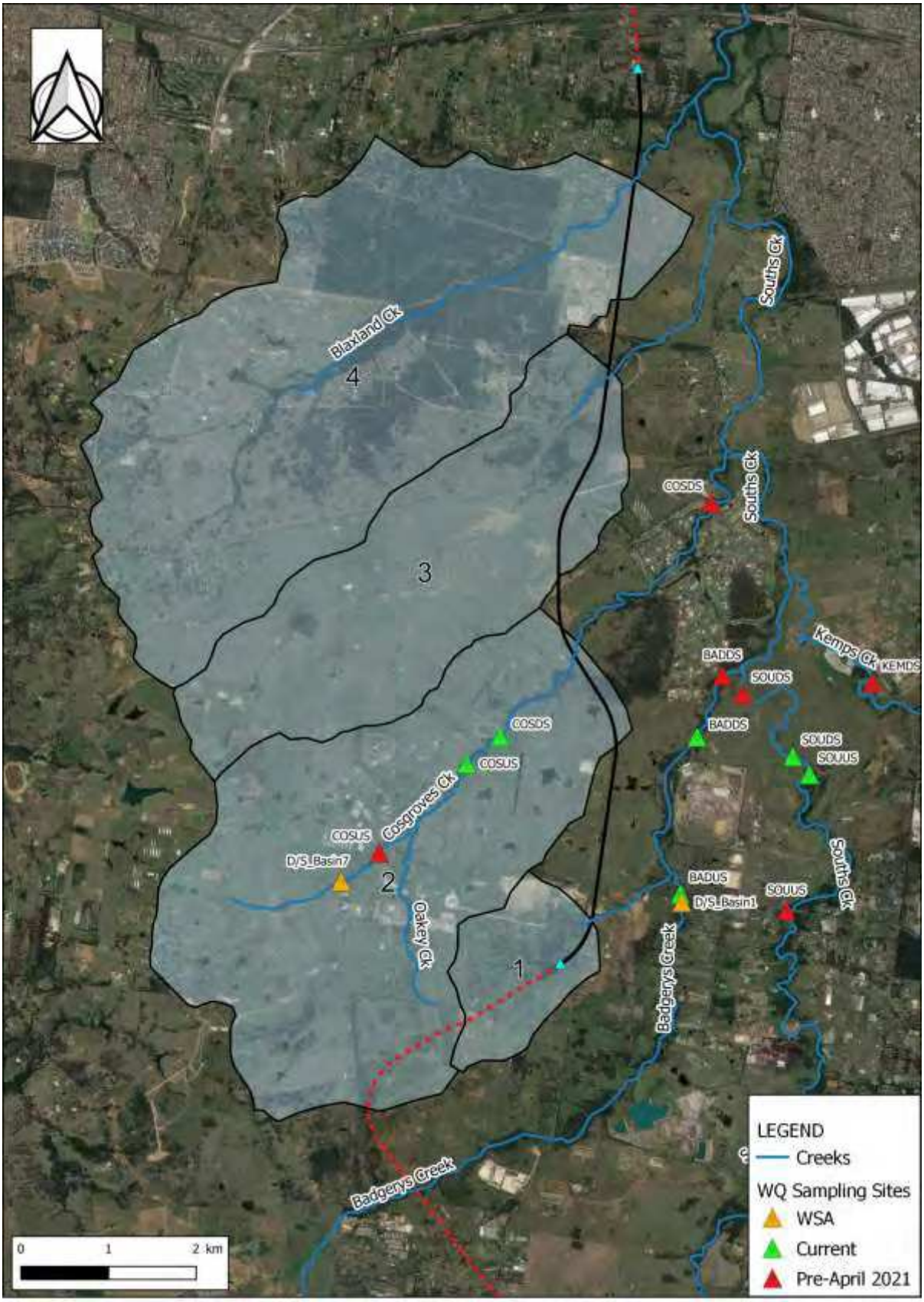

Figure 3-8: Surface water monitoring locations in proximity to the Project (Cardno 2021 and GHD, 2022).

Table 3-3 Turbidity Results for Cosgroves Creek (NTU) (GHD, 2021 and 2022)

Date	Turbidity (NTU) at Monitoring Sites				
	D/S Basin7	COSDS (Pre April 2021)	COSUS (Pre April 2021)	COSDS	COSUS
2/11/2015	39	-	-	-	-
8/12/2015	2.42	-	-	-	-
5/01/2016	20.7	-	-	-	-
4/02/2016	11.1	-	-	-	-
2/03/2016	24.8	-	-	-	-
7/04/2016	23.2	-	-	-	-
17/06/2016	68	-	-	-	-
20/06/2016	80.1	-	-	-	-
8/07/2016	17.7	-	-	-	-
5/08/2016	63.5	-	-	-	-
12/09/2016	12.6	-	-	-	-
7/10/2016	5.7	-	-	-	-
4/11/2016	8	-	-	-	-
8/02/2017	22.9	-	-	-	-
13/03/2017	20.1	-	-	-	-
10/04/2017	3.1	-	-	-	-
8/05/2017	10.2	-	-	-	-
5/06/2017	7.1	-	-	-	-
13/07/2017	7.7	-	-	-	-
8/08/2017	27.5	-	-	-	-
26/10/2018	43.8	-	-	-	-
17/12/2018	36.5	-	-	-	-
2/04/2019	19.1	-	-	-	-
9/04/2019	-	49.76	0.58	-	-
14/05/2019	-	11.09	-	-	-
11/06/2019	-	11.15	-	-	-
16/07/2019	-	4.53	17.47	-	-
20/08/2019	-	8.9	7.74	-	-
17/09/2019	-	69.46	33.23	-	-
26/09/2019	-	6.79	3.1	-	-
22/10/2019	-	5.95	0.99	-	-
5-8/11/2019	-	147.6	0.84	-	-
13/02/2020	-	91.2	162.4	-	-
20/02/2020	-	39.26	155.39	-	-
10/03/2020	-	5.25	118.47	-	-
21/04/2020	-	41.58	-	-	-
19/05/022	-	-	44.79	-	-
16/06/2020	-	8.55	14.62	-	-
14/07/2020	-	39.04	69.25	-	-
11/08/2020	-	-	-	-	-
10/09/2020	-	-	-	-	-
8/10/2020	-	-	-	-	-
27/10/2020	-	11026	162.3	-	-
12-13/11/2020	-	-	41.4	-	-
9/12/2020	-	41	26.9	-	-
12/01/2021	-	432.3	5.7	-	-
3/02/2021	-	-	-	-	-
9/02/2021	-	377.36	11.29	-	-
9-10/03/2021	-	30.86	3.1	-	-
8/04/2021	-	-	-	85.21	75.04
10/05/2021	-	-	-	125.3	135.28
10/06/2021	-	-	-	45.7	42.2
9/07/2021	-	-	-	27.1	31.58

Date	Turbidity (NTU) at Monitoring Sites				
	D/S Basin7	COSDS (Pre April 2021)	COSUS (Pre April 2021)	COSDS	COSUS
12/08/2021	-	-	-	6.6	5.46
25/08/2021	-	-	-	-	-
3/09/2021	-	-	-	23.8	25.21
13/10/2021	-	-	-	-	-
9/11/2021	-	-	-	152.38	139.78
29/11/2021	-	-	-	-	-
7/12/2021	-	-	-	63.53	51.3
14/01/2022	-	-	-	234.17	243.48
8/02/2022	-	-	-	11.35	19.23
17/03/2022	-	-	-	29.67	44.95

Turbidity levels were recorded over the same period for Badgerys Creek and are provided in Table 3-4.

Table 3-4 Turbidity Results for Badgerys Creek (NTU) (GHD, 2021 and 2022)

Date	Turbidity (NTU) at Monitoring Sites				
	D/S Basin1	BADDS (Pre April 2021)	BADUS (Pre April 2021)	BADDS	BADUS
2/11/2015	94.40	-	-	-	-
8/12/2015	4.87	-	-	-	-
5/01/2016	57.40	-	-	-	-
4/02/2016	24.30	-	-	-	-
2/03/2016	42.80	-	-	-	-
7/04/2016	19.50	-	-	-	-
5/05/2016	11.40	-	-	-	-
17/06/2016	33.40	-	-	-	-
20/06/2016	87.00	-	-	-	-
8/07/2016	23.80	-	-	-	-
5/08/2016	36.60	-	-	-	-
12/09/2016	19.30	-	-	-	-
7/10/2016	4.60	-	-	-	-
4/11/2016	12.00	-	-	-	-
12/12/2016	21.60	-	-	-	-
12/01/2017	196.20	-	-	-	-
2/02/2017	36.50	-	-	-	-
8/02/2017	509.00	-	-	-	-
13/03/2017	28.30	-	-	-	-
10/04/2017	32.00	-	-	-	-
8/05/2017	7.30	-	-	-	-
5/06/2017	8.70	-	-	-	-
13/07/2017	6.30	-	-	-	-
8/08/2017	4.20	-	-	-	-
8/09/2017	5.60	-	-	-	-
5/10/2017	2.80	-	-	-	-
6/04/2018	59.40	-	-	-	-
11/05/2018	210.00	-	-	-	-
28/06/2018	2.50	-	-	-	-
20/07/2018	6.20	-	-	-	-
17/08/2018	180.00	-	-	-	-
21/09/2018	7.59	-	-	-	-
26/10/2018	68.20	-	-	-	-

Date	Turbidity (NTU) at Monitoring Sites				
	D/S Basin1	BADDS (Pre April 2021)	BADUS (Pre April 2021)	BADDS	BADUS
26/11/2018	1418.50	-	-	-	-
17/12/2018	240.90	-	-	-	-
30/01/2019	9.90	-	-	-	-
2/04/2019	3868.30	-	-	-	-
9/04/2019	-	-	14.24	-	-
14/05/2019	-	-	17.68	-	-
11-12/06/2019	-	38.09	6.98	-	-
20/06/2019	7.7	-	-	-	-
16-17/07/2019	-	-	-	-	-
21/08/2019	-	400.09	22.06	-	-
20/09/2019	-	1819.46	1022.02	-	-
25/09/2019	-	-	18.03	-	-
25/10/2019	-	83.17	43.82	-	-
8/11/2019	-	-	167.29	-	-
13/02/2020	-	-	191.65	-	-
19-21/02/2020	-	44.01	13.83	-	-
10-12/03/2020	-	-	15.8	-	-
21-22/04/2020	-	14.77	7.8	-	-
19-20/05/022	-	13.78	5.92	-	-
16/06/2020	-	-	3.91	-	-
14-16/07/2020	-	-	5.43	-	-
11/08/2020	-	-	-	-	-
10/09/2020	-	-	-	-	-
8/10/2020	-	-	-	-	-
27/10/2020	-	-	11.94	-	-
12-13/11/2020	-	-	-	-	-
7-9/12/2020	-	16.6	15.4	-	-
12/01/2021	-	7.8	5	-	-
3/02/2021	-	-	-	-	-
9/02/2021	-	24.32	65.43	-	-
9-10/03/2021	-	11.5	9.3	-	-
7-8/04/2021	-	-	-	48.55	21.33
10/05/2021	-	-	-	-	90.1
10/06/2021	-	-	-	7.7	13.5
9/07/2021	-	-	-	25.3	9.49
12-13/08/2021	-	-	-	17.95	6.96
25/08/2021	-	-	-	-	-
3/09/2021	-	-	-	16.8	28.9
13/10/2021	-	-	-	-	-
9/11/2021	-	-	-	13.25	12.22
29/11/2021	-	-	-	-	-
7/12/2021	-	-	-	102.2	65.6
14/01/2022	-	-	-	294.31	322
8/02/2022	-	-	-	-	24.15
17/03/2022	-	-	-	-	7.72

3.12 Environmental Values and Water Quality Objectives

Environmental values are those values or uses of water that are desired by the community to be protected. These include, but are not limited to, protection of aquatic ecosystems, drinking water, primary and secondary recreation, visual amenity, and agricultural water for irrigation, livestock and growing aquatic foods.

The National Water Quality Management Strategy (NWQMS) including the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000 and ANZG, 2018) provides guidance on water quality planning and management. It highlights the need to adopt locally established community values where provided by the relevant authorities. In NSW, interim water quality objectives have been established in consultation with the community. They help decision makers consider water quality in both big picture strategic planning such as State Strategic Plans and Regional Strategies and at the local level when assessing impacts of development.

Environmental values for each catchment in NSW are provided by the NSW Department of Planning, Industry and Environment (Environment, Energy and Science) (available at: https://www.environment.nsw.gov.au/ieo/).

The EIS for the Project (Sydney Metro, 2020a) states that the existing catchment and watercourse health south of the M4 Western Motorway is degraded but adequate for existing land uses where available water is used for grazing and cropping activities. The Project lies largely within the lower Hawkesbury-Nepean Catchment within the regions classified as 'mixed-use rural' and 'predominantly urban'. The nominated environmental values applying to waterways within the study area are:

- Protection of the aquatic ecosystem;
- Visual amenity
- Primary contact recreation
- Secondary contact recreation
- Irrigation water supply
- Homestead water supply.

The indicators of water quality are selected for the relevant pressures identified for the waterway system, their associated stressors and anticipated ecosystem receptors. The selected indicators for the environmental values listed above include typical physical and chemical indicators such as turbidity, total phosphorus and total nitrogen that can compromise waterway health.

As noted in Section 2.2, this Assessment will only consider turbidity (and suspended sediment). As such, the relevant indicators are:

- Aquatic ecosystems: 6-50 Nephelometric Turbidity Units (NTU).
- Homestead water supply: 5 NTU; <1 NTU desirable for effective disinfection; > 1 NTU may shield some micro-organisms from disinfection.
- Primary contact recreation: A 200 mm diameter black disc should be able to be sighted horizontally from a distance of more than 1.6 m (approximately 6 NTU).

Homestead water supply is no longer relevant in these catchments as reticulated supply is available. Similarly, primary contact recreation is no longer relevant in these catchments due to watercourse degradation associated with urbanisation.

The Water Quality Objectives (WQO's) applied are as per ANZECC Water Quality guidelines, being the default trigger values for lowland rivers in South-east Australia. The relevant WQO for turbidity is 6-50 NTU, of which the upper limit has been adopted given the degraded condition of the local waterways.

The EIS (Sydney Metro, 2020a) indicates that the existing water quality is considered poor in South Creek, Blaxland Creek, Badgerys Creek and Cosgroves Creek and generally does not meet Australian and New Zealand Environment and Conservation Council (ANZECC) guidelines due to high nutrient and low dissolved oxygen concentrations.

DPI (2013) provides guidance on how to conserve and manage fish habitat that includes avoiding impacts on water quality and fish passage. Recommendations include the adoption of The Blue Book – Managing Urban Stormwater: Soils and Construction (Landcom 2004) for construction-phase erosion and sediment controls.

3.13 Construction-Phase De-watering and Discharge

The Blue Book (Landcom, 2004) suggests that water discharged from construction sites should not contain more than 50mg/L of suspended sediment. However this Construction Discharge Impact Assessment determines if the typical Blue Book recommendation of 50mg/L for discharges is consistent with the WQOs for this location.

Based on the conceptual basin design, the Project would have 14 construction-phase sediment basins as described in Table 3-5 below, all ultimately discharging to South Creek via local waterways.

Table 3-5 Basins discharging to local waterways, including calculated estimates of detained water volume

Catchment	Waterway	No of Basins	Total Sediment Basin settling water Volume (m^3)
1	Tributary of Badgerys Creek	2	1,420
2	Cosgroves Creek	3	6,048
3	Tributary of South Creek	5	6,608
4	Blaxland Creek	4	8,996
Total		**14**	**23,072**

For the purposes of this Assessment, the full settling zone volume of all sediment basins has been adopted to determine the overall volume of water to be discharged following each rainfall event.

De-watering has been assumed to occur within five days of the cessation of a rainfall event using a nominal pump rate over a 24-72 hour period (adopted flow rate of at least 5L/s per basin). Typically, de-watering occurs after chemical treatment of the water, when the rain has ceased and flows in the receiving watercourse have dropped or are rapidly dropping.

The flow rate of water discharged to each watercourse is expected to vary based on the number and volume of basins in that catchment. The flow rate from sediment basin discharge would peak early when all basins are being discharged and then taper off as the smaller basins are emptied and only the larger basins remain in a state of discharge. The expected maximum and average discharge flow rates into each waterway are provided in Table 3-6.

Table 3-6 Basins discharge rates to waterways

Catchment	Waterway	Maximum Discharge Rate (L/s)	Average Discharge Rate (L/s)
1	Tributary of Badgerys Creek	10.0	9.63
2	Cosgroves Creek	15.0	11.75
3	Tributary of South Creek	80.0	34.2
4	Blaxland Creek	27.1	23.17

The expected discharge rates are shown graphically in Figure 3-9. It has been conservatively assumed that all basins will start to discharge at the same time, approximately two days after the cessation of a rainfall event. In reality it is unlikely that all basins will discharge at the same time, and this assessment represents a worse case scenario.

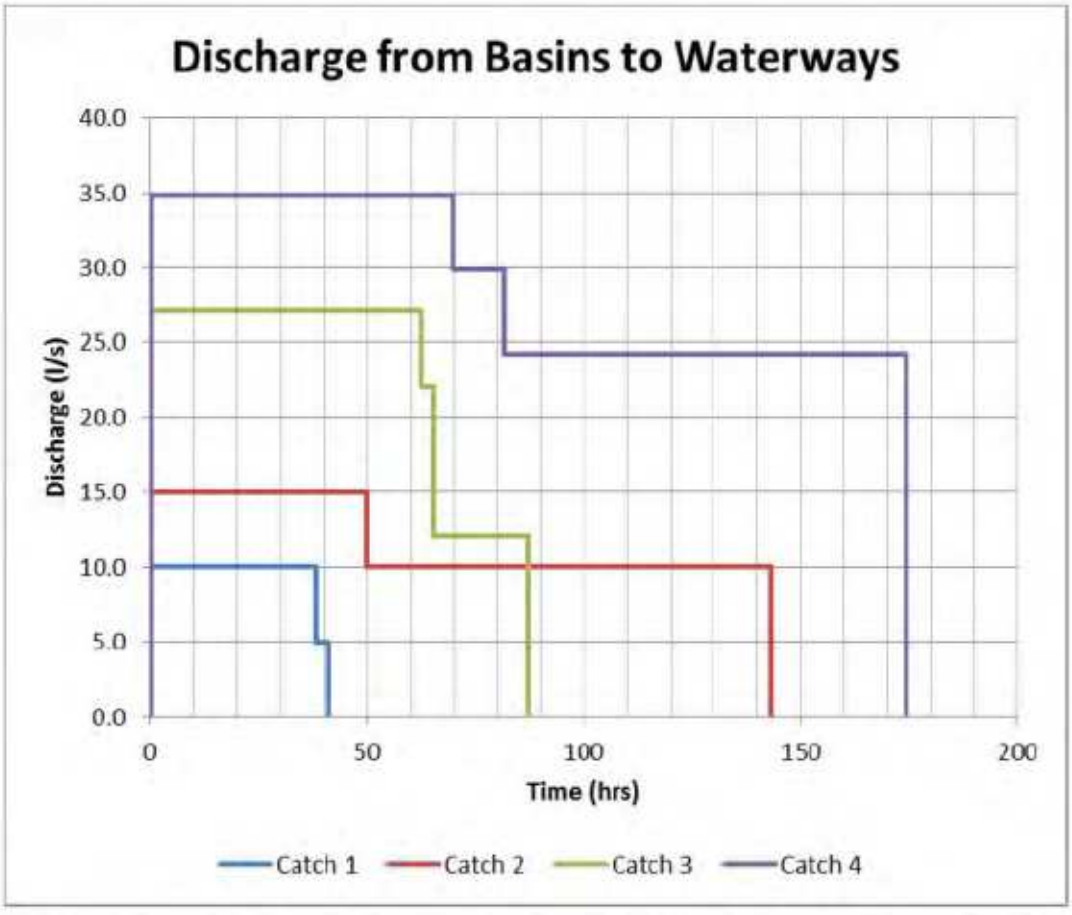

Figure 3-9: Expected discharge rates to waterways starting approximately two days following the cessation of a rainfall event.

4 DISCHARGE IMPACT ASSESSMENT

4.1 Desktop Calculation Method

A desktop based assessment method was adopted for this study to estimate the mixed turbidity of discharged treated stormwater and the background receiving water. The TfNSW Draft Guideline (TfNSW, 2020a) states that the desktop method is appropriate for calculating diluted turbidity when the waterway is flowing as a channel, stream or river and the decant will mix with the entire width and depth of the receiving waterway. The waterways potentially impacted by the Project are no greater than 5-10m wide and are relatively shallow, indicating that mixing will occur across the entire width and depth. Therefore, the mixed turbidity can be estimated using the following formula:

$$\mathrm{C\ mixed} = \frac{\mathrm{Q\ waterway\ .\ C\ background} + \mathrm{Q\ decant\ .\ C\ decant}}{\mathrm{Q\ waterway} + \mathrm{Q\ decant}}$$

Where:

C mixed = The mixed turbidity
C background = The background turbidity of the waterway
C decant = The turbidity of the decant water
Q waterway = The flowrate in the waterway (m^3/s)
Q decant = The discharge rate of the decant (m^3/s).

The proposed method will conservatively assume that all sediment basins within each catchment are "lumped" and discharge their combined flow rate at a single mixing zone at the same waterway location. Rather than adopt a single background water flow and concentration to assess the impact of the discharges, potential impacts have been estimated for as many days as possible (based on available recorded water quality samples and estimated waterway flow rates) to observe the expected range of mixed waterway concentrations.

4.2 Background Waterway Turbidity

Background waterway turbidity has been measured at various sites including Badgerys Creek, South Creek and Cosgroves Creek as part of the project and the nearby M12 Motorway upgrade Project as shown in Figure 3-8. Turbidity values vary throughout the waterway as shown in Figure 4-1, Figure 4-2 and Figure 4-3.

The data indicate that the locations downstream generally have a higher turbidity than what is experienced upstream.

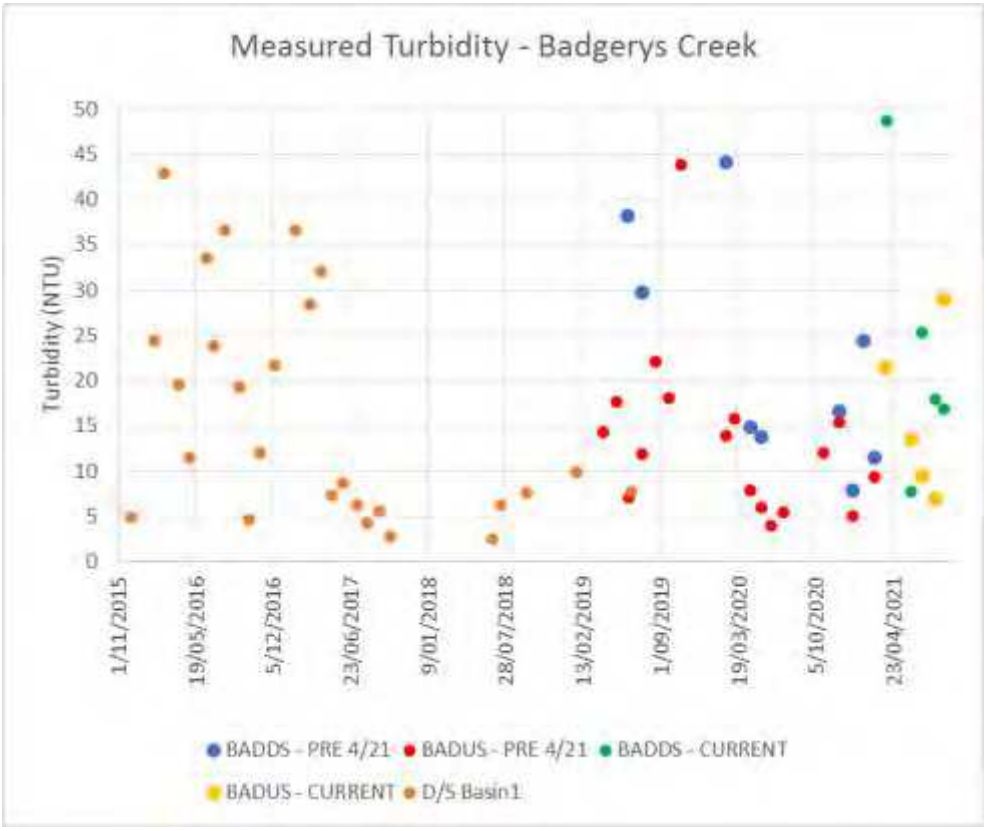

Figure 4-1: Turbidity values in Badgerys Creek. Note that values greater than 50 NTU are not shown (Cardno, 2021, GHD 2021, 2022).

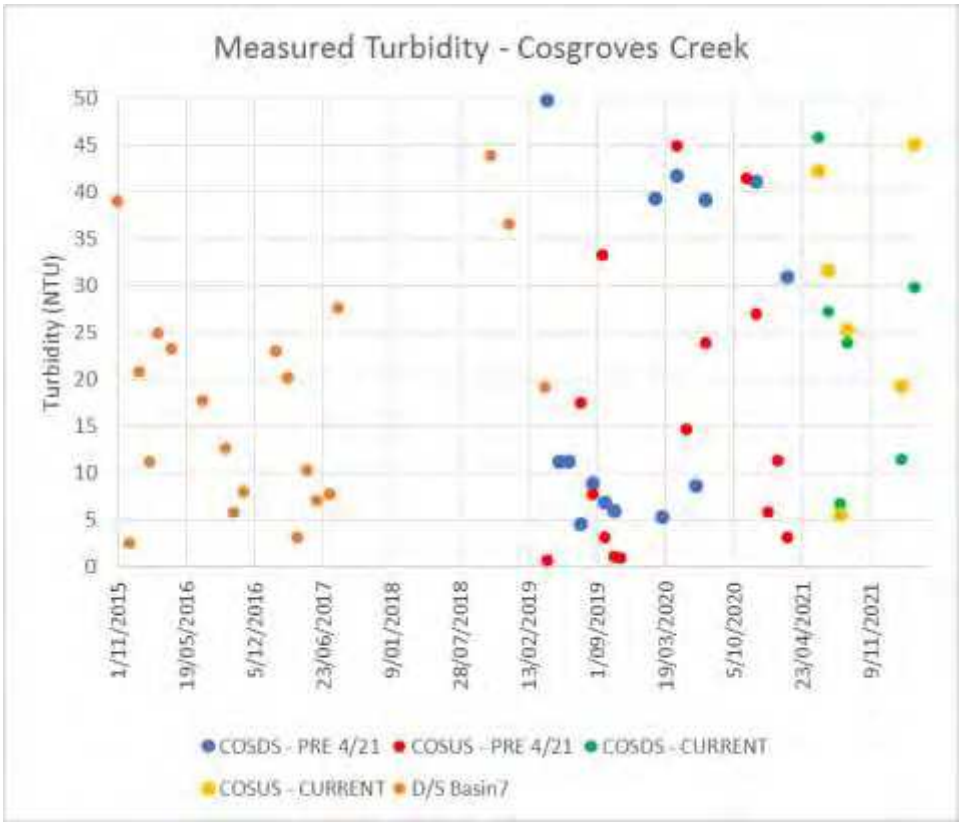

Figure 4-2: Turbidity values in Cosgroves Creek. Note that values greater than 50 NTU are not shown (Cardno, 2021, 2021, 2022).

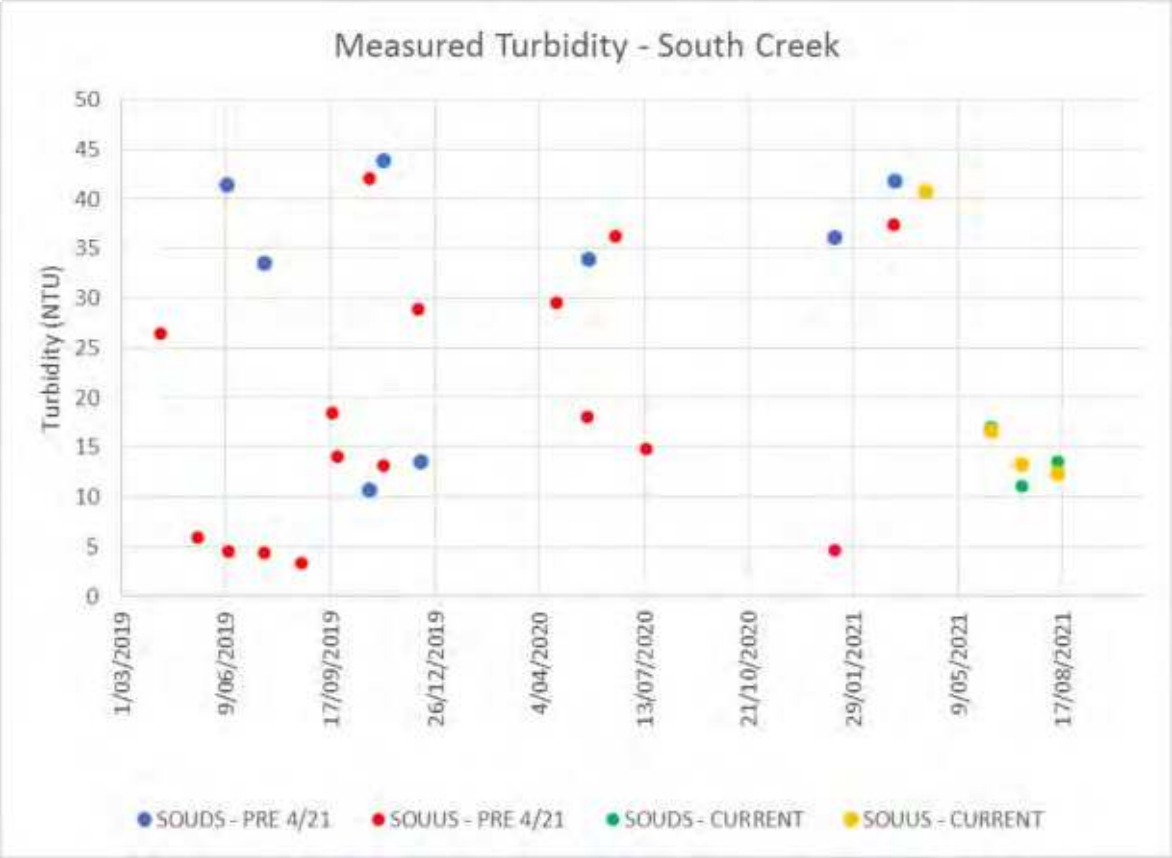

Figure 4-3: Turbidity values in South Creek. Note values greater than 50 NTU are not shown (GHD 2021, 2022).

4.3 Background Waterway Flow

There are no streamflow gauges within any of the waterways that basins will be discharging into. South Creek has a streamflow gauge at Elizabeth Drive which is the closest gauge to the project site. To determine flows at the Project site, an Australian Water Balance Model (AWBM) has been developed through the Rainfall Runoff Library and calibrated to the recorded gauge flows at Elizabeth Drive. A schematic of the AWBM model is provided in Figure 4-4.

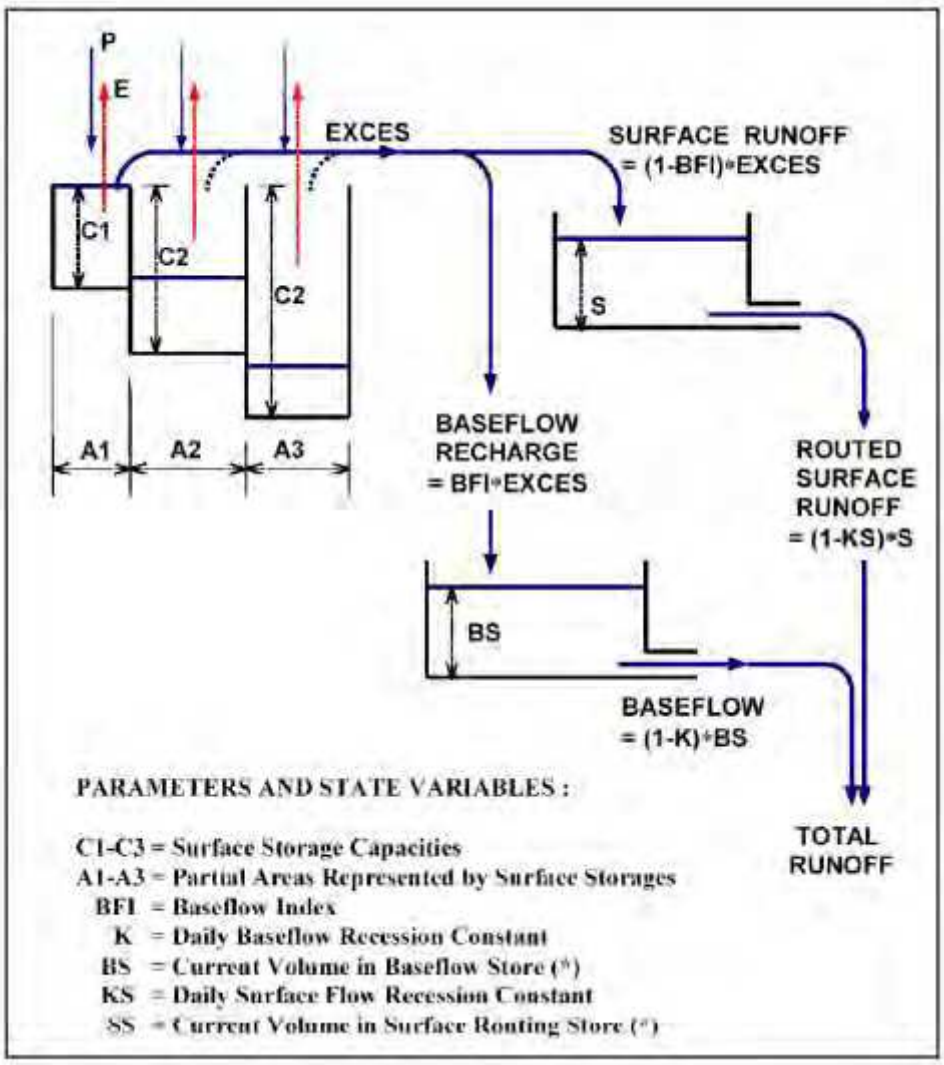

Figure 4-4: AWBM modeling schematic (Source: CRCCH, 2004)

The Elizabeth Drive gauge data was used for the calibration as it is the closest available site and has streamflow records dating back to September 1970. The data was input into the AWBM model with rainfall data obtained for the same period from the SILO (Scientific Information for Land Owners) database at the nearest station location (using closest available rainfall including Badgerys Creek AWS, Station 067108 and Badgerys Creek, Station 067068). Areal actual evapotranspiration data has also been obtained from the same dataset.

The model was run and auto calibrated to determine key runoff parameters to generate a simulated runoff time series as close as possible to the recorded data. The model provided a reasonable calibration with a Nash-Sutcliffe Criterion for calibration of 0.549 and a correlation of 0.743. A plot of the observed and simulated runoff is shown in Figure 4-5.

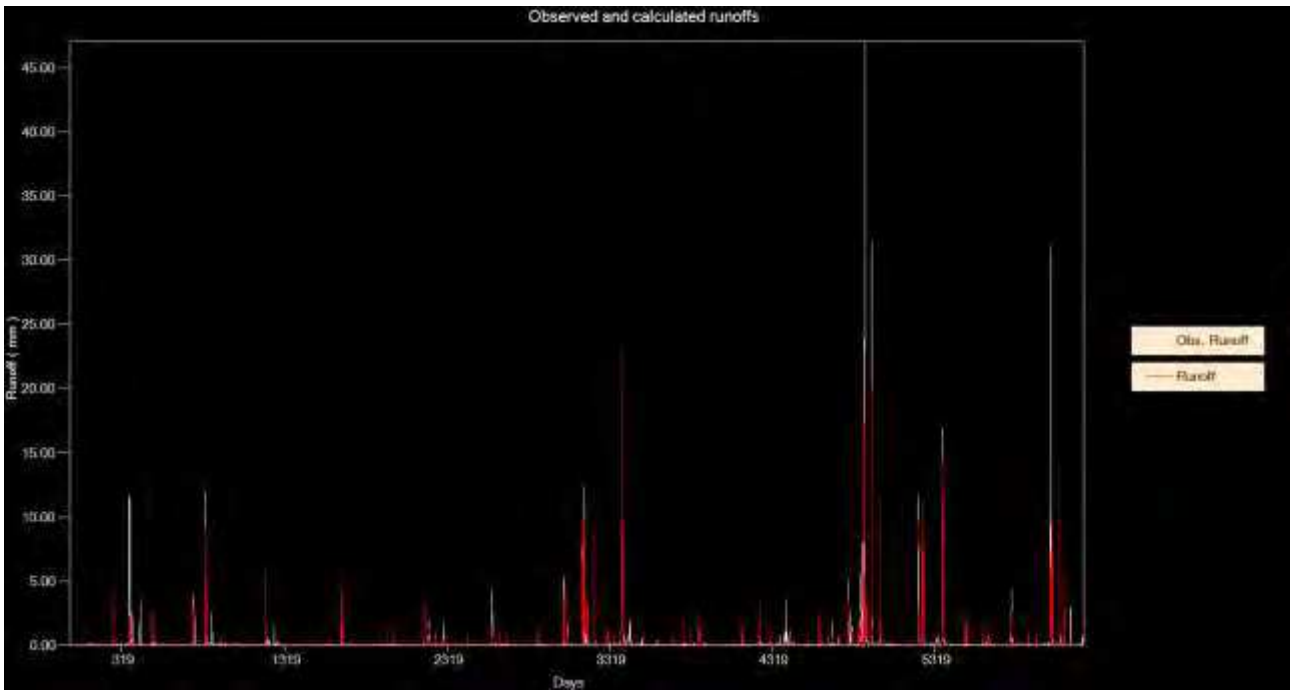

Figure 4-5: AWBM Calibration plot of observed and simulated runoff at South Creek – Elisabeth Drive.

The model appears to slightly underestimate flows as shown in the flow duration curve in Figure 4-6. This plot is a graphical representation of a ranking of all the flows, from the lowest to the highest, where the rank is the percentage of time the flow value is equalled or exceeded.

Figure 4-6 shows that the simulated flows with a frequency of around 0.005 (0.5% of the adopted time period) and 0.6 (around 60% of the time) match well and all other flows are slightly underestimated. As this assessment is primarily concerned with discharges after frequent rainfall events during lower and middle flow periods, the calibration is considered satisfactory.

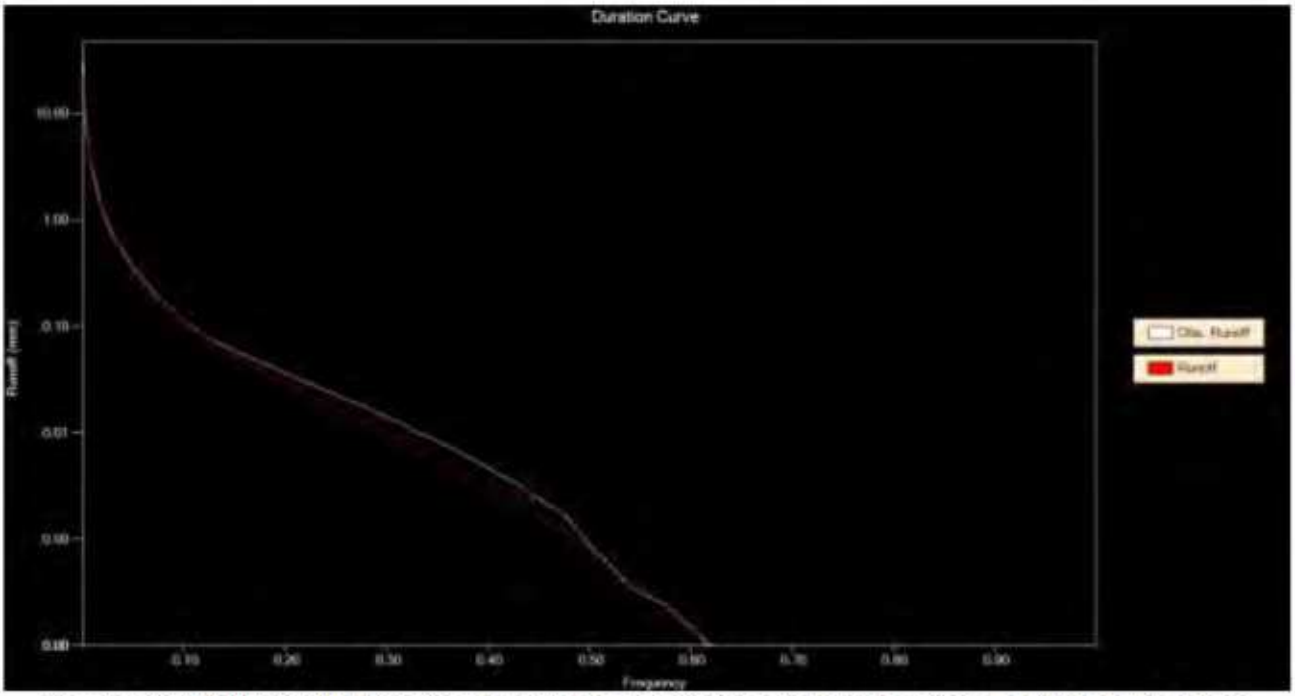

Figure 4-6: AWBM Calibration flow duration curve of observed vs simulated runoff at South Creek.

The adopted AWBM model parameters are listed below in Table 4-1.

Table 4-1: Calibrated AWBM parameters

AWBM Parameter	Adopted Value
A1	0.134
A2	0.433
Base Flow Index (BFI)	0.26
C1	43.5
C2	181.2
C3	479.7
KBase	0.895
KSurf	0.134

The values in Table 4-1 were applied to four individual catchment areas at the locations along the various waterways, as outlined in Table 4-2.

Table 4-2: Catchment locations and sizing where discharges will occur.

ID	Waterway	Location	Catchment [km^2]
1	Tributary of Badgerys Creek	Downstream of Badgerys Creek Road	2.22
2	Cosgroves Creek	Approximately 2.4km upstream of Twin Creeks Drive	17.18
3	Tributary of South Creek	Upstream of Patons Lane	10.70
4	Blaxland Creek	Approximately 1.3km upstream from South Creek junction	20.89

Streamflow was simulated for the period 2019-2022 to match with the observed water quality data from the respective water quality monitoring sites i.e. COSUS, COSDS and BADUS. Rainfall from Badgerys Creek AWS Station was adopted for Catchments 1-3 and Orchard Hills Station for Catchment 4 (Figure 3-5). These catchment areas were adopted for the analysis as they represent the locations where treated water from construction basins is expected to be discharged.

The simulated streamflow for Catchment 1 (tributary of Badgerys Creek) is shown in Figure 4-7. Note that the peak flows of 153.55 ML/day and 226.61 ML/day occurred on 3/3/2022 and 10/2/2020 respectively (not plotted to allow the smaller flows to be viewed more easily).

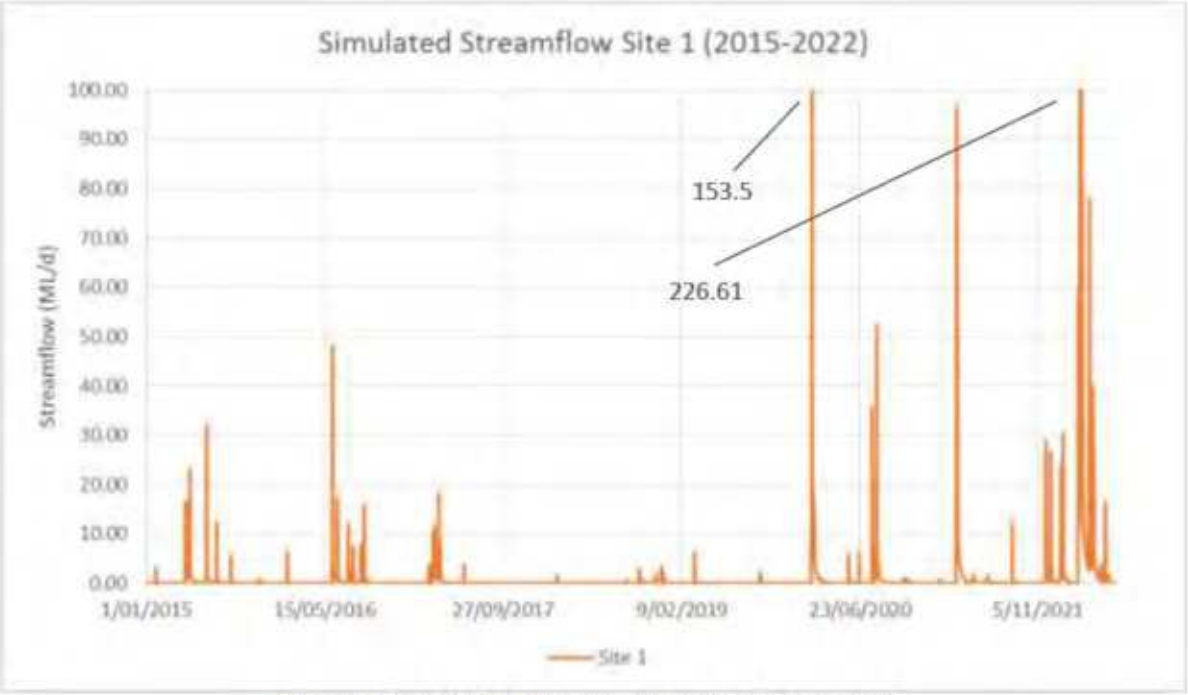

Figure 4-7: AWBM simulated flow in Catchment 1.

The simulated streamflow for Catchment 2, 3 and 4 are provided as Figure 4-8, Figure 4-9 and Figure 4-10 respectively.

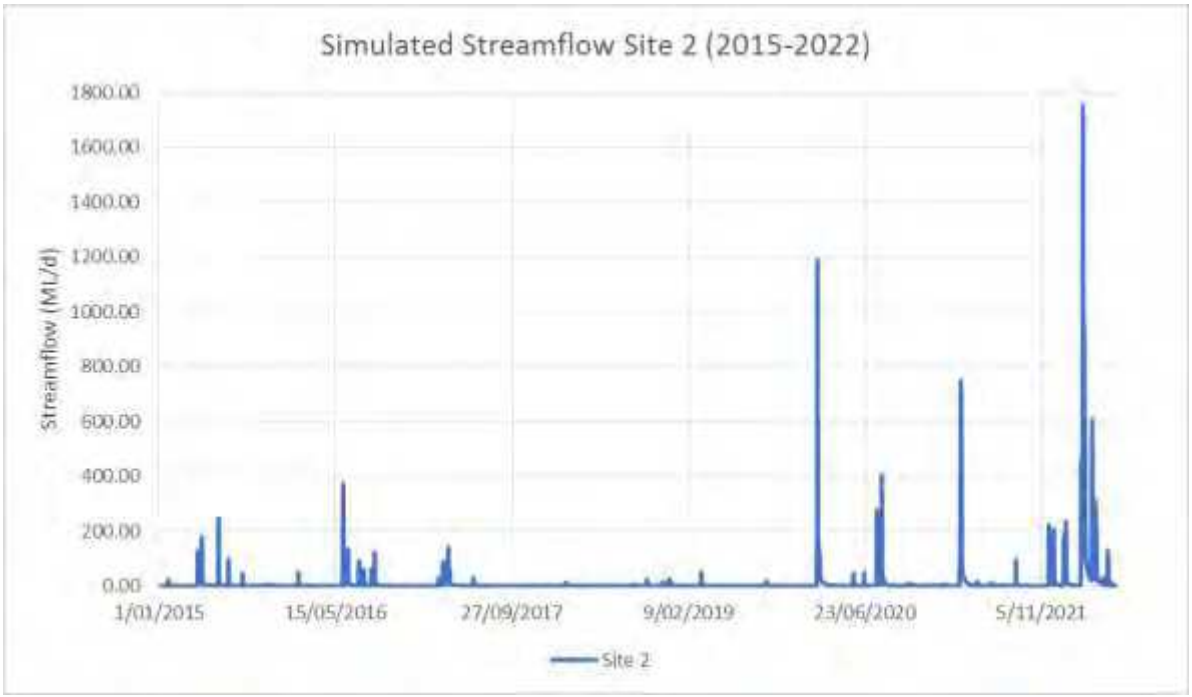

Figure 4-8: AWBM simulated flow in Catchment 2.

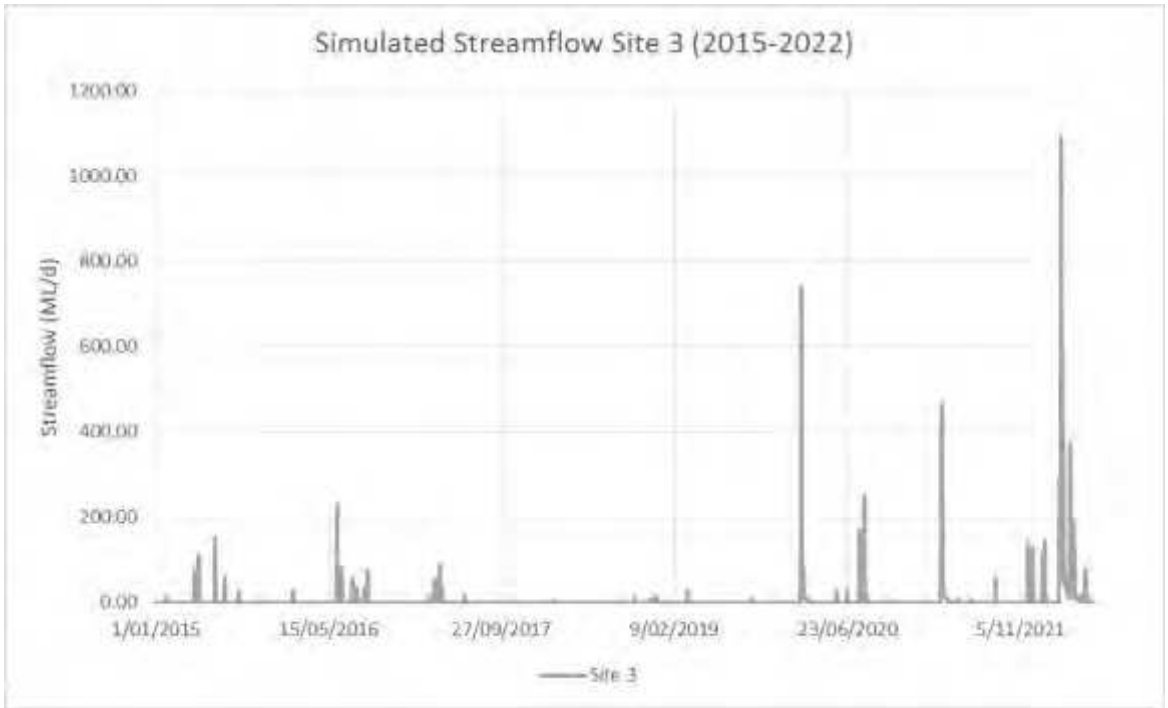

Figure 4-9: AWBM simulated flow in Catchment 3.

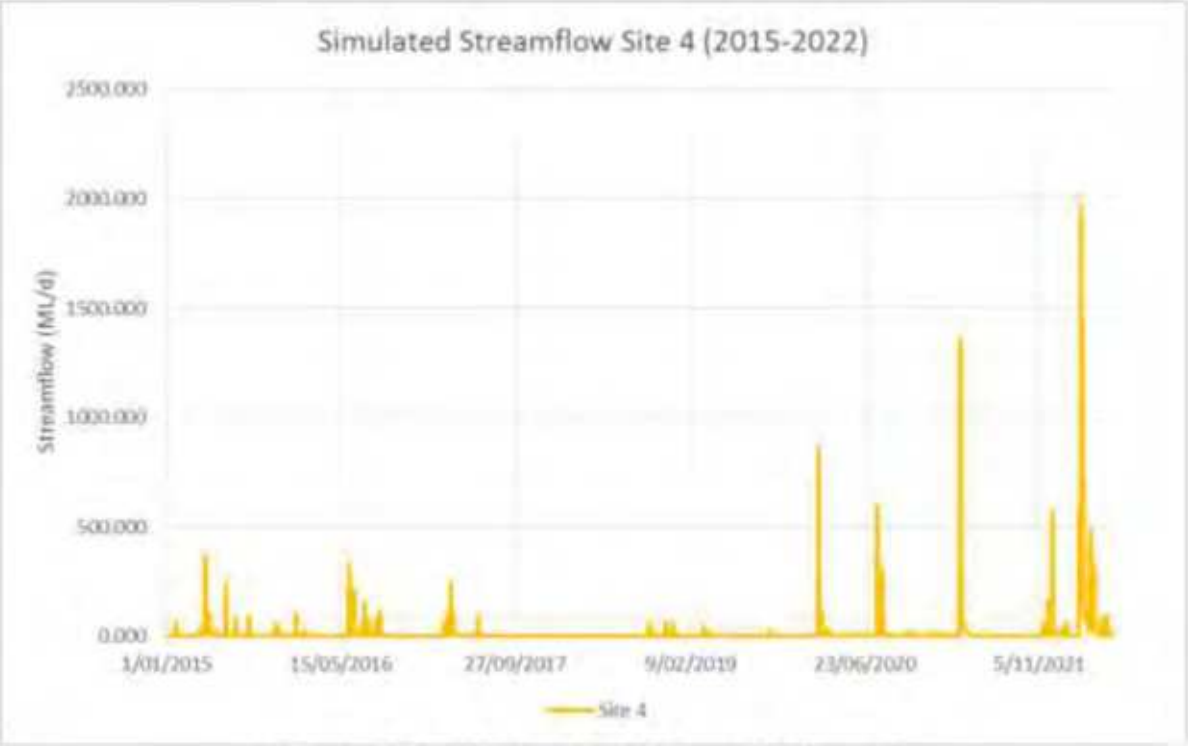

Figure 4-10: AWBM simulated flow in Catchment 4.

4.4 Discharge Limits

The formula described in Section 4.1 was used to determine the resultant mixed turbidity in receiving waters using the nominated discharge turbidity from the sediment basins. Background turbidity data were input into the model and integrated with the modeled flow data to estimate a mixed concentration in the waterway using the nominated discharge turbidity from the sediment basins. The estimated mixed concentration in the waterway was then compared against the relevant WQOs. Where the mixed concentration is higher than the WQO, the nominated discharge turbidity was lowered until the WQO was achieved.

Table 4-3 shows the values calculated for Catchment 1 (tributary of Badgerys Creek). A discharge turbidity of 59 NTU from the sediment basins provides an average mixed turbidity in the waterway of 49.52 NTU. The maximum mixed turbidity (using the short term maximum flow of 10L/s) results in an average turbidity of 49.63 NTU. Values greater than 50 NTU have been excluded in the calculation of average and maximum turbidity as they are above the Water Quality Objective.

Table 4-3: Estimated turbidity in the Tributary of Badgerys Creek (Catchment 1)

Date	Simulated Q (m3/s)	Observed Turbidity (NTU)	Discharged Turbidity (NTU)	Max Discharge Q (m3/s)	Avg Discharge Q (m3/s)	Max Mixed Turbidity (NTU)	Avg. Mixed Turbidity (NTU)
8/12/2015	0.0038	4.87	59	0.01	0.00963	**44.10**	**43.69**
4/02/2016	0.1679	24.3	59	0.01	0.00963	**26.25**	**26.18**
2/03/2016	0.0082	42.8	59	0.01	0.00963	**51.68**	**51.53**
7/04/2016	0.0002	19.5	59	0.01	0.00963	**58.41**	**58.39**

Date	Simulated Q (m3/s)	Observed Turbidity (NTU)	Discharged Turbidity (NTU)	Max Discharge Q (m3/s)	Avg Discharge Q (m3/s)	Max Mixed Turbidity (NTU)	Avg. Mixed Turbidity (NTU)
5/05/2016	0.0000	11.4	59	0.01	0.00963	**58.97**	**58.97**
17/06/2016	0.6965	33.4	59	0.01	0.00963	**33.76**	**33.75**
8/07/2016	0.1611	23.8	59	0.01	0.00963	**25.86**	**25.79**
5/08/2016	2.2108	36.6	59	0.01	0.00963	**36.70**	**36.70**
12/09/2016	0.2882	19.3	59	0.01	0.00963	**20.63**	**20.58**
7/10/2016	0.0179	4.6	59	0.01	0.00963	**24.10**	**23.63**
4/11/2016	0.0008	12	59	0.01	0.00963	**55.53**	**55.41**
12/12/2016	0.0000	21.6	59	0.01	0.00963	**58.96**	**58.95**
2/02/2017	0.0000	36.5	59	0.01	0.00963	**59.00**	**59.00**
13/03/2017	0.0716	28.3	59	0.01	0.00963	**32.06**	**31.94**
10/04/2017	0.5672	32	59	0.01	0.00963	**32.47**	**32.45**
8/05/2017	0.0252	7.3	59	0.01	0.00963	**21.97**	**21.58**
5/06/2017	0.0011	8.7	59	0.01	0.00963	**53.92**	**53.75**
13/07/2017	0.0040	6.3	59	0.01	0.00963	**43.82**	**43.41**
8/08/2017	0.0002	4.2	59	0.01	0.00963	**57.79**	**57.75**
8/09/2017	0.0000	5.6	59	0.01	0.00963	**58.96**	**58.96**
5/10/2017	0.0000	2.8	59	0.01	0.00963	**59.00**	**59.00**
28/06/2018	0.0000	2.5	59	0.01	0.00963	**59.00**	**59.00**
20/07/2018	0.0006	6.2	59	0.01	0.00963	**56.24**	**56.14**
21/09/2018	0.0071	7.59	59	0.01	0.00963	**37.66**	**37.19**
30/01/2019	0.0022	9.9	59	0.01	0.00963	**50.29**	**50.01**
9/04/2019	0.0003	14.24	59	0.01	0.00963	**57.57**	**57.51**
14/05/2019	0.0000	17.68	59	0.01	0.00963	**58.97**	**58.97**
12/06/2019	0.0000	6.98	59	0.01	0.00963	**59.00**	**59.00**
20/06/2019	0.0000	7.7	59	0.01	0.00963	**58.95**	**58.95**
17/07/2019	0.0000	11.82	59	0.01	0.00963	**59.00**	**59.00**
21/08/2019	0.0000	22.06	59	0.01	0.00963	**59.00**	**59.00**
25/09/2019	0.0010	18.03	59	0.01	0.00963	**55.40**	**55.27**
25/10/2019	0.0000	43.82	59	0.01	0.00963	**58.95**	**58.95**
21/02/2020	0.0306	13.83	59	0.01	0.00963	**24.95**	**24.63**
12/03/2020	0.0034	15.8	59	0.01	0.00963	**47.99**	**47.68**
21/04/2020	0.0000	7.8	59	0.01	0.00963	**58.76**	**58.75**
19/05/2020	0.0000	5.92	59	0.01	0.00963	**58.99**	**58.99**
16/06/2020	0.0002	3.91	59	0.01	0.00963	**57.84**	**57.80**
16/07/2020	0.0002	5.43	59	0.01	0.00963	**58.00**	**57.96**
27/10/2020	0.0019	11.94	59	0.01	0.00963	**51.32**	**51.08**
7/12/2020	0.0000	15.4	59	0.01	0.00963	**58.91**	**58.91**
12/01/2021	0.0000	5	59	0.01	0.00963	**58.77**	**58.76**
9/03/2021	0.0000	9.3	59	0.01	0.00963	**58.96**	**58.95**
7/04/2021	0.0200	21.33	59	0.01	0.00963	**33.90**	**33.59**
10/06/2021	0.0000	13.5	59	0.01	0.00963	**58.79**	**58.78**
9/07/2021	0.0002	9.49	59	0.01	0.00963	**58.27**	**58.24**
12/08/2021	0.0000	6.96	59	0.01	0.00963	**58.96**	**58.96**
3/09/2021	0.0021	28.9	59	0.01	0.00963	**53.70**	**53.53**
Average		**15.19**				**49.63**	**49.52**

The same procedure was followed for discharges from the other three catchments. Table 4-4 shows the values calculated for Catchment 2 (Cosgroves Creek). A discharge turbidity of 73 NTU from the sediment basins provides an average mixed turbidity in the waterway of 48.52 NTU. The maximum mixed turbidity (using the short term maximum flow of 15L/s) results in an average turbidity of 49.58 NTU.

Table 4-4: Estimated turbidity in Cosgroves Creek (Catchment 2)

Date	Simulated Q (m3/s)	Observed Turbidity (NTU)	Discharged Turbidity (NTU)	Max Discharge Q (m3/s)	Avg Discharge Q (m3/s)	Max Mixed Turbidity (NTU)	Avg. Mixed Turbidity (NTU)
2/11/2015	0.0010	39	73	0.015	0.01175	70.84	70.29
8/12/2015	0.0294	2.42	73	0.015	0.01175	26.27	22.58
5/01/2016	0.0013	20.7	73	0.015	0.01175	68.81	67.76
4/02/2016	1.2991	11.1	73	0.015	0.01175	11.81	11.65
2/03/2016	0.0638	24.8	73	0.015	0.01175	33.97	32.29
7/04/2016	0.0012	23.2	73	0.015	0.01175	69.40	68.50
8/07/2016	1.2464	17.7	73	0.015	0.01175	18.36	18.22
12/09/2016	2.2305	12.6	73	0.015	0.01175	13.00	12.92
7/10/2016	0.1385	5.7	73	0.015	0.01175	12.28	10.96
4/11/2016	0.0062	8	73	0.015	0.01175	54.07	50.63
8/02/2017	0.0000	22.9	73	0.015	0.01175	73.00	73.00
13/03/2017	0.5545	20.1	73	0.015	0.01175	21.49	21.20
10/04/2017	4.3894	3.1	73	0.015	0.01175	3.34	3.29
8/05/2017	0.1953	10.2	73	0.015	0.01175	14.68	13.76
5/06/2017	0.0087	7.1	73	0.015	0.01175	48.83	44.98
13/07/2017	0.0313	7.7	73	0.015	0.01175	28.85	25.52
8/08/2017	0.0017	27.5	73	0.015	0.01175	68.27	67.13
26/10/2018	0.6981	43.8	73	0.015	0.01175	44.41	44.28
17/12/2018	4.6111	36.5	73	0.015	0.01175	36.62	36.59
2/04/2019	0.4822	19.1	73	0.015	0.01175	20.73	20.38
9/04/2019	0.0026	49.76	73	0.015	0.01175	69.61	68.84
14/05/2019	0.0001	11.09	73	0.015	0.01175	72.78	72.73
11/06/2019	0.0000	11.15	73	0.015	0.01175	72.99	72.99
16/07/2019	0.0000	4.53	73	0.015	0.01175	73.00	73.00
20/08/2019	0.0000	8.9	73	0.015	0.01175	73.00	73.00
26/09/2019	0.0067	6.79	73	0.015	0.01175	52.60	49.00
22/10/2019	0.0004	5.95	73	0.015	0.01175	71.38	70.95
20/02/2020	0.2652	39.26	73	0.015	0.01175	41.07	40.69
10/03/2020	0.0336	5.25	73	0.015	0.01175	26.17	22.81
21/04/2020	0.0004	41.58	73	0.015	0.01175	72.26	72.06
16/06/2020	0.0017	8.55	73	0.015	0.01175	66.57	65.02
14/07/2020	0.0018	39.04	73	0.015	0.01175	69.28	68.39
9/12/2020	0.0001	41	73	0.015	0.01175	72.73	72.65
10/03/2021	0.0001	30.86	73	0.015	0.01175	72.83	72.78
10/06/2021	0.0004	45.7	73	0.015	0.01175	72.36	72.19
9/07/2021	0.0012	27.1	73	0.015	0.01175	69.70	68.87
12/08/2021	0.0001	6.6	73	0.015	0.01175	72.73	72.66
3/09/2021	0.0165	23.8	73	0.015	0.01175	47.20	44.24

Date	Simulated Q (m3/s)	Observed Turbidity (NTU)	Discharged Turbidity (NTU)	Max Discharge Q (m3/s)	Avg Discharge Q (m3/s)	Max Mixed Turbidity (NTU)	Avg. Mixed Turbidity (NTU)
8/02/2022	0.0123	11.35	73	0.015	0.01175	**45.23**	**41.48**
17/03/2022	0.6107	29.67	73	0.015	0.01175	**30.71**	**30.49**
Average		**20.28**				**49.58**	**48.52**

Table 4-5 shows the values calculated for Catchment 3 (Tributary of South Creek). A discharge turbidity of 66 NTU from the sediment basins provides an average mixed turbidity in the waterway of 48.97 NTU. The maximum mixed turbidity (using the short term maximum flow of 27L/s) results in an average turbidity of 49.53 NTU.

Table 4-5: Estimated turbidity in Tributary of South Creek (Catchment 3)

Date	Simulated Q (m3/s)	Observed Turbidity (NTU)	Discharged Turbidity (NTU)	Max Discharge Q (m3/s)	Avg Discharge Q (m3/s)	Max Mixed Turbidity (NTU)	Avg. Mixed Turbidity (NTU)
2/11/2015	0.001	39	66	0.0271	0.02317	**65.38**	**65.28**
8/12/2015	0.018	2.42	66	0.0271	0.02317	**40.37**	**37.94**
5/01/2016	0.001	20.7	66	0.0271	0.02317	**64.68**	**64.46**
4/02/2016	0.809	11.1	66	0.0271	0.02317	**12.88**	**12.63**
2/03/2016	0.040	24.8	66	0.0271	0.02317	**41.50**	**39.97**
7/04/2016	0.001	23.2	66	0.0271	0.02317	**64.88**	**64.70**
8/07/2016	0.776	17.7	66	0.0271	0.02317	**19.33**	**19.10**
12/09/2016	1.389	12.6	66	0.0271	0.02317	**13.62**	**13.48**
7/10/2016	0.086	5.7	66	0.0271	0.02317	**20.11**	**18.47**
4/11/2016	0.004	8	66	0.0271	0.02317	**58.80**	**57.76**
8/02/2017	0.000	22.9	66	0.0271	0.02317	**66.00**	**66.00**
13/03/2017	0.345	20.1	66	0.0271	0.02317	**23.44**	**22.99**
10/04/2017	2.734	3.1	66	0.0271	0.02317	**3.72**	**3.63**
8/05/2017	0.122	10.2	66	0.0271	0.02317	**20.37**	**19.13**
5/06/2017	0.005	7.1	66	0.0271	0.02317	**56.19**	**54.85**
13/07/2017	0.020	7.7	66	0.0271	0.02317	**41.60**	**39.36**
8/08/2017	0.001	27.5	66	0.0271	0.02317	**64.52**	**64.28**
26/10/2018	0.435	43.8	66	0.0271	0.02317	**45.10**	**44.92**
17/12/2018	2.872	36.5	66	0.0271	0.02317	**36.78**	**36.74**
2/04/2019	0.300	19.1	66	0.0271	0.02317	**22.98**	**22.46**
9/04/2019	0.002	49.76	66	0.0271	0.02317	**65.10**	**64.95**
14/05/2019	0.000	11.09	66	0.0271	0.02317	**65.93**	**65.92**
11/06/2019	0.000	11.15	66	0.0271	0.02317	**66.00**	**66.00**
16/07/2019	0.000	4.53	66	0.0271	0.02317	**66.00**	**66.00**
20/08/2019	0.000	8.9	66	0.0271	0.02317	**66.00**	**66.00**
26/09/2019	0.004	6.79	66	0.0271	0.02317	**58.12**	**56.99**
22/10/2019	0.000	5.95	66	0.0271	0.02317	**65.49**	**65.41**
20/02/2020	0.165	39.26	66	0.0271	0.02317	**43.03**	**42.55**
10/03/2020	0.021	5.25	66	0.0271	0.02317	**39.54**	**37.18**
21/04/2020	0.000	41.58	66	0.0271	0.02317	**65.80**	**65.76**
16/06/2020	0.001	8.55	66	0.0271	0.02317	**63.89**	**63.54**
14/07/2020	0.001	39.04	66	0.0271	0.02317	**64.90**	**64.73**
9/12/2020	0.000	41	66	0.0271	0.02317	**65.93**	**65.91**

Date	Simulated Q (m3/s)	Observed Turbidity (NTU)	Discharged Turbidity (NTU)	Max Discharge Q (m3/s)	Avg Discharge Q (m3/s)	Max Mixed Turbidity (NTU)	Avg. Mixed Turbidity (NTU)
10/03/2021	0.000	30.86	66	0.0271	0.02317	**65.95**	**65.94**
10/06/2021	0.000	45.7	66	0.0271	0.02317	**65.83**	**65.81**
9/07/2021	0.001	27.1	66	0.0271	0.02317	**64.99**	**64.82**
12/08/2021	0.000	6.6	66	0.0271	0.02317	**65.92**	**65.90**
3/09/2021	0.010	23.8	66	0.0271	0.02317	**54.38**	**53.01**
8/02/2022	0.008	11.35	66	0.0271	0.02317	**53.96**	**52.43**
17/03/2022	0.380	29.67	66	0.0271	0.02317	**32.09**	**31.76**
Average		**20.28**				**49.53**	**48.97**

Table 4-6 shows the values calculated for Catchment 4 (Blaxland Creek). A discharge turbidity of 71 NTU from the sediment basins provides an average mixed turbidity in the waterway of 49.60 NTU. The maximum mixed turbidity (using the short term maximum flow of 35L/s) results in an average turbidity of 49.66 NTU.

Table 4-6: Estimated turbidity in Blaxland Creek (Catchment 4)

Date	Simulated Q (m3/s)	Observed Turbidity (NTU)	Discharged Turbidity (NTU)	Max Discharge Q (m3/s)	Avg Discharge Q (m3/s)	Max Mixed Turbidity (NTU)	Avg. Mixed Turbidity (NTU)
2/11/2015	0.002	39	71	0.0349	0.03419	**68.91**	**68.87**
8/12/2015	0.257	2.42	71	0.0349	0.03419	**10.62**	**10.47**
5/01/2016	54.619	20.7	71	0.0349	0.03419	**20.73**	**20.73**
4/02/2016	0.973	11.1	71	0.0349	0.03419	**13.17**	**13.13**
2/03/2016	0.048	24.8	71	0.0349	0.03419	**44.25**	**44.02**
7/04/2016	0.001	23.2	71	0.0349	0.03419	**69.83**	**69.80**
8/07/2016	2.711	17.7	71	0.0349	0.03419	**18.38**	**18.36**
12/09/2016	2.243	12.6	71	0.0349	0.03419	**13.49**	**13.48**
7/10/2016	0.139	5.7	71	0.0349	0.03419	**18.78**	**18.57**
4/11/2016	0.006	8	71	0.0349	0.03419	**61.50**	**61.33**
8/02/2017	0.000	22.9	71	0.0349	0.03419	**71.00**	**71.00**
13/03/2017	0.834	20.1	71	0.0349	0.03419	**22.14**	**22.10**
10/04/2017	4.102	3.1	71	0.0349	0.03419	**3.67**	**3.66**
8/05/2017	0.182	10.2	71	0.0349	0.03419	**19.96**	**19.79**
5/06/2017	0.008	7.1	71	0.0349	0.03419	**58.94**	**58.74**
13/07/2017	0.094	7.7	71	0.0349	0.03419	**24.87**	**24.62**
8/08/2017	0.005	27.5	71	0.0349	0.03419	**65.35**	**65.25**
26/10/2018	1.674	43.8	71	0.0349	0.03419	**44.36**	**44.34**
17/12/2018	4.788	36.5	71	0.0349	0.03419	**36.75**	**36.74**
2/04/2019	1.246	19.1	71	0.0349	0.03419	**20.51**	**20.49**
9/04/2019	0.006	49.76	71	0.0349	0.03419	**67.68**	**67.63**
14/05/2019	0.000	11.09	71	0.0349	0.03419	**70.77**	**70.77**
11/06/2019	0.000	11.15	71	0.0349	0.03419	**70.99**	**70.99**
16/07/2019	0.000	4.53	71	0.0349	0.03419	**71.00**	**71.00**
20/08/2019	0.000	8.9	71	0.0349	0.03419	**71.00**	**71.00**
26/09/2019	0.011	6.79	71	0.0349	0.03419	**55.94**	**55.70**
22/10/2019	0.001	5.95	71	0.0349	0.03419	**69.91**	**69.89**
20/02/2020	0.365	39.26	71	0.0349	0.03419	**42.03**	**41.98**

Date	Simulated Q (m3/s)	Observed Turbidity (NTU)	Discharged Turbidity (NTU)	Max Discharge Q (m3/s)	Avg Discharge Q (m3/s)	Max Mixed Turbidity (NTU)	Avg. Mixed Turbidity (NTU)
10/03/2020	0.056	5.25	71	0.0349	0.03419	**30.38**	**30.06**
21/04/2020	0.000	41.58	71	0.0349	0.03419	**70.61**	**70.60**
16/06/2020	0.001	8.55	71	0.0349	0.03419	**69.66**	**69.63**
14/07/2020	0.000	39.04	71	0.0349	0.03419	**70.57**	**70.57**
9/12/2020	0.000	41	71	0.0349	0.03419	**70.81**	**70.81**
10/03/2021	0.000	30.86	71	0.0349	0.03419	**70.87**	**70.87**
10/06/2021	0.000	45.7	71	0.0349	0.03419	**70.85**	**70.85**
9/07/2021	0.000	27.1	71	0.0349	0.03419	**70.99**	**70.99**
12/08/2021	0.000	6.6	71	0.0349	0.03419	**71.00**	**71.00**
3/09/2021	0.000	23.8	71	0.0349	0.03419	**71.00**	**71.00**
8/02/2022	0.006	11.35	71	0.0349	0.03419	**61.80**	**61.64**
17/03/2022	0.810	29.67	71	0.0349	0.03419	**31.38**	**31.34**
Average		**20.28**				**49.66**	**49.60**

5 CONCLUSION AND RECOMMENDATIONS

5.1 Background

The new Sydney Metro Western Sydney Airport rail line is a key element in an integrated transport system for the Western Parkland City. It involves the construction and operation of a 23km new metro rail line that extends from the existing Sydney Trains suburban T1 Western Line at St Marys in the north and the Aerotropolis at Bringelly in the south.

This Project focuses on the surface works which includes:

- 3.6 kilometre of viaduct.
- 205 metres of bridges.
- 6.9km of at-grade alignment.
- Temporary and permanent access roads.

The purpose of this Assessment is to determine appropriate discharge criteria from construction sediment basins to protect water quality objectives in the receiving waters, to address the relevant CoAs, REMMs and assist in developing appropriate limits in the Project EPL.

5.2 Conclusions and Recommendations

The results of the discharge assessment are summarised as follows:

- The desktop assessment method as defined in the TfNSW (2020a) Draft guideline is appropriate for use for this Project (refer to Section 2.2). It has utilised collected data from around the Project premises and simulated streamflow estimated from a calibrated AWBM of South Creek.
- Following construction-phase sediment basin discharge events, average turbidity levels are predicted to be less than the threshold Water Quality Objective of 50 NTU.
- Based on this assessment, discharges to Badgerys Creek from construction-phase sediment basins should have turbidity no greater than 59 NTU.
- Based on this assessment, discharges to Cosgroves Creek from construction-phase sediment basins should have turbidity no greater than 73 NTU.
- Based on this assessment, discharges to the tributary of South Creek from construction-phase sediment basins should have turbidity no greater than 66 NTU.
- Based on this assessment, discharges to Blaxland Creek from construction-phase sediment basins should have turbidity no greater than 71 NTU.
- **Despite this discharge impact assessment indicating that the local waterways can cater for construction basin discharges between 59 NTU and 73 NTU a conservative discharge limit of 50 NTU is recommended for discharge to all waterways.**

- Based on modelling in this assessment, turbidity in all waterways already naturally exceeds 50 NTU during and after heavy rainfall events, and this is expected to continue to occur during construction.

5.3 Additional Recommendations

Notwithstanding the above conclusions and primary recommendations for discharge limits, for this Project a range of additional management measures are recommended to reduce the potential environmental impacts associated with construction-phase sediment basin discharges. These are outlined in the EIS (Sydney Metro, 2020a), and in the ESMR (SEEC, 2022).

Further to those recommendations, the following management measures are recommended for the construction-phase works component of this Project:

- Adoption of a single discharge criterion across the Project, rather than having different criteria for each watercourse. This would be to reduce the risk of site personnel applying an incorrect criterion when discharging water. The most conservative value (59 NTU) would need to be adopted.
- Measure compliance in terms of Turbidity rather than TSS. This will prevent the need to translate water quality objectives from Turbidity (NTU) to TSS (mg/L) and then back to on site Turbidity (NTU) measurements.
- The adoption of default values for pH (6 to 8.5) and oils and greases (none visible) in discharges.
- Apply a risk based approach regarding the re-use of water in construction-phase sediment basins in preference to discharge. This will include process for reusing surface detained on the site as discussed in Section 3.10. Infrastructure construction is an activity that requires considerable water volumes for earthworks compaction and dust control. During drier periods (minimal or no rainfall predicted), construction sediment basin water would typically be utilised for this purpose rather than discharged.
- Irrigation of sediment basin water to approved land where feasible and the water quality meets the required irrigation standards.
- All construction-phase sediment basin outlets would be rock armoured to meet Blue Book design requirements. Where nominated discharge points are located away from waterways, the rock armouring provides an opportunity for infiltration of discharged water into the underlying soil prior to discharge into the receiving environment.
- Basin dewatering activities should be undertaken in accordance with TfNSW's document titled Environmental Management of Construction Site Dewatering, which requires the following:
    - Preparation of site specific environmental work method statement for dewatering activities,
    - Dewatering methods that will minimise potential environmental impacts,
    - Reuse opportunities and any limitations,
    - Discharge locations and adequate energy dissipation,
    - Water quality criteria for discharge and/or reuse,
    - Treatment techniques required to meet the water quality criteria,

  - Water sampling and testing requirements.
- Use of floating siphon devices where possible to minimise resuspension of sediment during dewatering operations. Floating siphon devices remove water from the top of the water column where the supernatant is likely to be the best quality.
- This Assessment highlights that the proposed discharge limits result in an average turbidity level less than the water quality objective trigger values. Additional monitoring within the mixing zones during operation of the basins will confirm the desktop assessment that anticipates that discharges will be quickly mixed with the receiving waters.

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